

# Flora of China



*Cucurbitaceae through Valerianaceae  
with Annonaceae and Berberidaceae*

19

## Flora of China

The Chinese flora, with an estimated 31,500 species, is of immense scientific and horticultural importance. Noteworthy, too, is Chinese traditional medicine, which is based on the remarkable plant resources of the country. Descriptions and identification keys for this diverse flora, until now unavailable in English, have been published over the past 18 years in the *Flora of China*, in conjunction with a separate series, the *Flora of China Illustrations*. Thirty-eight of the total of 48 text and illustration volumes have already been published, thanks to an unprecedented and long-standing collaboration between Western and Chinese scientists.

This is the largest single volume of the *Flora of China*, with more than 2,000 species described in 22 families. Among these, the Acanthaceae include the large genus *Strobilanthes* (128 species); the Adoxaceae include the horticulturally important genus *Viburnum*; the Berberidaceae include the popular garden plants *Epimedium* as well as *Berberis* (barberry) and *Mahonia*; the Campanulaceae (bellflower family) include *Campanula*, *Codonopsis*, *Cyananthus*, and *Lobelia*; the Caprifoliaceae include *Lonicera* (honeysuckle) and *Leycesteria* (Himalayan honeysuckle); the Cucurbitaceae include various cultivated fruits and vegetables as well as many native species; the Lentibulariaceae include the carnivorous *Pinguicula* (butterwort) and *Utricularia* (bladderwort); finally, the Rubiaceae is the largest family in this volume, with some 700 species, including species-rich genera such as *Galium* (bedstraw), *Hedyotis*, and *Ophiorrhiza*, as well as the Chinese endemic ornamental tree *Emmenopterys henryi*.

To find out more about the *Flora of China* project, visit the website at  
<http://flora.huh.harvard.edu/china/>

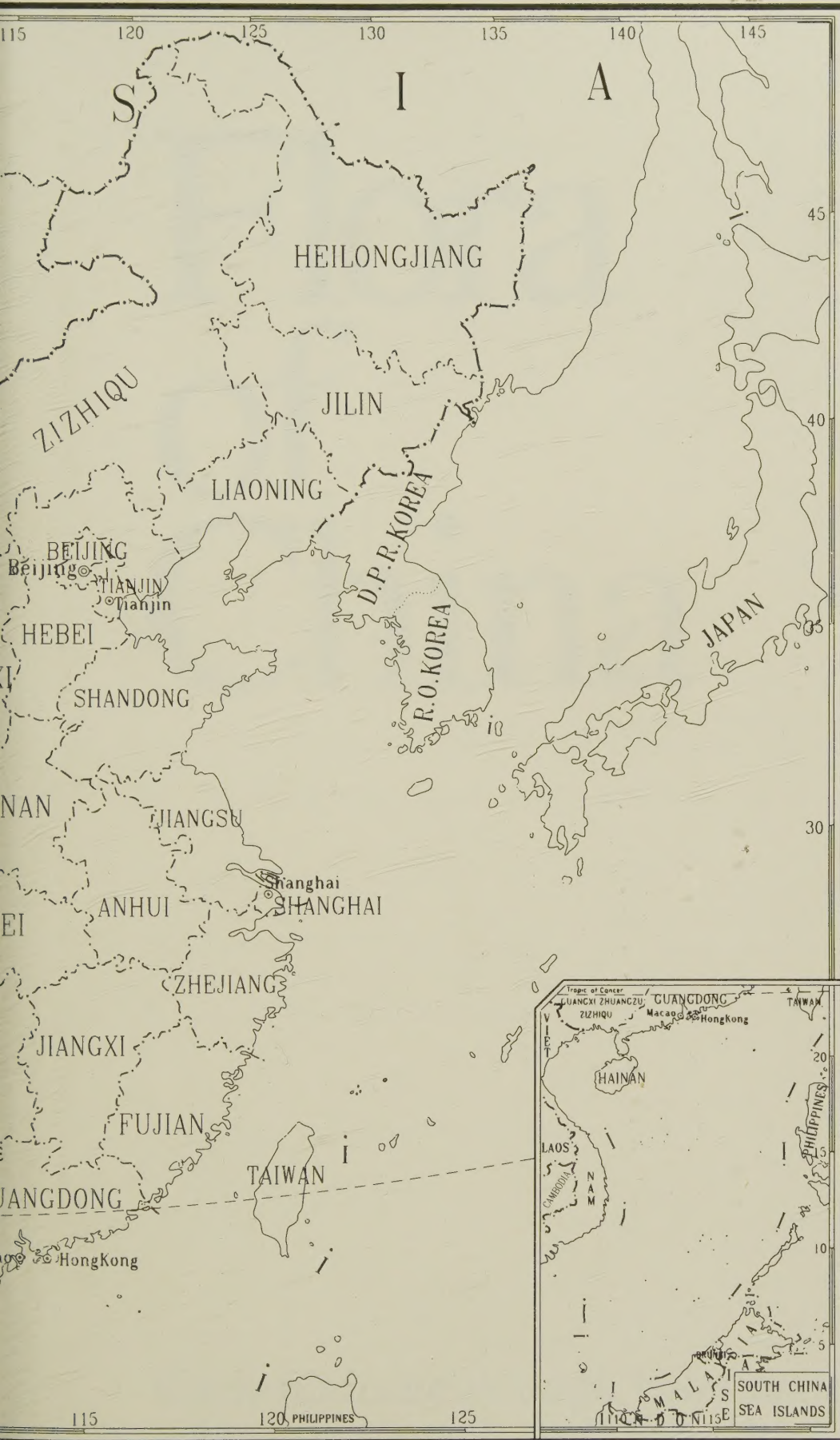


SCIENCE  
PRESS  
(Beijing)



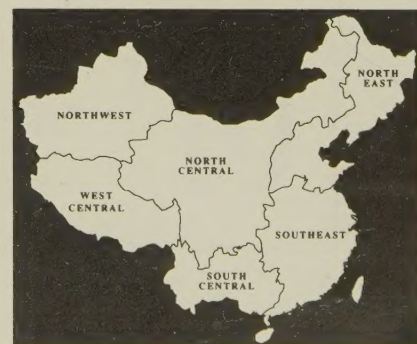
MISSOURI  
BOTANICAL  
GARDEN  
PRESS  
(St. Louis)






## CHINA'S ADMINISTRATIVE DIVISIONS

ANHUI – Southeast  
 BEIJING – Northeast  
 CHONGQING – North Central  
 FUJIAN – Southeast  
 GANSU – North Central  
 GUANGDONG – Southeast  
 GUANGXI – South Central  
 GUIZHOU – South Central  
 HAINAN – South Central  
 HEBEI – Northeast  
 HEILONGJIANG – Northeast  
 HENAN – Southeast  
 HONG KONG – Southeast  
 HUBEI – Southeast  
 HUNAN – Southeast  
 JIANGSU – Southeast  
 JIANGXI – Southeast  
 JILIN – Northeast  
 LIAONING – Northeast  
 MACAO – Southeast  
 NEI MONGOL – North Central  
 NINGXIA – North Central  
 QINGHAI – North Central  
 SHAANXI – North Central  
 SHANDONG – Northeast  
 SHANGHAI – Southeast  
 SHANXI – Northeast  
 SICHUAN – North Central  
 SOUTH CHINA SEA ISLANDS – Southeast  
 TAIWAN – Southeast  
 TIANJIN – Northeast  
 XINJIANG – Northwest  
 XIZANG – West Central  
 YUNNAN – South Central  
 ZHEJIANG – Southeast



The national boundaries of China on this map are drawn after the 1:4M Relief Map of People's Republic of China published by China Cartographic Publishing House in 1989



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The *Flora of China* logo (above) is a composite image, derived from the outlines of leaf shapes from genera of woody plants occurring in both China and the U.S.A., that symbolizes the collaboration between the two nations. It was designed by Charles P. Reay.

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## Preface

Volume 19 of the *Flora of China* is the 20th of the 24 text volumes in the series. It includes 22 families, 255 genera, and 2,024 species, among which 11 genera and 1,065 species (53%) are endemic to China, and 24 genera and 64 species (3%) are introduced to China. The final two families in this volume, Annonaceae and Berberidaceae, were originally scheduled for inclusion in vol. 7 (2008).

Volume 19 is formatted in the same manner as the first 19 volumes of the series: vol. 17 (1994), vol. 16 (1995), vol. 15 (1996), vol. 18 (1998), vol. 4 (1999), vol. 24 (2000), vol. 8 (2001), vol. 6 (2001), vol. 9 (2003), vol. 5 (2003), vol. 14 (2005), vol. 22 (2006), vol. 13 (2007), vol. 12 (2007), vol. 11 (2008), vol. 7 (2008), vol. 25 (2009), vol. 10 (2010), and vol. 23 (2010). The following 18 accompanying volumes of the *Flora of China Illustrations* have been published to date: vol. 17 (1998), vol. 16 (1999), vol. 15 (2000), vol. 18 (2000), vol. 4 (2001), vol. 24 (2002), vol. 8 (2003), vol. 6 (2003), vol. 9 (2004), vol. 5 (2004), vol. 14 (2006), vol. 22 (2007), vol. 13 (2008), vol. 12 (2008), vol. 11 (2009), vol. 7 (2009), vol. 25 (2010), and vol. 10 (2011).

Bruce Bartholomew edited the Acanthaceae, Annonaceae, Goodeniaceae, Lentibulariaceae, Myoporaceae, Phrymaceae, Plantaginaceae, and Stylidiaceae. Anthony R. Brach co-authored and edited the Berberidaceae (except *Berberis*) and Carlemanniaceae and edited the Adoxaceae, Berberidaceae (*Berberis*), Caprifoliaceae, Diervillaceae, Dipsacaceae, Linnaeaceae, Morinaceae, and Valerianaceae. Lisa J. Pepper edited the Rubiaceae. Nicholas J. Turland co-authored and edited the Pentaphragmataceae and Sphenocleaceae and, together with Anthony R. Brach, edited the Campanulaceae and Cucurbitaceae. Nicholas J. Turland checked the nomenclature. Lisa J. Pepper carried out the final editing of the whole volume. Zhang Libing (张丽兵) corrected errors and omissions in the Chinese and pinyin names. Anthony R. Brach, Han Xuezhe (韩学哲), Lisa J. Pepper, and Zeng Jianfei (曾建飞) proofread the volume. Nicholas J. Turland and Lisa J. Pepper compiled the indexes. Beth Parada helped with the production of the introductory pages. Rosemary Tanaka typeset the volume for publication.

The 21st and 22nd text volumes in the series (vols. 20 and 21) will be devoted to the Asteraceae (Compositae), with ca. 2,300 species.

Wu Zhengyi (吴征镒)

Peter H. Raven

Hong Deyuan (洪德元)

## Introduction

The *Flora of China* will be published in 24 volumes of text and will account for all known vascular plants of China. The taxa treated in the Flora include all native and naturalized plants, as well as economically important exotics, such as crops or plantation plants. Each text volume will be followed by an accompanying volume of the *Flora of China Illustrations*, which will provide detailed line drawings of approximately 60% of the species treated in the text volumes. A list of the volumes published to date is provided at the end of this book. An introductory volume will complete the Flora.

The Flora generally follows the same sequence of families as in *Flora Reipublicae Popularis Sinicae* (FRPS), i.e., a modified Englerian system that treats the monocotyledons last. However, the circumscription of some families reflects the present understanding of the groups. For example, the Menyanthaceae and Gentianaceae are both recognized, instead of combining them as the Gentianaceae, whereas the Lythraceae, Puniceae, and Sonneratiaceae are combined as the Lythraceae. Genera and species are arranged taxonomically, or occasionally alphabetically.

Taxonomic treatments are presented from the level of family to species and infraspecific ranks. Although intermediate ranks (e.g., subfamily, tribe, subgenus, section, series) are useful in the taxonomy of certain large families (e.g., Poaceae) and genera (e.g., *Rhododendron*), they are used only sparingly. Accepted names are cited with authors, bibliographic citations, and synonyms, except above the rank of genus when only the name is cited. Each recognized taxon has a description as well as an indication of the number of subordinate taxa and the distribution worldwide. For infraspecific taxa, either subspecies or varieties are recognized. Forms are not treated. All keys are dichotomous, indented, and generally artificial.

The synonymy given is based on close examination of accepted names and synonyms listed in major East Asian floras. At the generic level, synonyms widely used in the literature are included. At the specific and infraspecific levels, only the main synonyms, especially those listed in the floras of neighboring countries, are included. All names based on Chinese material are included. The complete bibliographic citation of synonyms is given only for basionyms or replaced synonyms of accepted names; only the authors' names are provided for other synonyms. The basionym of an accepted name is listed before other synonyms, which are arranged alphabetically. As far as possible, the bibliographic citations of all accepted names and their basionyms have been verified. Names not validly published or misapplied in major East Asian and local Chinese floras are not included in synonymy. Discussions relating to such names are dealt with as notes. Differences of opinion among authors in the circumscription of taxa are mentioned as notes.

Except where no material was available to authors and collaborators, all descriptions are based on Chinese plants. In general, the description of a given taxon does not exceed 130 words. Descriptions of families are followed by the number of genera and species, distribution, and usually other comments, including reference to FRPS accounts. If a species is represented in China by more than one infraspecific taxon, a full description is provided for the species, and only diagnostic features are listed under the infraspecific taxa. If only one infraspecific taxon of a species occurs in China, a full description is given under the infraspecific taxon. Flowering (fl.) and fruiting (fr.) times are usually given by month using the first three letters of the month.

If a single measurement is used, it indicates length. When both length and width are used, the measurements are given as length  $\times$  width. A range of measurements is separated by an en-dash (–). Discontinuous

states within a taxon are separated by the word “or.” Exceptional measurements or character states are in parentheses ( ) or, when applicable only to material from outside of China, in brackets [ ].

The distribution in China is given at the provincial level, listed alphabetically as follows: Anhui, Beijing, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanghai, Shanxi, Sichuan, Taiwan, Tianjin, Xinjiang, Xizang, Yunnan, and Zhejiang. Distributions may also include the special districts of Hong Kong and Macau, but only if the taxon is absent from Guangdong Province. The provincial map is provided on the front- and endpapers of this volume. The distributions are sometimes modified by using the directions C(entral), E(ast), N(orth), S(outh), W(est), or intermediate directions. A taxon endemic to China is marked with a bullet (●) at the beginning of the paragraph on habitat and distribution. Where a taxon is very local, the exact distribution may be given in parentheses. However, localities are not given below the level of *xian* (equivalent to county) or mountain. Elevations are rounded off to the nearest 100 m.

The distribution by country, continent, or area is given alphabetically in brackets [ ] for taxa extending beyond China. Only the countries adjacent to China are explicitly listed, as well as the other countries of tropical Asia from India eastward. These include Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Laos, Malaysia, Mongolia, Myanmar (formerly Burma), Nepal, Pakistan, Papua New Guinea, the Philippines, Russia, Singapore, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan, and Vietnam. When the distribution extends beyond these countries, a generalized range (including Africa, SW Asia, Australia, Europe, North America, the Pacific islands, and South America) is given.

Whenever available, somatic chromosome numbers are included at the end of descriptions of specific and infraspecific taxa; an asterisk (\*) indicates counts made from Chinese material.

A question mark (?) placed immediately before a synonym, character state in a description, or territory within a distribution indicates that confirmation is required.

Each recognized taxon in the *Flora of China* has one Chinese name, followed by its pinyin transliteration. Three indexes are included at the end of each volume: one for Chinese plant names, another for the pinyin transliterations, and the third for scientific names.

The family names of authors of plant names are written out in full. When it is necessary to use initials to differentiate authors with the same family name, the initials (if any) of the abbreviation published by Brummitt and Powell in *Authors of Plant Names* (Royal Botanic Gardens, Kew, 1992) and its continuously updated on-line supplement (at <http://www.ipni.org/>) are used. The abbreviation “f.” is not used for the Latin *filius*, but the son’s initials are used (e.g., “J. D. Hooker” rather than “Hook. f.”), except when the names of the parent and descendant are identical (e.g., “Linnaeus” and “Linnaeus f.”).

Abbreviations of periodicals are according to Bridson’s *BPH-2 (Botanico-Periodicum-Huntianum)*, ed. 2; Pittsburgh: Hunt Institute for Botanical Documentation, 2004), and abbreviations for books follow Stafleu and Cowan’s *Taxonomic Literature*, ed. 2 (*TL-2*; Utrecht/Antwerpen: Bohn, Scheltema and Holkema; The Hague/Boston: dr. W. Junk b.v., 1976–1988) and its supplements. Books and periodicals not included in these two works are abbreviated according to the recommendations in the Appendix of *BPH-2*.

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# CUCURBITACEAE

葫芦科 hu lu ke

Lu Anmin (路安民 Lu An-ming)<sup>1</sup>, Huang Luqi (黄璐琦)<sup>2</sup>, Chen Shukun (陈书坤)<sup>3</sup>; Charles Jeffrey<sup>4</sup>

Herbs, annual or perennial, or weak, woody shrubs with watery sap, scandent or prostrate. Roots fibrous or tuberous. Stem often angular. Leaves alternate, undivided or variously palmately or pedately divided, often cordate; tendrils solitary, lateral, simple or branched, spirally twisted, rarely absent; stipules absent. Plants monoecious or dioecious; flowers unisexual, very rarely bisexual; flowers paniculate, racemose, or subumbellate, rarely solitary. Calyx tube (hypanthium) adnate to ovary; tube rotate, campanulate, or saucer-shaped, usually 5-lobed; segments imbricate. Corolla usually sympetalous, inserted on calyx tube; segments valvate or involute. Stamens inserted at base or mouth of calyx tube, usually 5 or 3, of which one often 1-celled and other two 2-celled; filaments separate or variously united into a column; anthers separate or coherent into a head; anther cells straight to conduplicate, extrorse; rudimentary ovary often present in male flowers; staminodes often in female flowers. Ovary inferior or nearly completely so, mostly composed of 3 carpels, 3-locular, rarely 1- or 2- or spuriously 4–6-locular; ovules usually numerous, rarely few or solitary, horizontal, pendulous, or ascending, often immersed in pulp; placentas parietal, fleshy, often confluent at middle of ovary; style terminal, simple or branched at apex or styles free; stigma enlarged or 2-fid. Fruit usually a fleshy berry or corky, indehiscent or rarely opening by valves or by an operculum, rarely fibrous. Seeds often numerous, rarely few or solitary, horizontal, pendulous, or ascending, often compressed, rarely winged; endosperm absent; embryo with leaflike cotyledons and short radicle.

About 123 genera and over 800 species: most in tropics and subtropics, very rare in temperate regions; 35 genera (one endemic, nine introduced) and 151 species (73 endemic, 14 introduced) in China.

Lu An-ming & Zhang Zhi-yun. 1986. Cucurbitaceae. In: Lu An-ming & Chen Shu-kun, eds., Fl. Reipubl. Popularis Sin. 73(1): 84–280.

- 1a. Corolla segments fimbriate at margin.
  - 2a. Ovules and seeds numerous; calyx tube less than 7 cm ..... 21. *Trichosanthes*
  - 2b. Ovules 12, seeds usually 6, each with 1 abortive seed attached to its side; calyx tube 7–10 cm ..... 20. *Hodgsonia*
- 1b. Corolla segments not fimbriate.
  - 3a. Stamens 5, anther cells ovoid and straight.
    - 4a. Leaves palmately compound, rarely simple.
      - 5a. Plants woody, scandent; leaflets almost entire, with 2 glands at base; seeds with membranous wing at apex ..... 4. *Neosomitra*
      - 5b. Plants herbaceous, scandent; leaflets distinctly denticulate, eglandular at base; seeds without wing or rarely winged.
        - 6a. Fruit indehiscent; seeds horizontal ..... 11. *Thladiantha*
        - 6b. Fruit 3-valved, dehiscent at apex or rarely not dehiscent but then smaller in size; seeds pendulous.
          - 7a. Corolla segments more than 5 mm; fruit clavate-cylindric, obovoid, or globose, more than 6-seeded ..... 1. *Hemsleya*
          - 7b. Corolla segments less than 3 mm; fruit turbinate or globose, 1–3(–5)-seeded.
            - 8a. Plants monoecious; fruit turbinate, 3-valved, dehiscent at apex ..... 2. *Gomphogyne*
            - 8b. Plants dioecious; fruit globose or campanulate, indehiscent or dehiscent along ventral suture ..... 3. *Gynostemma*
      - 4b. Leaves simple.
        - 9a. Flowers with corolla segments less than 10 mm; fruit dehiscent, operculate or 3-valved.
          - 10a. Leaf blade entire; fruit 6–10 cm, truncate at apex, 3-valved; seeds surrounded by a membranous wing ..... 5. *Zanonia*
          - 10b. Leaf blade divided; fruit 1–3.5 cm, operculate; seed not winged or with membranous wing at apex.
            - 11a. Plants monoecious; leaf blade cordate-hastate, eglandular at base; fruit dehiscent near middle; seeds not winged ..... 7. *Actinostemma*
            - 11b. Plants dioecious; leaf blade with 1 or 2 pairs of glands at base; fruit dehiscent near apex; seeds with membranous wing at apex ..... 6. *Bolbostemma*

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- 9b. Flowers with corolla segments ca. 2 cm, or if smaller then calyx longer than corolla; fruit baccate, indehiscent; seed not winged.
  - 12a. Flowers with calyx longer than corolla; anthers reniform; fruit more than 10 cm ..... 8. *Indofevillea*
  - 12b. Flowers with corolla longer than calyx; anthers oblong; fruit less than 10 cm.
    - 13a. Plants with black glandular scales ..... 9. *Siraitia*
    - 13b. Plants without glandular scales.
      - 14a. Tendrils spiraling only above point of branching; anther cells straight ..... 11. *Thladiantha*
      - 14b. Tendrils spiraling also below point of branching; anther cells reniform-curved .... 10. *Sinobaijania*
- 3b. Stamens 3 or 1, anther cells horizontal when only 1 stamen, or rarely 5 but then anther cells conduplicate.
  - 15a. Stamens united into a central column and pollen sac fusing into ring; leaf blade pedatipartite ..... 22. *Cyclanthera*
  - 15b. Stamens 3, or rarely 5 but then anther cells conduplicate; leaves not pedately compound.
    - 16a. Flowers less than 10 mm in diam.
      - 17a. Plants dioecious or rarely flowers bisexual; fruit 3-valved from apex to base when mature; seeds 1–3, pendulous ..... 14. *Schizopepon*
      - 17b. Plants usually monoecious, rarely dioecious; fruit indehiscent; seeds often horizontal.
        - 18a. Male flowers without pistillode; anther cells conduplicate; male and female flowers fasciculate in leaf axil ..... 29. *Diplocyclos*
        - 18b. Male flowers with globose or subulate pistillode; anther cells straight, curved or conduplicate.
          - 19a. Anther cells incurved or reflexed ..... 33. *Solena*
          - 19b. Anther cells straight.
            - 20a. Male flowers in sessile or subsessile fascicles; ovary hispid ..... 27. *Mukia*
            - 20b. Male flowers in pedunculate cymes, racemes, or umbels, or solitary; ovary glabrous or with fine hairs.
              - 21a. Filaments as long as or longer than anthers, ca. 1 mm or more.
                - 22a. Corolla yellow; filaments and staminodes glabrous except at very base; seeds scrobiculate ..... 28. *Scopellaria*
                - 22b. Corolla white or pale yellow; filaments and staminodes hairy above base; seeds smooth ..... 25. *Zehneria*
              - 21b. Filaments shorter than anthers, 0.5–1 mm.
                - 23a. Anther connective not produced beyond thecae; stigmas glabrous, apically shortly 2-lobed; fruit black when ripe ..... 24. *Melothria*
                - 23b. Anther connective usually shortly produced beyond thecae; stigmas papillose, rounded; fruit white or red when ripe ..... 25. *Zehneria*
    - 16b. Flowers more than 10 mm in diam.
      - 24a. Anther cells straight; calyx tube narrowly funnelform ..... 17. *Edgaria*
      - 24b. Anther cells conduplicate.
        - 25a. Tendrils absent ..... 13. *Ecballium*
        - 25b. Tendrils present.
          - 26a. Corolla campanulate.
            - 27a. Leaf blade hirsute, eglandular at base; flowers yellow; fruit large ..... 35. *Cucurbita*
            - 27b. Leaf blade glabrous, with a few glands at base; flowers white; fruit ca. 5 cm ..... 30. *Coccinia*
          - 26b. Corolla rotate or rarely campanulate but then segments almost free.
            - 28a. Calyx tube in male flower elongate, tubular or funnelform.
              - 29a. Flowers white; petiole apex 2-glandular ..... 31. *Lagenaria*
              - 29b. Flowers yellow; leaf blade eglandular at base.
                - 30a. Corolla rotate; leaf blade less than 10 cm ..... 19. *Gymnopetalum*
                - 30b. Corolla campanulate; leaf blade over 10 cm.
                  - 31a. Leaf blade deeply lobed; seeds many, horizontal ..... 15. *Biswarea*
                  - 31b. Leaf blade undivided; seeds few, pendulous ..... 16. *Herpetospermum*
            - 28b. Calyx rotate.
              - 32a. Flowers with leaflike bract on pedicel; fruit usually muriculate, often 3-valved when mature ..... 12. *Momordica*
              - 32b. Flowers without bract on pedicel.
                - 33a. Male inflorescence racemose or subumbellate.
                  - 34a. Annual herb; fruit many seeded ..... 18. *Luffa*
                  - 34b. Perennial climber; fruit 1-seeded; seed large ..... 23. *Sechium*

- 33b. Flowers solitary or fascicled.
  - 35a. Calyx segments subleaflike, dentate, reflexed ..... 34. *Benincasa*
  - 35b. Calyx segments subulate, entire, not reflexed.
    - 36a. Tendrils 2- or 3-fid; connective not produced ..... 32. *Citrullus*
    - 36b. Tendrils simple; connective produced beyond anther cells ..... 26. *Cucumis*

# 1. **HEMSLEYA** Cogniaux ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 23: 490. 1888.

雪胆属 xue dan shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, perennial, scandent. Roots enlarged, oblate or rarely cylindric. Stem and branches slender or moderately robust. Tendrils filiform, 2-fid. Leaves pedately (3-)5-9(-11)-foliolate; leaflets narrowly oblong-lanceolate to obovate-lanceolate, membranous or papery. Plants dioecious. Inflorescence cymose-racemose to paniculate, axillary. Male flowers: calyx tube short; segments ovate to ovate-lanceolate, ascending, spreading, rotate, recurved, or reflexed; corolla pale yellow, yellow-green, or orange-red, rotate, discoid, turbinate, bowl-shaped, inverted bowl-shaped, Chinese lanternlike, or umbelliform; segments ovate-lanceolate to broadly ovoid, herbaceous or subsucculent; stamens 5; filaments exerted. Female flowers: calyx and corolla usually as in male flowers, sometimes slightly larger; ovary subglobose or conical, smooth or muriculate; styles 3; stigmas 2-lobed. Fruit globose, cylindric, or tubular-cylindric, longitudinally 9- or 10-striate or 9- or 10-angular, almost smooth or verrucose. Seeds elliptic or broadly ovate, usually with woody wings, sometimes wings membranous or absent.

About 27 species: subtropical or tropical Asia; 25 species (21 endemic) in China.

- 1a. Roots without tuber; seeds with broad membranous wing ..... 1. *H. graciliflora*
- 1b. Roots with tuber (except possibly for *H. heterosperma*); seeds without wing or with thin woody wing.
  - 2a. Flower smaller, corolla 3-7 mm in diam.
    - 3a. Corolla bowl-shaped, 5-7 mm in diam.; petals fleshy; fruit conical to cylindric, 2.4-3.5 cm × 8-10 mm; seeds oblong-elliptic to ovate, with a corky wing ..... 2. *H. delavayi*
    - 3b. Corolla laxly patelliform, 3-5 mm in diam.; petals membranous-herbaceous; fruit obconic, 2-4 cm × 12-15 mm; seeds lenticular, ± isodiametric, unwinged ..... 3. *H. kunmingensis*
  - 2b. Flower larger, corolla 8-15 mm in diam.
    - 4a. Corolla segments spreading, explanate, or ascending, corolla bowl-shaped or rotate.
      - 5a. Seeds strongly biconvex, almost without wing, margin slightly broad,  $\bar{l}$ -1.3(-2) mm; fruit conical to terete-elliptic.
        - 6a. Corolla 15-20 cm, yellow-green, segments broadly ovate ..... 6. *H. panlongqi*
        - 6b. Corolla 10-13 cm, green or pale green, segments strap-shaped; fruit conical or terete-conical.
          - 7a. Corolla segments ascending; flower buds obtuse at apex ..... 4. *H. macrocarpa*
          - 7b. Corolla segments spreading or reflexed; flower buds acute at apex ..... 5. *H. mitrata*
      - 5b. Seeds oblong, lenticular, or strongly biconvex, margin narrower, less than 1 mm in diam.; fruit globose, narrowly elliptic, or narrowly conical.
        - 8a. Seeds oblong, with thin corky wing; fruit narrowly elliptic to narrowly conical ..... 7. *H. dipterygia*
        - 8b. Seeds biconvex, without wing; fruit globose or conical.
          - 9a. Seeds lenticular; corolla bowl-shaped ..... 11. *H. sphaerocarpa*
          - 9b. Seeds ovate to orbicular; corolla rotate.
            - 10a. Fruit globose, pedicel with an articulation ..... 8. *H. amabilis*
            - 10b. Fruit conical or cylindric, pedicel without an articulation.
              - 11a. Fruit apex with distinct style; corolla segments lanceolate ..... 9. *H. heterosperma*
              - 11b. Fruit apex without distinct style; corolla segments ovate-orbicular ..... 10. *H. lijiangensis*
    - 4b. Corolla segments reflexed or revolute, corolla umbelliform or ± globose.
      - 12a. Seed margin narrower; corolla red-brown or pale red-brown, base often dark red-brown.
        - 13a. Leaflets 9-11; corolla bowl-shaped, 8-10 mm in diam. .... 25. *H. endecaphylla*
        - 13b. Leaflets (3-)5-9.
          - 14a. Corolla Chinese lanternlike.
            - 15a. Fruit elliptic; corolla 10-15 mm in diam. .... 20. *H. chinensis*
            - 15b. Fruit ovoid to globose; corolla 20-25 mm in diam. .... 21. *H. gigantea*
          - 14b. Corolla bowl-shaped (*H. dulongjiangensis* corolla unknown).
            - 16a. Fruit elliptic, 5-8 cm; seed margin erose ..... 22. *H. dolichocarpa*
            - 16b. Fruit ovoid to globose, 3-4 cm.

- 17a. Seed margin smooth; fruiting pedicel with an articulation; leaflets 5–7, elliptic-lanceolate ..... 23. *H. macrosperma*  
 17b. Seeds margin erose; fruiting pedicel without an articulation; leaflets 3–5, rhombic ..... 24. *H. dulongjiangensis*
- 12b. Seed margin smooth; corolla pale yellow or yellow-green.  
 18a. Fruit globose or subglobose.  
 19a. Corolla umbelliform, 10–12 mm in diam.; fruiting pedicel with an articulation ..... 12. *H. panacis-scandens*  
 19b. Corolla Chinese lanternlike or bowl-shaped, 6–12 mm in diam.  
 20a. Corolla Chinese lanternlike; fruit 2–2.5 cm in diam. .... 13. *H. emeiensis*  
 20b. Corolla bowl-shaped; fruit 3–3.5 cm in diam. .... 14. *H. pengxianensis*
- 18b. Fruit conical or elliptic to claviform-elliptic.  
 21a. Fruit elliptic or claviform, over 7 cm.  
 22a. Fruit narrowly elliptic-claviform, distinctly longitudinally costate, 7–8 cm, pedicel with indistinct articulation ..... 18. *H. chengyihana*  
 22b. Fruit broadly to narrowly elliptic, indistinctly costate, (6–)11–17 cm, pedicel with distinct articulation ..... 19. *H. zhejiangensis*
- 21b. Fruit conical to elliptic, 3.5–5 cm.  
 23a. Corolla bowl-shaped, segments cariose, 8–9 mm; fruit elliptic to ovoid ..... 17. *H. carnosiflora*  
 23b. Corolla Chinese lanternlike, segments thinner.  
 24a. Fruit conical, base cuneate; corolla segments 14–17 mm ..... 15. *H. turbinata*  
 24b. Fruit elliptic; base obtuse; corolla segments 10–15 mm ..... 16. *H. ellipsoidea*

**1. *Hemsleya graciliflora*** (Harms) Cogniaux in Engler, Pflanzentr. 66(IV. 275. I): 24. 1916.

马铜铃 *ma tong ling*

*Alsomitra graciliflora* Harms, Bot. Jahrb. Syst. 29: 602. 1901; *Gomphogyne bonii* Gagnepain; *Hemsleya graciliflora* var. *tianmuensis* X. J. Xue & H. Yao; *H. longgangensis* X. X. Chen & D. R. Liang.

Root fibrous; tuber absent. Leaves pedately 7-foliolate; petiole 1.8–3 cm; leaflets oblong-lanceolate to obovate-lanceolate, 5–10 × 2–3.5 cm; petiolule 4–7 mm. Inflorescence largely cymose; peduncle 5–20 cm, densely pubescent. Male flowers: pedicel filiform, 1–2 mm; calyx segments spreading, triangular, ca. 2 × 1 mm; corolla spreading, yellowish to pale yellow-green, rotate, 5–6 mm; segments obovate, 3–4 × ca. 2 mm, thinly membranous; filaments short, ca. 1 mm. Female flowers: calyx and corolla as in male flowers; ovary narrowly cylindric, base attenuate. Fruit conical, 2.5–3.5 × 1–1.5 cm; fruiting pedicel curved, 5–6 mm. Seeds oblong, compressed, 12–14 × 5–6 mm, with membranous wing, wing 3–4 mm at both ends of seed, seed body obovate. Fl. Jun–Sep, fr. Aug–Nov. *2n* = 28.

Mountain slopes; 500–2400 m. Guangdong, Guangxi, Hubei, Jiangxi, Sichuan, Zhejiang [Vietnam].

The fruit is used medicinally.

**2. *Hemsleya delavayi*** (Gagnepain) C. Jeffrey ex C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 134. 1985.

短柄雪胆 *duan bing xue dan*

Tuber oblate to conical. Stem and branchlets slender. Tendrils glabrous, 2-fid. Leaves pedately 5–7-foliolate; petiole 2–5 mm; leaflets lanceolate to elliptic-lanceolate, median leaflets 3–10 cm × 8–15 mm; petiolule 2–3 mm. Plants dioecious. Inflorescence dichotomous, to 30 cm; pedicels filiform, 2–5 mm. Male flowers: calyx segments ovate-lanceolate, 2–4 mm, gla-

brous, apex acute; corolla orange-yellow to pale yellow, bowl-shaped, 5–7 mm in diam.; segments ovate, revolute, 5–6 mm; filaments short, 0.5–1 mm. Female flowers: slightly larger than male flowers; ovary cylindric to conical, 4–5 × 2–2.5 mm. Fruit conical to cylindric, 2.4–3.5 cm × 8–10 mm, base attenuate, slightly curved; fruiting pedicel 4–7 mm. Seeds dark brown, narrowly elliptic, compressed, 10–12 × 4–6 mm, with corky wing; wing 3–4 mm at apex, ca. 1 mm wide on both sides; seed body broadly elliptic to ovate. Fl. Jul–Sep, fr. Aug–Oct.

• Forests, valleys, mountain slopes; 1600–2200 m. SW Sichuan, C and W Yunnan.

- 1a. Leaves subglabrous; corolla segments in male acute at apex ..... 2a. var. *delavayi*  
 1b. Leaves densely pubescent; corolla segments in male rounded-obtuse at apex ..... 2b. var. *yalungensis*

## 2a. *Hemsleya delavayi* var. *delavayi*

短柄雪胆(原变种) *duan bing xue dan* (yuan bian zhong)

*Gomphogyne delavayi* Gagnepain, Bull. Mus. Natl. Hist. Nat. 24: 373. 1918; *Hemsleya brevipedunculata* Handel-Mazzetti.

Leaves subglabrous. Corolla segments in male flowers acute at apex.

• Forests, valleys; 1800–2000 m. SW Sichuan, C and W Yunnan.

**2b. *Hemsleya delavayi* var. *yalungensis*** (Handel-Mazzetti) C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 134. 1985.

雅砻雪胆 *ya long xue dan*

*Hemsleya brevipedunculata* var. *yalungensis* Handel-Mazzetti, Symb. Sin. 7: 1059. 1936.

Leaves densely pubescent. Corolla segments in male flowers rounded-obtuse at apex.

• Mountain slopes; 1600–2200 m. SW Sichuan.

**3. *Hemsleya kunmingensis*** H. T. Li & D. Z. Li, *Ann. Bot. Fenn.* 44: 486. 2007.

昆明雪胆 kun ming xue dan

Tuber enlarged, ovoid. Stem slender, tomentose when young but smooth when older. Tendril glabrous, distally 2-fid. Leaves pedately 7–9-foliolate; petiole 2–4 cm; leaflets lanceolate to oblong; median leaflets 6–12 × 1–1.5 cm; petiolule 2–4 mm. Plants dioecious. Inflorescence dichasial, 5–30 cm, 10–30-flowered; pedicels 5–10 mm. Male flowers: calyx segments broadly triangular, 3–5 mm, revolute, shortly cuspidate at apex; corolla yellowish green, laxly patelliform, 3–5 mm in diam., herbaceous; segments elliptic, 3–5 mm, evaginate and revolute into an anchor shape at apex; filaments 1–2 mm; anthers whitish. Female flowers: calyx and corolla as in male flowers; ovary conical; styles 3, 1–2 mm. Fruit many, greenish, longitudinally 10-striate, obconic, 2–4 × 1.2–1.5 cm, almost smooth; fruiting pedicel 10–15 mm. Seeds many, blackish brown, lenticular, 5–8 mm in diam., 2–3 mm thick, verrucose, unwinged. Fl. Jun–Sep, fr. Aug–Nov.

• Damp valleys in secondary forests; ca. 2300 m. C Yunnan.

**4. *Hemsleya macrocarpa*** (Cogniaux) C. Y. Wu ex C. Jeffrey, *Kew Bull.* 36: 739. 1982.

圆锥果雪胆 yuan zhui guo xue dan

Tuber oblate or ovoid. Stem sometimes slightly thickened at nodes. Leaves pedately 7–9-foliolate; petiole 3–7 cm, sparsely puberulent or subglabrous; leaflets obovate-lanceolate to elliptic-lanceolate; median leaflets 6–10 × 2.5–4 cm; petiolule 2–6 mm. Inflorescence dichotomously cymose, 4–12 cm; peduncle and branches slightly flexuous. Male flowers: bud obtuse at apex; calyx segments spreading, ovate-lanceolate, 4–5 × 2–3 mm; corolla green to pale yellow-green, rotate, 7–15 mm in diam.; segments strap-shaped, 6–7 × 2–3 mm, fleshy, base with a pair of glands; filaments less than 1 mm. Female flowers: calyx and corolla as in male flowers; ovary conical, 5–7 × 3–4 mm. Fruit campanulate to conical, (3–)4–7 × 3–4 cm, with distinct ribs; fruiting pedicel 8–10 mm. Seeds dark brown, irregularly orbicular, 12–15 × 8–12 mm, 3–4 mm thick, with very narrow wing. Fl. Jul–Sep, fr. Sep–Nov.  $2n = 28$ .

Evergreen forests, thickets on mountain slopes; 1000–2300 m. NW and SW Yunnan [NE India].

1a. Fruit (3–)4.5(–6) cm, (1.3–)1.6(–1.85) × as long as broad ..... 4a. var. *macrocarpa*

1b. Fruit (4–)6.2(–6.5) cm, (1.5–)2.5(–3) × as long as broad.

2a. Corolla 7–9 mm in diam. .... 4b. var. *clavata*

2b. Corolla 12–15 mm in diam. .... 4c. var. *grandiflora*

**4a. *Hemsleya macrocarpa* var. *macrocarpa***

圆锥果雪胆(原变种) yuan zhui guo xue dan (yuan bian zhong)

*Gomphogyne macrocarpa* Cogniaux in Engler, *Pflanzenr.* 66(IV. 275. I): 40. 1916; *Hemsleya changningensis* C. Y. Wu & Z. L. Chen; *H. obconica* C. Y. Wu & Z. L. Chen.

Fruit (3–)4.5(–6) cm, (1.3–)1.6(–1.85) × as long as broad.

Evergreen forests; 1000–2200 m. SW Yunnan [NE India].

**4b. *Hemsleya macrocarpa* var. *clavata*** (C. Y. Wu) D. Z. Li, *Syst. Evol. Hemsleya*, 76. 1993.

棒果雪胆 bang guo xue dan

*Hemsleya clavata* C. Y. Wu, *Acta Phytotax. Sin.* 23: 124. 1985.

Corolla 7–9 mm in diam. Fruit (4–)6.2(–6.5) cm, (1.5–)2.5(–3) × as long as broad.

• Broad-leaved forests; 1400–1500 m. SW Yunnan.

**4c. *Hemsleya macrocarpa* var. *grandiflora*** (C. Y. Wu) D. Z. Li, *Syst. Evol. Hemsleya*, 76. 1993.

大花雪胆 da hua xue dan

*Hemsleya grandiflora* C. Y. Wu, *Acta Phytotax. Sin.* 23: 130. 1985.

Corolla 12–15 mm in diam. Fruit (4–)6.2(–6.5) cm, (1.5–)2.5(–3) × as long as broad.

• Thickets on mountain slopes; ca. 2300 m. NW Yunnan.

**5. *Hemsleya mitrata*** C. Y. Wu & Z. L. Chen, *Acta Phytotax. Sin.* 23: 128. 1985.

帽果雪胆 mao guo xue dan

Tuber enlarged. Stem and branchlets stout, sparsely puberulent, ultimately glabrous; stem nodes thickened, densely pubescent. Leaves pedately 5–7-foliolate; petiole 5–8 cm; leaflets lanceolate to elliptic-lanceolate, margin serrate; median leaflets 5–11 × 2.5–4 cm; petiolule 2–5 mm. Plants dioecious. Inflorescence peduncle slightly reflexed, 5–11 cm. Male flowers: buds acute at apex; calyx segments lanceolate, ca. 6 × 3 mm; corolla pale yellow-green, rotate, 10–11 mm, fleshy; segments ± strap-shaped, base with 2 distinct glands. Female flower unknown. Fruit caplike, 4–5 × 3–3.6 cm. Seeds dark brown, broadly ovoid, 12–13 × 9–10 mm, 3–3.5 mm thick, almost unwinged. Fl. Jul–Oct, fr. Sep–Dec.

• Thickets on mountain slopes; 2400–2700 m. SW Yunnan.

**6. *Hemsleya panlongqi*** A. M. Lu & W. J. Chang, *Acta Phytotax. Sin.* 21: 183. 1983.

盘龙七 pan long qi

Tuber oblate-spheroid. Branches slender, sulcate-angular, densely pubescent at nodes. Tendrils 2-fid. Leaves pedately 7-foliolate; petiole 2–4 cm; leaflets elliptic-lanceolate to ovate-lanceolate, median leaflets 8–12 × 2–3.5 cm, lateral leaflets smaller, base cuneate, margin serrate, apex acuminate; petiolule 3–6 mm, densely pubescent. Inflorescence peduncle filiform; pedicel linear, 12–15 mm. Male flower unknown. Female flowers: bracts very small, subulate; calyx segments 5, ovate-lanceolate, ca. 10 × 3 mm, apex acuminate; corolla pale yellow to yellow-green, rotate, 15–20 mm in diam.; segments spreading, broadly ovate, ca. 12 × 8 mm; ovary ovoid-globose to narrowly ovoid, 8–11 × 4–6 mm. Fl. Sep.

• Broad-leaved forests; ca. 1800 m. S Sichuan.

**7. *Hemsleya dipterygia*** Kuang & A. M. Lu, *Acta Phytotax.* Sin. 20: 88. 1982 [*"dipteryga"*].

翼蛇莲 yi she lian

*Hemsleya cissiformis* C. Y. Wu.

Tuber enlarged. Stem usually thickened at nodes, densely pubescent, ultimately glabrous. Tendrils glabrous. Leaves pedately 5–7-foliolate; petiole 2–6 cm; leaflets broadly lanceolate to rhombic, margin serrate or crenate, median leaflets 7–11 × ca. 2.5 cm, lateral leaflets smaller; petiolule 2–4 mm. Inflorescence peduncle and branches filiform. Male flowers: pedicel 5–10 mm; calyx segments ovate, ca. 7 mm; corolla pale yellow to pale yellow-green, rotate to bowl-shaped, 12–13 mm in diam.; corolla segments spreading, broadly obovate, ca. 8 × 7.5 mm, apex obtuse; filaments less than 1 mm. Female flower unknown. Fruit oblong-claviform or claviform, 4–5.5 × 0.6–1.7 cm, densely pubescent when immature, glabrous when mature, with indistinct ribs. Seeds dark brown, oblong, ca. 14 × 15 mm, 3–4 mm thick. Fl. Jun–Oct, fr. Aug–Nov.

Broad-leaved forests; 100–1500 m. N Guangxi, S Guizhou, C and S Yunnan [N Vietnam].

**8. *Hemsleya amabilis*** Diels, *Notes Roy. Bot. Gard. Edinburgh* 5: 206. 1912.

曲莲 qu lian

Tuber oblate-spheroid. Stem and branchlets very slender. Tendrils 8–12 cm. Leaves pedately 5–9-foliolate; petiole 2–4 cm; leaflets lanceolate to narrowly lanceolate, median leaflets 4–5 × 1–1.5 cm. Male flowers dichotomously cymose; peduncle slightly flexuous, 5–15 cm; calyx segments 5, ovate-triangular, 4–5 × ca. 2 mm; corolla pale yellow to pale yellow-green, rotate, 10–12 mm in diam.; segments spreading, broadly obovate, 5–6 × 4–5 mm; filaments ca. 2 mm, exserted. Female flowers in simple dichotomously cymose inflorescence, larger than male flowers, 11–12(–15) mm in diam.; ovary subglobose, 4–5 mm. Fruit spheroid, 12–20 mm; fruiting pedicel filiform, 2–3 mm. Seeds dark brown, broadly ovate-orbicular, 6–8 × 5–7 mm, 3–4 mm thick, unwinged. Fl. Jun–Oct, fr. Aug–Nov.  $2n = 28^*$ .

• Forests; 1800–3000 m. SW Sichuan, C and W Yunnan.

**9. *Hemsleya heterosperma*** (Wallich) C. Jeffrey, *Kew Bull.* 36: 739. 1982.

异子雪胆 yi zi xue dan

*Zanonia heterosperma* Wallich, *Pl. Asiat. Rar.* 2: 29. 1831; *Alsomitra heterosperma* (Wallich) M. Roemer; *Gomphogyne heterosperma* (Wallich) Kurz.

Tuber unknown. Stem slender, glabrous. Leaves pedately 3–5-foliolate; petiole 3–4 cm, glabrous; leaflets ovate-lanceolate, base attenuate, apex shortly acuminate; median leaflets 5–7 × ca. 1.5 cm; petiolule 3–6 mm. Plants dioecious. Inflorescence compound or simple; peduncle slender, slightly flexuous, glabrous. Male flowers: calyx segments subulate, ca. 1 mm, apex apiculate; corolla pale yellow to pale yellow-green, rotate, 3–4 mm in diam.; segments ovate-lanceolate, ca. 3 × 1 mm, glabrous, apex acuminate; filaments free, ca. 1 mm. Female flow-

ers similar to male flowers; peduncle 5–11 cm; ovary conical. Fruit pale yellow-green, narrowly campanulate or claviform, 12–35 × 6–12 mm, glabrous, with distinct ribs, dehiscent at apex, 3-seeded in each locule. Seeds small, irregularly ovate, ca. 3 × 2 mm, ca. 1 mm thick. Fl. Sep–Oct, fr. Oct–Nov.  $2n = 28$ .

Rain forests, evergreen broad-leaved forests; 100–2300 m. Yunnan [Myanmar, Thailand].

**10. *Hemsleya lijiangensis*** A. M. Lu ex C. Y. Wu & Z. L. Chen, *Acta Phytotax.* Sin. 23: 129. 1985.

丽江雪胆 li jiang xue dan

Tuber enlarged. Stem and branchlets filiform, sparsely pubescent, ultimately subglabrous. Tendrils apically 2-fid. Leaves pedately 5–7-foliolate; petiole 2–4 cm; leaflets oblong-lanceolate to narrowly lanceolate; median leaflets 6–12 × 2–2.2 cm; petiolule 2–4 mm. Male flowers: inflorescence peduncle and branchlets flexuous, 4–5 cm, densely pubescent; pedicel filiform; calyx segments 5, spreading, ovate-triangular, ca. 4 × 2 mm, apex acuminate; corolla pale yellow, rotate, 8–10 mm; segments spreading, obovate, ca. 5 × 4 mm; filaments ca. 2 mm. Female flowers solitary or few dichotomously cymose in leaf axils; pedicel 5–30 mm; ovary narrowly campanulate or conical, ca. 3 × 2 mm, densely white punctate. Fruit campanulate to conical, 2.2–4 cm × 13–18 mm. Seeds dark brown, irregularly orbicular, compressed, 4–6 × 4–5 mm, 2–3 mm thick. Fl. Jul–Sep, fr. Aug–Oct.

• Forests; 2000–3000 m. NW Yunnan.

**11. *Hemsleya sphaerocarpa*** Kuang & A. M. Lu, *Acta Phytotax.* Sin. 20: 87. 1982.

蛇莲 she lian

Tuber oblate-spheroid. Stem and branchlets slender, nodes densely pubescent. Tendrils 8–24 cm. Leaves pedately 5–9-foliolate; petiole 1.6–4 cm; leaflets oblong-lanceolate to broadly lanceolate; median leaflets 7–16 × 2.5–4 cm. Male flowers in a large dichotomous cyme, 5–25(–45) cm (varying in different subspecies); calyx segments ovate-triangular, ca. 4 × 3 mm; corolla pale yellow-green, bowl-shaped, 7–15 mm in diam.; segments broadly ovate, apex acuminate. Female flowers usually in a short inflorescence; ovary spheroid to ovoid, 3–5 mm. Fruit spheroid to ovoid, 2–3 cm in diam.; fruiting pedicel 1–9 mm, with distinct articulation. Seeds lenticular, 8–9 mm in diam., unwinged. Fl. May–Sep, fr. Jul–Nov.  $2n = 28^*$ .

• Broad-leaved forests; 400–2400 m. E and NE Guangxi, S and SE Guizhou, S Hunan, SE, SW, and WC Yunnan.

- 1a. Male inflorescence (14–)20(–44) cm ..... 11b. subsp. *megathyrsa*
- 1b. Male inflorescence (5–)9(–15) cm.
  - 2a. Corolla (7–)8(–9) mm in diam.; fruiting pedicel 1–2 mm ..... 11c. subsp. *wenshanensis*
  - 2b. Corolla (9–)12(–15) mm in diam.; fruiting pedicel 8–9 mm ..... 11a. subsp. *sphaerocarpa*

**11a. *Hemsleya sphaerocarpa* subsp. *sphaerocarpa***

蛇莲(原亚种) she lian (yuan ya zhong)

Inflorescence (5-)9(-15) cm. Corolla (9-)12(-15) mm in diam. Fruiting pedicel 8-9 mm.

- Broad-leaved forests; 400-1600 m. E and NE Guangxi, S and SE Guizhou, S Hunan, SE and SW Yunnan.

**11b. *Hemsleya sphaerocarpa* subsp. *megathyrsa* (C. Y. Wu) D. Z. Li, Syst. Evol. *Hemsleya*, 84. 1993.**

大序雪胆 da xu xue dan

*Hemsleya megathyrsa* C. Y. Wu, Acta Phytotax. Sin. 23: 131. 1985; *H. megathyrsa* var. *major* C. Y. Wu & Z. L. Chen.

Male inflorescence (14-)20(-44) cm. Corolla 8-12 mm in diam.

- Evergreen broad-leaved forests; 2200-2400 m. SW Yunnan.

**11c. *Hemsleya sphaerocarpa* subsp. *wenshanensis* (A. M. Lu ex C. Y. Wu & Z. L. Chen) D. Z. Li, Syst. Evol. *Hemsleya*, 85. 1993.**

文山雪胆 wen shan xue dan

*Hemsleya wenshanensis* A. M. Lu ex C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 130. 1985.

Inflorescence (5-)9(-15) cm. Corolla (7-)8(-9) mm in diam. Fruiting pedicel 1-2 mm.

- Evergreen forests; 1800-2300 m. SE and WC Yunnan (Jingdong, Wenshan).

**12. *Hemsleya panacis-scandens* C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 135. 1985.**

藤三七雪胆 teng san qi xue dan

Tuber oblate-spheroid. Stem and branchlets robust, stem nodes stout, sparsely pubescent. Tendrils 8-15 cm. Leaves pedately 7-9-foliolate; petiole 5-8 cm; leaflets obovate-lanceolate; median leaflets 6-10 × 2-3 cm; petiolule 4-8 mm. Male flowers dichotomously cymose or paniculate; peduncle usually filiform, 3-7 cm; calyx segments ovate-lanceolate, ca. 9 × 4 mm, apex reflexed; corolla pale yellow to yellow-green, umbelliform, 10-12 mm in diam.; segments obovate to ovate-oblong, fleshy, base thickened, apex obtuse; filaments ca. 1 mm. Female flowers: corolla 12-15 mm in diam., ovary subglobose, 5-8 × 4-7 mm. Fruit globose, 25-45 mm in diam., fruiting pedicel 4-8 mm, with articulation. Seeds dark brown, ovoid-spheroid, ca. 15 × 12-13 mm, almost unwinged, margin ca. 3 mm wide. Fl. Aug-Oct, fr. Oct-Dec.  $2n = 42^*$ .

- Evergreen broad-leaved forests; 1700-2400 m. SE Yunnan.

- 1a. Corolla pale yellow, segments involute (not reflexed), margin sinuate ..... 12a. var. *panacis-scandens*  
 1b. Corolla deep yellow, umbelliform, margin entire ..... 12b. var. *pingbianensis*

**12a. *Hemsleya panacis-scandens* var. *panacis-scandens***

藤三七雪胆(原变种) teng san qi xue dan (yuan bian zhong)

Corolla pale yellow, spheroid, 10-12 mm in diam.; segments sinuate at margin. Fruit smooth, 10-angular.

- Evergreen broad-leaved forests; 1700-2400 m. SE Yunnan.

**12b. *Hemsleya panacis-scandens* var. *pingbianensis* C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 137. 1985.**

屏边藤三七雪胆 ping bian teng san qi xue dan

Corolla deep yellow, umbelliform, ca. 15 mm in diam.; segments entire. Ovary and fruit densely white verrucose.

- Broad-leaved forests; ca. 1700 m. SE Yunnan (Pingbian).

**13. *Hemsleya emeiensis* L. D. Shen & W. J. Chang, Acta Phytotax. Sin. 21: 191. 1983.**

峨眉雪胆 e mei xue dan

Tuber enlarged, pale brown-yellow. Branchlets slender, sparsely pubescent when young. Leaves pedately 7-9-foliolate; petiole 4-6 cm; leaflets oblong-lanceolate to ovate-lanceolate; median leaflets 9-14 × 2-4.5 cm. Male flowers dichotomously cymose, peduncle 3-8 cm; calyx segments 5, lanceolate, ca. 4 × 2 mm, apex reflexed; corolla yellow-green, Chinese lanternlike, ca. 8 mm in diam.; segments 5, obovate-lanceolate, ca. 8 × 5 mm; filaments ca. 1 mm. Female inflorescence simple; ovary subglobose, 3-6 mm. Fruit globose, 20-25 mm in diam. Seeds ovoid, ca. 10 × 8 mm, ca. 3 mm thick, unwinged. Fl. Jul-Sep, fr. Sep-Nov.  $2n = 28^*$ .

- Broad-leaved forests; 1800-2000 m. Sichuan (Emei Shan).

**14. *Hemsleya pengxianensis* W. J. Chang, Acta Phytotax. Sin. 17(4): 97. 1979.**

彭县雪胆 peng xian xue dan

Tuber oblate-spheroid. Stem and branchlets slender. Leaves pedately 5-7-foliolate; petiole 4.5-7 cm, glabrous or pubescent; leaflets obovate-lanceolate to narrowly lanceolate, median leaflets 8-17 × 2-4 cm; petiolule 3-5 mm. Male flowers dichotomously cymose; peduncle 4-10 cm, slightly flexuous; calyx segments lanceolate, ca. 4 × 2-3 mm; corolla yellow-green, bowl-shaped or Chinese lanternlike, 6-12 mm in diam.; segments ovate, ca. 6 × 4 mm, apex reflexed. Female inflorescence reduced; ovary ovoid or subglobose, ca. 3 mm in diam. Fruit ovoid or ellipsoid, 3-4 × 3-3.5 mm. Seeds almost circular, compressed, 10-13 × 10-13 mm, almost unwinged, margin 2-3 mm wide. Fl. Jun-Sep, fr. Aug-Nov.

- Broad-leaved forests, forest margins; 700-2100 m. Chongqing, Sichuan.

- 1a. Fruit elliptic; corolla Chinese lanternlike, 10-12 mm in diam. .... 14c. var. *gulinensis*  
 1b. Fruit ovate to ovoid or subglobose; corolla bowl-shaped, ca. 8 mm in diam.  
     2a. Ovary ovoid; petiole, rachis, and corolla pubescent ..... 14b. var. *junlianensis*  
     2b. Ovary subglobose; petiole and corolla glabrous ..... 14a. var. *pengxianensis*

**14a. *Hemsleya pengxianensis* var. *pengxianensis***

彭县雪胆(原变种) peng xian xue dan (yuan bian zhong)

*Hemsleya pengxianensis* var. *jinfushanensis* L. D. Shen & W. J. Chang; *H. pengxianensis* var. *polycarpa* L. D. Shen & W. J. Chang.

Petiole glabrous. Corolla bowl-shaped, ca. 8 mm in diam., glabrous.

- Broad-leaved forests; 700–2100 m. Chongqing, C and SW Sichuan.

**14b. *Hemsleya pengxianensis* var. *junlianensis*** L. D. Shen & W. J. Chang, *Acta Phytotax. Sin.* 21: 188. 1983.

筠连雪胆 *jun lian xue dan*

Petiole, peduncle, and corolla pubescent. Corolla bowl-shaped, ca. 8 mm in diam. Ovary ovoid. Fruit ovate to ovoid.

- Forest margins; ca. 1500 m. SW Sichuan.

**14c. *Hemsleya pengxianensis* var. *gulinensis*** L. D. Shen & W. J. Chang, *Acta Phytotax. Sin.* 21: 188. 1983.

古蔺雪胆 *gu lin xue dan*

*Hemsleya gulinensis* L. D. Shen & W. J. Chang.

Corolla Chinese lanternlike, 10–12 mm in diam. Fruit elliptic.

- Broad-leaved forests. Sichuan.

*Hemsleya pengxianensis* var. *gulinensis* is not a new combination based on *H. gulinensis* (L. D. Shen & W. J. Chang, *Acta Acad. Med. Sichuan.* 11(2): 103. 1980), although both names have the same type.

**15. *Hemsleya turbinata*** C. Y. Wu, *Acta Phytotax. Sin.* 23: 140. 1985.

陀罗果雪胆 *tuo luo guo xue dan*

Tuber oblate-spheroid. Stem and branchlets robust. Tendrils 12–20 cm. Leaves 5–7-foliolate; petiole 3–5 cm; leaflets obovate-lanceolate to elliptic-lanceolate, margin dentate; median leaflets 6–12 cm; petiolule 2–5 mm. Male flowers unknown. Female flowers 2 to more in a dichotomous cyme; peduncle 3–10 cm; calyx segments lanceolate, 11–13 × ca. 4 mm, apex reflexed; corolla pale yellow-green, Chinese lanternlike, 10–12 mm; segments oblong-lanceolate, 14–17 × 6–8 mm, base with 2 glands, revolute, acute at apex; ovary conical, ca. 9 × 3–4 mm. Fruit conical, 3.5–5 × 2–2.5 cm, base attenuate; fruiting pedicel only ca. 3 mm. Seeds dark brown, broadly ovate, compressed, 9–11 × 8–10 mm, 2–3 mm thick, unwinged, margin ca. 2 mm wide. Fl. Jul–Sep, fr. Sep–Nov.

- Evergreen broad-leaved forests; 1600–2400 m. SW Yunnan.

**16. *Hemsleya ellipsoidea*** L. D. Shen & W. J. Chang, *Acta Phytotax. Sin.* 21: 185. 1983.

椭圆果雪胆 *tuo yuan guo xue dan*

Tuber enlarged. Stem and branchlets slender, sulcate. Leaves pedately 3–5-foliolate; petiole 2–5 cm; leaflets ovate-lanceolate; median leaflets 9–15 × 4–5 cm; petiolule 3–5 cm. Male flowers sparsely dichotomously cymose; peduncle 10–12 cm; calyx segments lanceolate, ca. 10 × 3 mm, apex reflexed; corolla pale yellow-green, lantern-shaped, 9–11 mm; segments broadly ovate-lanceolate, 10–15 × 6–10 mm, apex reflexed; filaments ca. 1 mm. Female flowers: corolla larger than male flowers, 12–15 mm in diam.; ovary ovoid, ca. 10 × 5 mm. Fruit ellipsoid, 3.5–4 × ca. 2.5 cm, base obtuse-rounded; fruit wall

leathery. Seeds almost circular, compressed, ca. 15 mm in diam., ca. 3 mm thick, unwinged, margin 3–4 mm wide. Fl. Jul–Sep, fr. Sep–Nov.

- Broad-leaved forests; ca. 2000 m. Sichuan (Emei Shan).

**17. *Hemsleya carnosiflora*** C. Y. Wu & Z. L. Chen, *Acta Phytotax. Sin.* 23: 133. 1985.

肉花雪胆 *rou hua xue dan*

Tuber oblate-spheroid. Stem and branchlets rather robust, thickened at nodes, densely pubescent. Tendrils 7–16 cm. Leaves pedately 7–9-foliolate; petiole 5–8 cm; leaflets obovate-lanceolate, margin dentate; median leaflets 8–12 × 3–4 cm; petiolule 4–8 mm. Male flowers dichotomously cymose or paniculate; peduncle indistinctly flexuous, 3–7 cm; calyx segments ovate-lanceolate, ca. 7 × 4 mm, apex reflexed; corolla pale yellow-green, bowl-shaped, 8–10 mm. Female inflorescence simple; peduncle 2.5–5 cm; corolla larger than male, 11–12 mm in diam.; ovary ellipsoid, ca. 10 mm × 6–7 mm. Fruit ellipsoid to ovoid, 4–5 × 2.5–3 cm; fruiting pedicel 9–12 mm. Seeds obovate-elliptic to almost circular, compressed, 13–16 × 12–14 mm, 3–4 mm thick, almost unwinged, margin ca. 4 mm wide. Fl. Jun–Oct, fr. Aug–Nov.  $2n = 42^*$ .

- Forests; 1800–1900 m. SE Yunnan.

**18. *Hemsleya chengyihana*** D. Z. Li, *Syst. Evol. Hemsleya*, 91. 1993.

征镒雪胆 *zheng yi xue dan*

*Hemsleya macrocarpa* C. Y. Wu, *Acta Phytotax. Sin.* 23: 135. 1985, not (Cogniaux) C. Y. Wu ex C. Jeffrey, *Kew Bull.* 36: 739. 1982.

Tuber oblate-ovoid. Stem and branchlets slightly stout, distinctly sulcate. Tendrils 12–25 cm. Leaves pedately 5–7-foliolate; petiole 3–6 cm; leaflets lanceolate to obovate-lanceolate, margin crenate; median leaflets ca. 14 × 1.5–4 cm; petiolule 5–10 mm. Male inflorescence dichotomously cymose; peduncle flexuous, 5–12 cm, densely pubescent; calyx segments ovate-triangular, ca. 5 × 3 mm, apex reflexed; corolla pale yellow-green, bowl-like, ca. 10 mm in diam.; segments oblong, 7–8 × 3–4 mm; filaments ca. 1 mm. Female flowers unknown. Fruit clavate or clavate-elliptic, 7–8 × 2–2.5 cm, distinctly costate; fruiting pedicel 10–15 mm. Seeds dark brown, elliptic, ca. 12 × 7 mm, almost unwinged, margin 1–3 mm wide. Fl. Jul–Oct, fr. Sep–Nov.

- Broad-leaved forests, forest margins. SW Yunnan.

**19. *Hemsleya zhejiangensis*** C. Z. Zheng, *Acta Phytotax. Sin.* 23: 67. 1985.

浙江雪胆 *zhe jiang xue dan*

Tuber enlarged. Stem and branchlets slender, sulcate, nodes densely pubescent. Leaves pedately 5–9-foliolate; petiole 2.5–5 cm; leaflets elliptic-lanceolate, margin sparsely dentate; median leaflets 6–11 × 2–3.5 cm. Male inflorescence dichotomously cymose; peduncle flexuous, 13–17 cm; calyx segments ovate-lanceolate, 4–5 × 3–4 mm, apex reflexed; corolla pale

yellow-green, bowl-like, 8–10 mm; segments obovate, 7–8 × 4–5 mm, fleshy, apex reflexed; filaments ca. 1 mm. Female flower unknown. Fruit broadly to narrowly elliptic, (6–)11–17 × 2–3 cm, indistinctly costate; fruiting pedicel with distinct articulation, 1–2 cm. Seeds dark brown, oblong, almost unwinged, margin 2–4 mm. Fl. Jun–Sep, fr. Aug–Nov.

• Broad-leaved forests, bamboo forests; 800–1000 m. Anhui, Jiangxi, Zhejiang.

**20. *Hemsleya chinensis*** Cogniaux ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 23: 490. 1888.

雪胆 xue dan

Tuber ovoid or oblate. Stem and branchlets slender. Tendrils 8–14 cm. Leaves pedately 5–9-foliolate; petiole 4–8 cm; leaflets ovate-lanceolate, oblong-lanceolate, or broadly lanceolate, margin crenate; median leaflets 5–12 × 2–2.5 cm; petiolule 5–10 mm. Male inflorescence dichotomously cymose or paniculate; peduncle filiform, flexuous, 5–12 cm; calyx segments ovate, ca. 7 × 4–5 mm, apex acute, reflexed; corolla orange-red, Chinese lantern-shaped or rounded-globose, 8–15 mm in diam.; segments oblong, 10–13 × 8–9 mm, subglabrous; filaments ca. 1 mm. Female inflorescence simple; peduncle 2–4 cm; calyx and corolla as in male flowers; corolla ca. 15 mm in diam.; ovary cylindric, 5–10 × 2–3 mm. Fruit ellipsoid, 3–7 × ca. 2 cm, base attenuate; fruiting pedicel slightly curved, with or without articulation, 8–10 mm. Seeds brown, suborbicular, 10–12 × ca. 10 mm, ca. 3 mm thick, unwinged, margin ca. 1 mm wide. Fl. Jul–Sep, fr. Sep–Nov.  $2n = 28^*$ .

• Evergreen broad-leaved forests, forest margins; 400–2800 m. Guizhou, Hubei, Sichuan, Yunnan.

- 1a. Fruit with white spiculiform hairs along longitudinal ribs; branchlets and petiole with dense spiculiform hairs ..... 20d. var. *polytricha*
- 1b. Fruit without spiculiform hairs along longitudinal ribs; branchlets and petiole without spiculiform hairs.
  - 2a. Corolla usually glabrous, 12–15 mm in diam.; fruit elliptic, 3–7 cm ..... 20a. var. *chinensis*
  - 2b. Corolla densely white pubescent, 8–12 mm in diam.
    - 3a. Corolla 10–12 mm in diam.; fruit obovoid, pedicel with articulation ..... 20b. var. *ningnanensis*
    - 3b. Corolla ca. 8 mm in diam.; fruit ovoid, pedicel without articulation ..... 20c. var. *longevillosa*

**20a. *Hemsleya chinensis* var. *chinensis***

雪胆(原变种) xue dan (yuan bian zhong)

Branchlets, petiole, and fruit without spiculiform hairs. Corolla 12–15 mm in diam., usually glabrous. Fruit elliptic, 3–7 cm.

• Evergreen broad-leaved forests, forest margins; 400–2800 m. Guizhou, Hubei, Sichuan, Yunnan.

**20b. *Hemsleya chinensis* var. *ningnanensis*** L. D. Shen & W. J. Chang, Acta Phytotax. Sin. 21: 185. 1983.

宁南雪胆 ning nan xue dan

*Hemsleya ningnanensis* L. D. Shen & W. J. Chang; *H. villosipetala* C. Y. Wu & Z. L. Chen.

Branchlets, petiole, and fruit without spiculiform hairs. Corolla 10–12 mm in diam., usually with dense white hairs. Fruit obovoid; pedicel with articulation.

• Evergreen broad-leaved forests. SW Sichuan, NE Yunnan.

*Hemsleya chinensis* var. *ningnanensis* is not a new combination based on *H. ningnanensis* (L. D. Shen & W. J. Chang, Acta Acad. Med. Sichuan. 11(1): 19. 1980), although both names have the same type.

**20c. *Hemsleya chinensis* var. *longevillosa*** (C. Y. Wu & Z. L. Chen) D. Z. Li, Syst. Evol. *Hemsleya*, 95. 1993 [*“longivillosa”*].

长毛雪胆 chang mao xue dan

*Hemsleya longevillosa* C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 140. 1985.

Branchlets, petiole, and fruit without spiculiform hairs. Corolla usually with dense white hairs, ca. 8 mm in diam. Fruit ovoid; pedicel without articulation.

• Evergreen broad-leaved forests; 1900–2100 m. Yunnan (Fuyuan).

**20d. *Hemsleya chinensis* var. *polytricha*** Kuang & A. M. Lu, Acta Phytotax. Sin. 20: 90. 1982.

毛雪胆 mao xue dan

Branchlets and petiole with dense spiculiform hairs. Fruit with dense spiculiform hairs along longitudinal ribs.

• Broad-leaved forests; 1300–1500 m. W Hubei.

**21. *Hemsleya gigantha*** W. J. Chang, Acta Phytotax. Sin. 21: 186. 1983.

巨花雪胆 ju hua xue dan

Tuber yellow-brown. Leaves pedately 7–9-foliolate; petiole 5–9 cm; leaflets broadly elliptic-lanceolate or ovate-lanceolate; base cuneate, margin crenate; median leaflets 7–12 × 3–5 cm. Male inflorescence dichotomously cymose; rachis 7–11 cm; calyx segments lanceolate, ca. 15 × 7 mm, apex reflexed; corolla orange-red, Chinese lanternlike, 1.5–2(–2.5) cm in diam.; segments broadly ovate, 20–25 × 15–18 mm, revolute, obtuse-rounded and apiculate at apex; filaments ca. 1 mm. Female inflorescence simple; ovary ellipsoid, 10–15 × 6–10 mm. Fruit subspheroid to ovoid, 2–3.5 cm in diam., fruit wall leathery. Seeds dark brown, broadly ovoid, 10–12 × 8–10 mm, 2–3 mm thick, almost unwinged; margin narrow, ca. 2 mm wide, slightly erose. Fl. Jun–Sep, fr. Aug–Nov.

• Broad-leaved or *Pinus* forests, forest margins. SW Sichuan.

**22. *Hemsleya dolichocarpa*** W. J. Chang, Acta Phytotax. Sin. 21: 190. 1983.

长果雪胆 chang guo xue dan

Tuber enlarged, yellow-brown. Stem and branchlets slender. Leaves pedately 5–7-foliolate; petiole 3.5–6.5 cm; leaflets obovate-lanceolate or elliptic-lanceolate, margin crenate; median leaflets 7–15 × 4–7 cm. Male inflorescence dichotomously cymose; rachis 3–8 cm; calyx segments lanceolate, 6–8 × 4–6 mm, apex apiculate, flexuous; filaments ca. 1 mm. Female inflorescence simple; ovary cylindric, ca. 6 × 3 mm. Fruit elliptic, 5–8 × 2–3.5 cm. Seeds broadly ovate to suborbicular, compressed, 13–14 × ca. 11 mm, 2–3 mm thick, unwinged; margin ca. 1 mm wide, erose. Fl. Jun–Sep, fr. Aug–Nov.

- Broad-leaved forests; 1400–1800 m. C and SW Sichuan.

**23. *Hemsleya macrosperma*** C. Y. Wu, Acta Phytotax. Sin. 23: 139. 1985.

罗锅底 *luo guo di*

Tuber enlarged, oblate. Stem and branchlets slender. Tendrils 6–10 cm. Leaves pedately 5–7-foliolate; petiole 4–5 cm; leaflets oblong-lanceolate to obovate-lanceolate, margin crenate; median leaflets 4–9 × 1.5–3 cm; petiolule 2–4 mm. Male inflorescence dichotomously cymose; peduncle 2–8 cm; calyx segments ovate, 4–5 × ca. 3 mm, apex acute, reflexed; corolla orange-red, bowl-like, 8–10 mm in diam.; segments oblong, ca. 8 × 4 mm, sparsely white villous; filaments ca. 2 mm. Female inflorescence: peduncle 1–5 cm; ovary ellipsoid or subglobose, 5–7 × 4–5 mm. Fruit ovoid, 3.5–5 cm in diam. Seeds dark brown, ovoid, 9–11 × 8–9 mm, unwinged, margin smooth, ca. 1 mm wide. Fl. Jul–Sep, fr. Sep–Nov.

- Evergreen broad-leaved or *Pinus* forests; 1800–3200 m. SW Sichuan, C and NE Yunnan.

- 1a. Fruit ovoid, 3.5–4 cm ..... 23a. var. *macrosperma*  
1b. Fruit elliptic, to 5 cm ..... 23b. var. *oblongicarpa*

**23a. *Hemsleya macrosperma* var. *macrosperma***

罗锅底(原变种) *luo guo di* (*yuan bian zhong*)

Fruit ovoid, 3.5–4 cm.

- Evergreen broad-leaved or *Pinus* forests; 1800–3200 m. SW Sichuan, C and NE Yunnan.

**23b. *Hemsleya macrosperma* var. *oblongicarpa*** C. Y. Wu & Z. L. Chen, Acta Phytotax. Sin. 23: 140. 1985.

长果罗锅底 *chang guo luo guo di*

Fruit elliptic, to 5 cm.

- Evergreen broad-leaved forests; 1900–2000 m. SW Sichuan, NE Yunnan.

**24. *Hemsleya dulongjiangensis*** C. Y. Wu, Acta Phytotax. Sin. 23: 134. 1985.

独龙江雪胆 *du long jiang xue dan*

Tuber enlarged. Stem and branchlets slender, longitudinally sulcate, densely pubescent. Tendrils 6–9 cm, densely pubescent. Leaves pedately 3–7-foliolate; petiole 2–3 cm; leaflets broadly ovate-lanceolate to rhombic, margin sparsely serrate; median leaflets 3–6 × 3–3.5 cm. Flowers unknown. Fruit ovoid, 3.5–4.5 × 3–3.5 cm; fruiting pedicel curved, 5–8 cm. Seeds (immature) yellow-brown, broadly ovoid, ca. 13 mm in diam., unwinged; margin 1–2 mm wide, erose. Fr. Sep.

- Open forests in valleys; 1400–2700 m. NW Yunnan.

**25. *Hemsleya endecaphylla*** C. Y. Wu, Acta Phytotax. Sin. 23: 142. 1985.

十一叶雪胆 *shi yi ye xue dan*

Tuber enlarged. Stem slightly robust. Tendrils 8–12 cm. Leaves pedately 9–11-foliolate; petiole stout, 5–7 cm; leaflets obovate-lanceolate, margin irregularly crenate; median leaflets 5–7 × 2–2.5 cm; petiolule 3–5 mm. Male inflorescence paniculate; rachis indistinctly flexuous, 5–8 cm; calyx segments pale yellow-green, ovate-triangular, ca. 5 × 4 mm, apex reflexed; corolla orange-yellow, bowl-like, 8–10 mm in diam.; segments oblong, with dense squamose hairs, apex reflexed; filaments very short, ca. 0.5 mm. Female flower and fruit unknown. Fl. Jun–Jul.

- Broad-leaved forests; ca. 2400 m. NW Yunnan.

## 2. GOMPHOGYNE Griffith, Account Bot. Coll. Cantor, 26. 1845.

锥形果属 *zhui xing guo shu*

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, climbing; stems slender, angular. Leaves petiolate, pedately 7–9-foliolate; leaflet blade lanceolate or oblong, dentate. Tendrils 2-fid. Plants monoecious. Flowers small, pale green. Male flowers in racemes or panicles; calyx rotate, 5-partite; segments oblong-lanceolate, margins erose; corolla rotate, 5-partite; segments oblong-lanceolate, erose, caudate-acuminate; stamens 5; filaments short, united at base; anthers erect, subglobose, 1-celled, dehiscence longitudinal; rudimentary ovary absent. Female flowers in panicles or fascicled in axils of leaves; calyx and corolla as in male flowers; ovary clavate, 1-locular; styles 3; stigmas 2-lobed; ovules 3, pendulous from apex of locules; staminodes absent. Fruit capsular, turbinate, venose and ribbed, foveolate, truncate at apex, 3-valved, crowned by persistent styles. Seeds 3, black, oblong, testa thick, margin thickened, erose.

Two species: Bhutan, China, India, Nepal; one species in China.

**1. *Gomphogyne cissiformis*** Griffith, Account Bot. Coll. Cantor, 26. 1845.

锥形果 *zhui xing guo*

Stem glabrous or slightly puberulent. Leaves membranous; petiole 3–6 cm, glabrous; leaflets obovate-oblong, glabrous, median leaflets 4–6 × 1.5–2 cm, lateral leaflets shorter, base attenuate, margin crenate-dentate, apex acuminate or acute; petio-

lules 3–9 cm. Tendrils slender, 2-fid. Plants monoecious. Male flowers in racemes or panicles; rachis slender, flexuous, 10–30 cm, glabrous; pedicels capillary-like, often fasciculate, 1–3 mm, with bracteoles at base; calyx segments narrowly ovate, 1–1.5 mm, acute; corolla segments ovate-lanceolate, 2.5–3 × ca. 1 mm, 3-veined, entire or indistinctly dentate. Female flowers in panicles 5–12 cm, or fascicled in axils of leaves; pedicels filiform, reflexed; bracteoles subulate; ovary funnelform. Fruit pale green, turbinate, 12–16 × 8–11 mm, apex truncate, 3-longitudinally dehiscent, 1–3-seeded. Seeds dark brown, oblong, 7(–12) × 3–4 mm, 1–2 mm thick, verrucose, base acute, margin dentate, apex truncate.

Forests on mountainsides; 2100–2800 m. S and SW Yunnan [Bhutan, India, Nepal].

- 1a. Fruit glabrous ..... 1a. var. *cissiformis*  
 1b. Fruit tomentose ..... 1b. var. *villosa*

### 1a. *Gomphogyne cissiformis* var. *cissiformis*

锥形果(原变种) zhui xing guo (yuan bian zhong)

Fruit glabrous.

Forests on mountainsides; 2100–2800 m. S and SW Yunnan [Bhutan, India, Nepal].

### 1b. *Gomphogyne cissiformis* var. *villosa* Cogniaux in A. Candolle & C. Candolle, Monogr. Phan. 3: 925. 1881.

毛锥形果 mao zhui xing guo

*Gomphogyne cissiformis* f. *villosa* (Cogniaux) M. Mizushima.

Fruit tomentose.

Forests on mountainsides; ca. 2300 m. S and SW Yunnan (Menghai, Yongde) [NE India (Sikkim), Nepal].

## 3. GYNOSTEMMA Blume, Bijdr. 23. 1825.

绞股蓝属 jiao gu lan shu

Chen Shukun (陈书坤), Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Enkylia* Griffith; *Pestalozzia* Zollinger & Moritz; *Trirostellum* Z. P. Wang & Q. Z. Xie.

Herbs, perennial, scandent, glabrous or pubescent. Leaves alternate, pedate, with 3–9 leaflets, rarely simple; leaflet blade ovate-lanceolate. Tendrils bifurcate, rarely simple. Plants dioecious, rarely monoecious. Flowers unisexual, in racemes or panicles, axillary or terminal; pedicel articulate; bracteole basal. Male flower: calyx tube short, 5-lobed; segments narrowly lanceolate; corolla greenish or white, rotate, deeply 5-lobed; segments lanceolate or ovate-lanceolate, involute in bud; stamens 5, inserted at base of perianth tube; filaments short, connate; anthers erect, ovoid, 2-celled, dehiscence longitudinal; connective narrow, but not extended; pollen grains globose or elliptic, longitudinally striate or smooth, dehiscent by pores; rudimentary pistil absent. Female flowers: calyx and corolla as in male flower; staminodes present; ovary globose, 2–5-locular; styles 3, rarely 2, 4, or 5, free; stigmas 2 or 1 and crescent-shaped and irregularly incised-dentate; ovules 2, pendulous in each locule. Berry globose, in form and size like a pea, or capsule, 3-lobed from top, top unbonulate or with 3 persistent long styles. Seeds 2 or 3, broadly ovate, compressed, with papillae or spiniform papillae.

About 17 species: tropical Asia to E Asia, from the Himalaya to Japan, Malaysia, and New Guinea; 14 species (nine endemic) in China.

- 1a. Capsule campanulate, dehiscent when mature along ventral suture, 3-lobed; persistent styles 3(–5), long rostriform.  
 2a. Female flowers solitary or paired, axillary, pedicel 3–4 cm; ovary 5-locular, styles 5 ..... 1. *G. pentagynum*  
 2b. Female flowers numerous, in racemes or panicles, axillary or terminal, pedicel shorter than 5 mm; ovary 3-locular, styles 3.  
 3a. Female flowers in lax panicle; fruit stalk 8–10 mm ..... 6. *G. laxiflorum*  
 3b. Female flowers in spiciform racemes; fruit stalk shorter than 5 mm.  
 4a. Stigma crescent-shaped and irregularly incised-dentate, style 2.5–3 mm, or thick and short, ca. 0.5 mm.  
 5a. Styles thin and long, 2.5–3 mm; persistent styles up to 5 mm; side of seed not sulcate and without wing ..... 2. *G. yixingense*  
 5b. Styles short and thick; persistent styles shortly rostriform; seed broadly cordate, margin sulcate and with narrow wing ..... 3. *G. cardiospermum*  
 4b. Stigma 2-lobed, forked, never crescent-shaped, style shorter than 0.5 mm.  
 6a. Fruit ca. 3 mm in diam., glabrous, dark punctate; leaves with 5 elliptic leaflets ..... 4. *G. microspermum*  
 6b. Fruit 5–6 mm in diam., white villous, without dark spots; leaves with 5–7 obovate-elliptic leaflets ..... 5. *G. aggregatum*  
 1b. Berry globose or depressed-globose, not dehiscent; persistent styles short, umbonate, never rostrate.  
 7a. Leaves simple ..... 7. *G. simplicifolium*  
 7b. Leaves compound, pedate.  
 8a. Stem 3-angled, with narrow wings ..... 14. *G. caulopterum*  
 8b. Stem cylindrical, with longitudinal striae, but without wings.

- 9a. Leaves with 3–5 leaflets.  
 10a. Leaf smooth, glabrous on both surfaces, or with hairs only along midrib; stem with only sparse hairs at nodes; corolla segments narrowly lanceolate, 2–3 mm ..... 8. *G. laxum*  
 10b. Leaf blade and stem all densely pubescent; corolla segments oblong-elliptic, ca. 2 mm .... 9. *G. "burmanicum"*  
 9b. Leaves with (3–)5–7(–9) leaflets.  
 11a. Fruit densely hirsute-pubescent; stem stout ..... 10. *G. pentaphyllum*  
 11b. Fruit glabrous; stem slender.  
 12a. Fruit stalk shorter than 5 mm; leaves sparsely to densely pubescent ..... 10. *G. pentaphyllum*  
 12b. Fruit stalk 7–25 mm.  
 13a. Plants monoecious; fruit 3-angled-obovoid or 3-angled-oblate ..... 11. *G. guangxiense*  
 13b. Plants dioecious; fruit globose or obtriangular.  
 14a. Fruit obtriangular, compressed; leaflets 5–7, elliptic or elliptic-ovate ..... 12. *G. compressum*  
 14b. Fruit globose; leaflets 7–9, rhombic-elliptic or obovate-lanceolate ..... 13. *G. longipes*

**1. *Gynostemma pentagynum*** Z. P. Wang, Acta Bot. Yunnan. 11: 165. 1989.

五柱绞股蓝 wu zhu jiao gu lan

Plants with short and succulent rootstocks. Stem ca. 2 m or more, ca. 4 mm in diam., angular, white villous. Tendrils filiform, villous below, gradually glabrescent above, apex bifid. Leaves pedate, with (5–)7 leaflets; petiole 9–13 cm, villous; leaflet blade elliptic, central leaflet ca. 10 cm, both surfaces sparsely pubescent, densely villous along veins, margin irregularly serrate, apex shortly acuminate; petiolule 3–5 mm; lateral leaflet blades gradually smaller and asymmetrical, petiolule shorter; outermost leaflet without petiolule. Plants dioecious. Male flowers numerous in panicle, 3–4 cm, villous; calyx segments narrowly elliptic, ca. 0.9 × 0.5 mm, both surfaces glabrous, apex obtuse; corolla segments ovate, ca. 4 × 0.6 mm, outside glabrous, inside glandular hairy, with obscure midrib, apex filiform-acuminate; filaments ca. 0.2 mm, connective cylindrical. Female flower(s) solitary or 2(or 3) in very short raceme; peduncles 2–3 mm; pedicels up to 4 cm; calyx and corolla as in male flowers; staminodes absent; gynoecium with (4 or)5 carpels; ovary densely pubescent and glandular pubescent, (4 or)5-locular, each locule with 1 ovule; styles (4 or)5, divaricate; stigmas 2, explanate. Fruit immature. Fl. Jul.

• Evergreen broad-leaved forests, moist mountains. NW Hunan (Dayong).

**2. *Gynostemma yixingense*** (Z. P. Wang & Q. Z. Xie) C. Y. Wu & S. K. Chen, Acta Phytotax. Sin. 21: 364. 1983.

喙果绞股蓝 hui guo jiao gu lan

*Triostellum yixingense* Z. P. Wang & Q. Z. Xie, Acta Phytotax. Sin. 19: 483. 1981; *T. yixingense* var. *trichocarpum* J. N. Ding.

Plants to over 10 m. Stem slender, angular-sulcate, villous only at nodes. Leaves membranous, pedately 5–7-foliolate; petiole 3–6 cm; leaflets elliptic, median leaflets 4–8 cm, lateral leaflets smaller, veins pubescent, base cuneate, margin crenate, apex acuminate; petiolule ca. 5 mm. Tendrils filiform, simple. Male flowers in panicle; rachis 9–12 cm, sparsely pubescent; calyx segments elliptic-lanceolate, 1–1.5 × ca. 0.5 mm, apex obtuse; corolla pale green; segments ovate-lanceolate, 2–2.5 mm, caudate-acuminate; filaments connected; anthers ca. 0.2 mm. Female flowers fasciculate in axils of leaves; calyx and

corolla as in male flowers; ovary subglobose, 1.5–2 mm in diam., sparsely puberulent; styles 3, 2.5–3 mm; stigmas half-moon-shaped, margin dentate; staminodes 5, subulate. Capsule campanulate, ca. 5 × 8 mm, glabrous, apex truncate. Seeds broadly cordate, ca. 3 × 4 mm. Fl. Aug–Sep, fr. Sep–Oct.

• Forests, thickets; below 100 m. Anhui, S Jiangsu, Zhejiang.

One of us (Jeffrey) treats *Gynostemma laxiflorum* as a synonym of this species.

**3. *Gynostemma cardiospermum*** Cogniaux ex Oliver, Hooker's Icon. Pl. 23: t. 2225. 1892 [*"cardiosperma"*].

心籽绞股蓝 xin zi jiao gu lan

*Triostellum cardiospermum* (Cogniaux ex Oliver) Z. P. Wang & Q. Z. Xie.

Herbs, scandent. Stem slender, angular-sulcate, glabrous. Leaves pedately 3–7-foliolate; petiole 2.5–5 cm; leaflets lanceolate or oblong-elliptic, median leaflets 4–10 cm, lateral leaflets shorter, glabrous or setose only on veins, base attenuate, margin irregularly crenate, apex acuminate. Tendrils slender, 2-fid. Male flowers in a panicle; rachis slender; calyx segments oblong-lanceolate, acute; corolla segments lanceolate, 1-veined, caudate-acuminate; anthers ovoid, 1-celled. Female flowers in a raceme; calyx and corolla as in male flowers; ovary globose, villous; ovules 2; styles 3, ca. 0.5 mm; stigmas half-moon-shaped, margin dentate. Capsule globose or subcampanulate, ca. 8 mm in diam., apex truncate. Seeds broadly cordate, 4.2–5 mm in diam., slightly compressed, both surfaces rugose-verrucose, margin narrowly winged. Fl. Jun–Aug, fr. Aug–Oct.

• Forests and thickets on mountain slopes; (1400–)1900–2300 m. W Hubei, S Shaanxi, Sichuan.

**4. *Gynostemma microspermum*** C. Y. Wu & S. K. Chen, Acta Phytotax. Sin. 21: 364. 1983 [*"microsperma"*].

小籽绞股蓝 xiao zi jiao gu lan

Stem slender, angular-sulcate, glabrous or pubescent at nodes. Leaves pedately 5-foliolate; petiole ca. 2 cm, glabrous; leaflets elliptic, median leaflets 3–4 × 1.5–2 cm, lateral leaflets smaller, thinly papery, adaxially pubescent, base obtuse, margin irregularly crenate, apex obtuse, cuspidate. Tendrils filiform, 2-fid, glabrous. Flowers unknown. Infructescence racemose, dense. Capsule yellow-green, dark punctate, globose, ca. 3 mm in diam., glabrous, apex truncate, dehiscent, 1- or 2-seeded.

Seeds brown, broadly cordate, compressed, ca.  $2.5 \times 2$  mm, less than 1 mm thick, papillose. Fr. Dec.

Dense forests; 800–1400 m. S Yunnan [N Thailand].

**5. *Gynostemma aggregatum*** C. Y. Wu & S. K. Chen, Acta Phytotax. Sin. 21: 365. 1983.

聚果绞股蓝 ju guo jiao gu lan

Stem slender, angular-sulcate, glabrous or pubescent at nodes. Leaves pedately 5–7-foliolate; petiole 2–2.5 cm, glabrous; leaflets obovate-elliptic, median leaflets  $3\text{--}3.5 \times \text{ca. } 1.5$  cm, lateral leaflets smaller, membranous, abaxially glabrous, adaxially sparsely pubescent, lateral veins 6–9 pairs, base obtuse, margin crenate, apex obtuse-rounded, cuspidate; petiolule 2–5 mm, glabrous. Tendrils filiform, 2-fid. Male flowers unknown. Female flowers in a small 3- or 4-flowered panicle; bracts capillary; calyx segments very small, subulate; corolla segments lanceolate, ca. 1 mm, apex shortly acuminate; ovary globose, ca. 1 mm in diam., villous; styles 3, free, ca. 0.75 mm; stigma 2-lobed. Capsules aggregated in a dense 1.5–2 cm spike; fruit broadly campanulate, ca. 5 mm in diam., white pubescent, apex truncate. Seeds gray-brown, ovoid, ca.  $3 \times 2$  mm, ca. 1 mm thick, verruculose, margin dentate. Fl. Jul–Aug, fr. Sep–Oct.

• Pinus forests, mixed forests; 2300–2700 m. NW Yunnan.

**6. *Gynostemma laxiflorum*** C. Y. Wu & S. K. Chen, Acta Phytotax. Sin. 21: 366. 1983.

疏花绞股蓝 shu hua jiao gu lan

Stem slender, angular-sulcate, glabrous or puberulent at nodes. Leaves pedately 5-foliolate; petiole ca. 3 cm; leaflets oblong-lanceolate, median leaflets ca.  $4 \times 1.5$  cm, lateral leaflets smaller, membranous, abaxially glabrous, adaxially sparsely puberulent, base obtuse, margin dentate, apex acuminate. Tendrils simple, glabrous. Male flowers unknown. Female flowers: inflorescence a sparse panicle, axillary or terminal, 2–5  $\times$  1.5–2.5 cm, rachis and branches glabrous; pedicel filiform, 4–5 mm; bracts linear; calyx segments oblong-lanceolate, ca.  $1.75 \times 0.5$  mm, glabrous, apex shortly acuminate; corolla segments ovate-lanceolate, ca.  $2.5 \times 1$  mm, puberulent or glabrescent, apex caudate-acuminate; staminodes 5, terete; ovary globose, ca. 2 mm in diam., pubescent; styles 3, ca. 1.5 mm, base puberulent; stigma luniform, irregularly 3–5-dentate. Fruiting pedicel 8–10 mm, glabrous; capsule campanulate, 6–7 mm, glabrous, apex truncate, 3-rostrate, beak 2–3 mm, dehiscent, 2- or 3-seeded. Seeds brown, broadly cordate, ca.  $2 \times 2.5$  mm, ca. 1.5 mm thick, papillate. Fl. and fr. Nov–Dec.

• Mountain slopes; below 300 m. S Anhui.

One of us (Jeffrey) treats this taxon as a synonym of *Gynostemma yixingense*.

**7. *Gynostemma simplicifolium*** Blume, Bijdr. 24. 1825 [“*simplicifolia*”].

单叶绞股蓝 dan ye jiao gu lan

*Gynostemma pentaphyllum* (Thunberg) Makino f. *simplicifolium* (Blume) W. J. de Wilde & Duyfjes.

Stem slender, branched, angular-sulcate, pubescent. Leaves simple; leaf blade ovate, 10–15  $\times$  8–9 cm, papery, abaxially glabrous, adaxially puberulent only on veins, basal veins 7–9, base rounded to slightly cordate, margin crenate, apex acuminate; petiole 4–6 cm, pubescent. Tendrils 2-fid. Male flowers: inflorescence paniculate; peduncle filiform, 10–25 cm, pubescent; pedicels filiform, 0.5–2 mm; calyx segments oblong-lanceolate, 0.5–1 mm, puberulent, apex obtuse; corolla pale green-white or pale green-yellow; segments oblong, ca.  $3 \times 0.7\text{--}1$  mm, 1-veined, apex obtuse. Fruit pale yellow-green, black when mature, globose, 7–8 mm in diam. Seeds broadly ovate, ca.  $4 \times 3.5$  mm, compressed, verrucose, base rounded, apex acute.

Forests; 1300–1400 m. Hainan, S Yunnan [India, Indonesia, Malaysia, Myanmar, Philippines].

One of us (Jeffrey) treats this taxon as a synonym of *Gynostemma pentaphyllum*.

**8. *Gynostemma laxum*** (Wallich) Cogniaux in A. Candolle & C. Candolle, Monogr. Phan. 3: 914. 1881.

光叶绞股蓝 guang ye jiao gu lan

*Zanonia laxa* Wallich, Pl. Asiat. Rar. 2: 29. 1831; *Alsomitra laxa* (Wallich) M. Roemer; *Gynostemma crenulatum* Ridley; *Pestalozzia laxa* (Wallich) Thwaites; *Z. wightiana* Arnott.

Stem slender, much branched, glabrous or sparsely puberulent. Leaves pedately 3-foliolate; petiole 1.5–4 cm, glabrous; median leaflet oblong-lanceolate, sometimes rhombic, 5–10  $\times$  2–3 cm, papery, base broadly cuneate, apex acute or shortly acuminate; lateral leaflets ovate, 4–7  $\times$  2–3.5 cm, glabrous, margin undulate-crenate; petiolule (2–)5–7 mm. Male flowers: inflorescence paniculate, terminal or axillary, (5–)10–30 cm, pubescent; bracts subulate-lanceolate, ca. 1 mm; pedicels filiform, 3–7 mm; bracteole subulate, small; calyx segments narrowly triangular-ovate, ca. 0.5 mm; corolla yellow-green; segments narrowly ovate-lanceolate, ca.  $1.5 \times 0.5$  mm, glabrous, 1-veined, entire, acuminate at apex. Female inflorescence as male flowers; corolla segments narrowly triangular; ovary globose, ca. 1 mm in diam.; styles 3, free, apex 2-fid. Fruit yellow-green, globose, 8–10 mm, glabrous, indehiscent. Seeds pale gray, broadly ovate, ca. 4 mm in diam., compressed, both surfaces papillate, base rounded, apex acute. Fl. Aug, fr. Aug–Sep.

Dense forests in valleys. Guangxi, Hainan, SE Yunnan [India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

One of us (Jeffrey) would treat this taxon as a synonym of *Gynostemma pentaphyllum*.

**9. *Gynostemma “burmanicum”*** King ex Chakravarty, Indian J. Agric. Sci. 16(1): 86. 1946 [“*Gynostemma burmanica*”].

缅甸绞股蓝 mian dian jiao gu lan

Stem angular-sulcate, densely pubescent at nodes. Leaves papery, 3-foliolate, both surfaces hispidulous; petiole 3–6.5 cm, densely pubescent; median leaflet rhombic, (6–)8–12  $\times$  3–5.5 cm, base broadly cuneate, margin crenate, apex shortly acuminate; lateral leaflets 4–9  $\times$  ca. 4 cm, outside subovate, base rounded, inside sub lanceolate or oblanceolate, base attenuate, lateral veins 8 or 9; median petiolule 5–6 mm; lateral leaflets

subsessile. Tendrils 2-fid. Male flowers in panicle; calyx segments oblong, ca.  $0.75 \times 0.3$  mm, apex obtuse; corolla green; segments  $\pm$  elliptic, apex acute or shortly acuminate; stamens ca. 1 mm, glabrous. Female flowers unknown. Fruit green, baccate, globose, 5–10 mm in diam., glabrous, 3-seeded. Seeds pale brown, broadly ovate, ca.  $3(-5) \times 3$  mm, ca. 2 mm thick, compressed, both surfaces papillate, base subrounded, edges with furrow.

Open forests or thickets, forests in mountain valleys; 600–1300 m. S and SE Yunnan [Myanmar, Thailand].

One of us (Jeffrey) considers this species and its varieties, the names of which have never been validly published, to represent densely hairy variants of *Gynostemma pentaphyllum*. The name *G. "burmanicum"* was not validly published by Chakravarty (loc. cit.) because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1); as a result, the name *G. "burmanicum" var. molle* was not validly published either (Art. 43.1). A subsequent publication of the species name (Chakravarty, Rec. Bot. Surv. India 17(1): 190. 1959) again failed to provide a Latin description or diagnosis and did not indicate a type.

- 1a. Fruit 5–6 mm in diam.; seeds  
3(–3.5) mm ..... 9a. var. "*burmanicum*"  
1b. Fruit 8–10 mm in diam.; seeds  
ca. 5 mm ..... 9b. var. "*molle*"

**9a. *Gynostemma "burmanicum" var. burmanicum***

缅甸绞股蓝(原变种) mian dian jiao gu lan (yuan bian zhong)

Fruit 5–6 mm in diam.; seeds 3(–3.5) mm.

Open forests and thickets; 800–1200 m. S Yunnan [Myanmar, Thailand].

**9b. *Gynostemma "burmanicum" var. molle*** (C. Y. Wu, Acta Phytotax. Sin. 21: 360. 1983).

大果绞股蓝 da guo jiao gu lan

Fruit 8–10 mm in diam.; seeds ca. 5 mm.

• Forests in mountain valleys or open forests; 600–1300 m. S and SE Yunnan.

**10. *Gynostemma pentaphyllum*** (Thunberg) Makino, Bot. Mag. (Tokyo) 16: 179. 1902.

绞股蓝 jiao gu lan

Stem and branches slender, angular-sulcate, glabrous or sparsely pubescent. Leaves pedately 3–9-foliolate, usually 5–7-foliolate, membranous or papery, pubescent or glabrous; leaflets ovate-oblong or lanceolate, median leaflets  $3-12 \times 1.5-4$  cm, lateral leaflets smaller, both surfaces sometimes hispid, lateral veins 6–8 pairs, base attenuate, margin crenate, apex acute or shortly acuminate; petiole 1–5 mm. Tendrils filiform, 2-fid. Male flowers in panicle; peduncle filiform, 10–15(–30) cm, many branched; pedicels filiform, 1–4 mm; bracteole subulate; calyx tube very short; segments triangular, ca. 0.7 mm, apex acute; corolla pale green or white; segments ovate-lanceolate,  $2.5-3 \times$  ca. 1 cm, 1-veined, apex long acuminate. Female flowers: panicle shorter than that of male flowers; calyx and corolla as in male flowers; ovary globose, 2- or 3-loculed; styles 3; stigmas 2-lobed; staminodes 5, short. Fruit indehiscent, black when mature, globose, 5–6 mm in diam., 2-seeded, glabrous or densely hispid and pubescent. Seeds brown, ovate-cordate, ca. 4

mm in diam., compressed, both surfaces papillose, base cordate, apex obtuse. Fl. Mar–Nov, fr. Apr–Dec.

Forests, thickets or roadsides on mountain slopes; 300–3200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, S Japan, S Korea, Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Thailand, Vietnam].

- 1a. Fruit glabrous ..... 10a. var. *pentaphyllum*  
1b. Fruit densely hispid and  
pubescent ..... 10b. var. *dasycarpum*

**10a. *Gynostemma pentaphyllum* var. *pentaphyllum***

绞股蓝(原变种) jiao gu lan (yuan bian zhong)

*Vitis pentaphylla* Thunberg in Murray, Syst. Veg., ed. 14, 244. 1784; *Alsomitra cissoides* M. Roemer; *Enkylia digyna* Griffith; *E. trigyna* Griffith; *Gomphogyne alleizettei* Gagnepain; *Gynostemma pallidinerve* Z. Zhang; *G. pedatum* Blume; *G. pedatum* var. *hupehense* Pampanini; *G. pedatum* var. *pubescens* Gagnepain; *G. pedatum* var. *trifoliatum* Hayata; *G. pubescens* (Gagnepain) C. Y. Wu; *G. siamicum* Craib; *G. zhejiangense* X. J. Xue; *Pestalozzia pedata* (Blume) Zollinger & Moritz; *V. mairei* H. Léveillé (1912), not H. Léveillé (1909); *V. martini* H. Léveillé & Vaniot; *Zanonia pedata* (Blume) Miquel.

Fruit glabrous.

Forests, thickets or roadsides on mountain slopes; 300–3200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, India, Indonesia, S Japan, S Korea, Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Vietnam].

One of us (Jeffrey) would treat "*Gynostemma burmanicum*," *G. laxum*, and *G. longipes* as synonyms of *G. pentaphyllum* var. *pentaphyllum*.

**10b. *Gynostemma pentaphyllum* var. *dasycarpum*** C. Y. Wu, Acta Phytotax. Sin. 21: 362. 1983.

毛果绞股蓝 mao guo jiao gu lan

*Gynostemma pentaphyllum* f. *dasycarpum* (C. Y. Wu) W. J. de Wilde & Duyfjes.

Fruit densely hispid and pubescent.

Forests; 1400–1700 m. S Yunnan [Indonesia (Borneo), Myanmar, Thailand].

**11. *Gynostemma guangxiense*** X. X. Chen & D. H. Qin, Acta Bot. Yunnan. 10: 495. 1988.

广西绞股蓝 guang xi jiao gu lan

Stems slender, glabrous, striate and sulcate. Tendrils filiform, apex bifid. Leaves alternate, pedate, with (3–)5–7 leaflets; petiole 4–8 cm, glabrous; leaflet blade ovate-elliptic or obovate, central leaflets  $3-4.5 \times 1.5-2.5$  cm, lateral leaflets smaller, slightly oblique, membranous, glabrous or with sparse pubescence along midrib and lateral veins on both surfaces, base cuneate, margin serrate, apex shortly acuminate or obtuse; petiole 3–5 mm. Plants monoecious. Male flowers greenish, ca. 2 m in diam., in axillary panicles 3–5 cm; peduncle filiform, 8–15 mm, glabrous; bracteoles subulate, ca. 1.5 mm; pedicels fili-

form, 2–3 mm; calyx segments deltoid, ca.  $0.5 \times 0.4$  mm; corolla segments lanceolate,  $1-1.5 \times$  ca.  $0.5$  mm; filaments very short; anthers ovoid. Female flowers few, cymose; peduncle slender, 6–14 mm, glabrous; pedicels 7–15 mm; calyx segments lanceolate, ca.  $1 \times 0.3$  mm; corolla segments lanceolate, ca.  $2.5 \times 0.5$  mm, apex caudate-acuminate; ovary 2- or 3-locular, each locule with 1 ovule; styles 2 or 3, slightly connate at base; stigmas slightly bifid. Fruit greenish, obovate-triangular or 3-angled-oblate,  $4-5 \times 5-6$  mm, apex truncate, with persistent perianth and styles, glabrous; fruit stalk filiform, 7–18 mm. Seeds 2 or 3, cream colored, oblong or subglobose, ca.  $2.5 \times 2.2$  mm, verruculose. Fl. Oct, fr. Nov–Dec.

- Forests on limestone mountains. Guangxi (Daxin, Longzhou).

**12. *Gynostemma compressum*** X. X. Chen & D. R. Liang, *Guihaia* 11: 13. 1991.

扁果绞股蓝 *bian guo jiao gu lan*

Stems slender, sulcate, glabrous. Tendrils filiform, apex usually bifid. Leaves pedate, with 7 leaflets; petiole 5–12 cm, glabrous; leaflets abaxially gray-green, adaxially green, elliptic or elliptic-ovate, membranous, base cuneate, margin crenulate, apex acuminate or acute, abaxially sparsely puberulent along midrib and lateral veins, adaxially sparsely pilose, middle leaflets  $3.6-6.5 \times 2-2.25$  cm, lateral leaflets smaller, outside oblique; petiolule 3–5 mm. Plants dioecious. Male flowers in panicles, axillary, 2–5 cm; peduncle filiform, 8–16 mm, glabrous; bracteoles subulate, ca. 1.5 mm; pedicels 2–5 mm; flowers greenish, ca. 1.5 mm in diam.; calyx segments triangular, ca.  $0.8 \times 0.5$  mm; filaments very short, connate; anthers ovoid. Female flowers solitary or paired, axillary; peduncle filiform, 5–9 mm, glabrous; pedicels 5–10 mm; calyx segments ca.  $1.3 \times 0.4$  mm; corolla segments linear-lanceolate,  $2-3 \times$  ca.  $0.4$  mm, apex caudate-acuminate; ovary 2-locular, each locule with 1 ovule; styles 2, free; stigmas bifid. Fruit baccate, compressed, obtriangular,  $5-8 \times 5-7$  mm, glabrous, apex with persistent perianth and styles; fruit stalk filiform, 1.3–2.5 cm. Seeds brownish, obtriangular, ca. 3 mm, apex ca. 3.5 mm in diam., both surfaces tuberculate, margin crenate and sulcate. Fl. Mar–Apr, fr. Mar–May.

- Forests, moist limestone foothills; below 400 m. Guangxi (Longzhou).

This species is used in Chinese herbal medicine by the people of Guangxi.

**13. *Gynostemma longipes*** C. Y. Wu, *Acta Phytotax. Sin.* 21: 362. 1983.

长梗绞股蓝 *chang geng jiao gu lan*

Stem pubescent. Leaves papery, pedately 7–9-foliolate; petiole 4–8 cm; leaflets rhombic-elliptic or obovate-lanceolate, median leaflets  $5-12 \times 2-4.5$  cm, base attenuate, margin irregularly crenate, apex shortly acuminate; lateral leaflets smaller than median leaflets, apex obtuse, abaxially hispid-pubescent on veins, adaxially sparsely pubescent; petiolule ca. 1 cm. Tendrils slender, 2-fid. Male flowers: panicle 10–20 cm, rachis and branches pubescent; bracts linear, ca. 2 mm; pedicel filiform, ca. 4 mm; bracteole linear, ca. 0.7 mm; calyx segments ovate, ca.  $1 \times 0.5$  mm, acute; corolla white; segments narrowly ovate-lanceolate, ca.  $2.5 \times 1$  mm, pubescent, 1-veined, apex long acuminate. Female flowers unknown. Fruit yellow-green, globose, 6–7 mm in diam., glabrous; fruiting pedicel filiform, (8–)15–20 mm, glabrous. Seeds pale gray or brown, compressed cordate, ca.  $3 \times 3$  mm, ca. 1 mm thick.

- Forests on valley sides; 1400–3200 m. Guangxi, Guizhou, S Shaanxi, W Sichuan, NE and NW Yunnan.

One of us (Jeffrey) treats this taxon as a synonym of *Gynostemma pentaphyllum*.

**14. *Gynostemma caulopterum*** S. Z. He, *Acta Phytotax. Sin.* 34: 207. 1996.

翅莖绞股蓝 *chi jing jiao gu lan*

Stem stout, 4–10 m high, 5–10 mm in diam., branched, 3-angled, angles winged, wings 1.5–3 mm wide, glabrous or sparsely puberulent at nodes. Tendrils filiform, apex bifid. Leaves pedate, 7-foliolate; petiole 5–8 cm, glabrous; leaflets rhombic-elliptic or obovate-elliptic, papery, abaxially glabrous, adaxially pilose, base cuneate, margin serrate, apex acuminate, mucronate; central leaflet  $6-12 \times 2-4$  cm, lateral leaflets smaller. Plants dioecious. Male flowers in axillary panicles, 7–9 cm; bracteoles linear, ca. 1.5 mm; flowers ca. 2 mm in diam.; pedicels 2–2.5 mm; calyx segments triangular, ca.  $0.8 \times 0.5$  mm; corolla segments ovate-lanceolate, ca.  $1.5 \times 1$  mm; filaments very short, connate; anthers ovoid. Female flowers in axillary or terminal panicles,  $1.5-3.5 \times 1.2-1.8$  cm, glabrous; pedicel 1–1.5 mm; basal bract 1, linear; calyx 5-lobed; segments triangular, ca.  $0.5 \times 0.4$  mm; corolla 5-parted; segments lanceolate, ca.  $2 \times 0.5$  mm, apex acuminate; ovary compressed globose, ca. 1.5 mm in diam., 2-locular, each locule with 1 ovule; styles 2, free; stigmas 3-fid. Berry greenish, compressed globose,  $2.5-3 \times 5.5-6$  mm, glabrous, with persistent corolla and styles; fruit stalks filiform, 3–6 mm. Seeds 2, cream colored, broadly cordate, ca.  $2 \times 3$  mm, spiniform-tuberculate. Fl. and fr. Sep–Nov.

- Moist places along small stream valleys; 400–700 m. Guizhou (Renhuai, Ziyun).

#### 4. NEOALSOMITRA Hutchinson, *Ann. Bot. (Oxford)*, n.s., 6: 97. 1942.

棒锤瓜属 *bang chui gua shu*

Lu Anmin (路安民 *Lu An-ming*); Charles Jeffrey

Herbs or shrubs, climbing. Leaves simple or often 3–5-foliolate, leaflets sometimes 2-glandular at base. Tendrils simple or 2-fid. Plants dioecious. Male flowers in paniculate or racemose inflorescences in axils of leaves; peduncle and pedicels filiform; calyx tube cupular, 5-partite; segments oblong or oblong-lanceolate; corolla rotate, 5-partite; segments oblong; stamens 5, free; filaments short,

united at base; anthers oblong, 1-celled. Female flowers in lax axillary panicles or racemes; ovary 1-locular or imperfectly 3-locular; ovules numerous, pendulous; styles 3, rarely 4; stigma semilunar. Fruit clavate or cylindric, terete or slightly 3-angled, apex broadly truncate and 3-valved. Seeds imbricate, compressed, terminated by a very thin elongated wing, margins wavy-tuberculate, testa crustaceous.

Eleven species: India to Polynesia and Australia; one species in China.

**1. *Neoalsomitra clavigera*** (Wallich) Hutchinson, Ann. Bot. (Oxford), n.s., 6: 101. 1942.

棒锤瓜 bang chui gua

*Zanonia clavigera* Wallich, Pl. Asiat. Rar. 2: 28. 1831; *Alsomitra clavigera* (Wallich) M. Roemer; *A. integrifoliola* (Cogniaux) Hayata; *A. pubigera* Prain; *A. tonkinensis* Gagnepain; *Gynostemma elongatum* Merrill; *G. integrifolium* Cogniaux; *Hemsleya elongata* (Merrill) Cogniaux; *H. henryi* Cogniaux; *Neoalsomitra integrifoliola* (Cogniaux) Hutchinson; *N. tonkinensis* (Gagnepain) Hutchinson.

Herbs. Stem slender, much branched, pubescent or subglabrous. Leaf blade pedately 3–5-foliolate; petiole 1.5–2 cm, pubescent; leaflets abaxially pale green, adaxially green, oblong or oblong-lanceolate, median leaflet 7–14 × 3–7 cm, lateral leaflets smaller, 1- or 2-glandular, membranous or thinly papery, both surfaces pubescent along veins, lateral veins 4 or 5 pairs, base obtuse, apex acuminate; petiolule 0.5–1 cm, densely pubescent. Tendrils glabrous or pubescent, 2-fid. Male inflores-

cences paniculate, 12–30 cm, much branched; pedicel filiform, 4–8 mm, glabrous or pubescent; bracteole subulate-lanceolate, 1–2 mm, densely pubescent; calyx tube short; segments ovate-lanceolate to lanceolate-linear, ca. 2 × 1 mm, hirsute-pubescent; corolla white; segments ovate, 2–4 × 1.5–3 mm, abaxially densely pubescent, apex acute; filaments ca. 0.8 mm; anthers ovoid. Female flowers paniculate; calyx and corolla as in male flowers; ovary subcylindric, ca. 10 mm, pubescent; styles 3; stigma 2-lobed. Fruit capsular, cylindric, 4–8.5 × 1.5–2 cm, glabrous or pubescent, base obtuse, apex truncate, with numerous seeds. Seeds gray- or yellow-brown, substelliform, narrowly ovate, margin 4–7-dentate, 10–14 × 6–10 mm, both surfaces muriculate, apex with oblong, membranous, 15–22 × 6–8 mm wing. Fl. Sep–Nov, fr. Nov–Apr (following year).

Rain forests, broad-leaved forests, valleys, secondary forests. Guangdong, Guangxi, Taiwan, SE Xizang (Médog), Yunnan [Bhutan, Cambodia, NE India, Indonesia (Sumatra), Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; Australia (Queensland), Pacific islands (Fiji, Solomon Islands)].

## 5. ZANONIA Linnaeus, Sp. Pl. 2: 1028. 1753.

翅子瓜属 chi zi gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Climbers, woody. Stem subglabrous. Leaves petiolate, undivided, margin entire. Tendrils simple or bifid. Plants dioecious; male flowers in lax pendulous panicles; female flowers in racemes. Male flower: calyx tube shortly cupular; segments 3, rarely 4, membranous, concave; corolla rotate; segments 5, apex narrow and inflexed in flower bud; stamens 5, free, all of same length, inserted on a fleshy disk; filaments short, thick; anthers oblong, 1-celled; pistillode absent. Female flowers: calyx as in male flowers; staminodes 5, very short, alternate with petals; ovary inferior, at first 3-loculed, ultimately 1-loculed; styles 3, spreading, apex bifid; ovules in each locule 2 or many, pendulous, attached in 2 series to a fleshy parietal placenta. Fruit a capsule, large, narrowly cylindric, clavate, 3-valved at truncate apex. Seeds pendulous, large, oblong, compressed, surrounded by a large membranous wing.

One species: Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam.

**1. *Zanonia indica*** Linnaeus, Syst. Nat., ed. 10, 2: 1292. 1759.

翅子瓜 chi zi gua

Stem robust, branched, ± sulcate, glabrous. Leaves glabrous; leaf blade ovate-oblong, 8–16 × 5–10 cm, leathery, abaxially with distinct reticulate veins, lateral veins 3 or 4 pairs, adaxially smooth, base rounded or slightly emarginate, margin entire, apex acute; petiole 1.5–3 cm, glabrous. Male peduncle slender; rachis ca. 16 cm, much branched; pedicel robust, 4–5 mm, with articulation; calyx segments ovate-triangular, ca. 2 mm, glabrous, apex acute; corolla pale yellow-brown; segments oblong, 3–3.5 × 1–1.5 mm, apex obtuse. Female peduncle 10–30 cm, sparsely 5–10-flowered; pedicels thick; calyx segments ca. 4 mm, apex obtuse; corolla segments 6–8 mm; ovary obconic-cylindric, 10–12 mm. Fruit brownish, 6–10 × 2.5–5 cm, finely granulate, base obtuse, apex truncate. Seeds oblong, ca. 2 × 1–1.5 cm; wing yellowish or white, surrounding central seed, 5–8 × 1.3–2 cm, base and apex rounded.

Riversides, mountain slopes; 300–900 m. W Guangxi, S Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

- 1a. Fruit 6–10 × 2.5–3 cm, glabrous; seed wing 5–6 × 1.3–1.5 cm ..... 1a. var. *indica*  
1b. Fruit ca. 10 × 4.5–5 cm, densely pubescent; seed wing ca. 8 × 2 cm ..... 1b. var. *pubescens*

### 1a. *Zanonia indica* var. *indica*

翅子瓜(原变种) chi zi gua (yuan bian zhong)

*Alsomitra simplicifolia* Merrill; *Jupia borneensis* Merrill; *Zanonia indica* subsp. *orientalis* W. J. de Wilde & Duyfjes.

Fruit 6–10 × 2.5–3 cm, glabrous. Seeds ca. 2 × 1 cm; wing 5–6 × 1.3–1.5 cm.

Riversides, mountain slopes; ca. 300 m. W Guangxi (Napo) [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

**1b. *Zanonia indica* var. *pubescens*** Cogniaux in A. Candolle & C. Candolle, Monogr. Phan. 3: 927. 1881.

滇南翅子瓜 dian nan chi zi gua

Fruit ca.  $10 \times 4.5$ –5 cm, densely pubescent. Seeds ca.  $2 \times 1.5$  cm; wing white, ca.  $8 \times 2$  cm.

Open forests on mountain slopes and dry valley sides; ca. 800 m. S Yunnan (Mengla) [N India].

## 6. *BOLBOSTEMMA* Franquet, Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 325. 1930.

假贝母属 jia bei mu shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, climbing, with a multi-tuberos base. Stems slender. Leaves cordate, 5-lobed, glandular at base. Tendrils 2-fid. Plants dioecious; male flowers in panicle, female flowers often in panicle, sometimes solitary or fascicled. Male flowers: calyx rotate, 5-partite; segments linear-lanceolate; corolla rotate, 5-partite; segments narrowly lanceolate, caudate-acuminate; stamens 5; filaments free or connate at base in pairs; anthers subovoid, 1-celled; connective papillose on back. Female flowers: calyx and corolla as in male flowers; ovary subglobose, verrucose, 3-locular; style short; stigmas 3, 2-lobed; ovules 2 in each locule, pendulous. Fruit narrowly ovoid, conical at apex, with or without spines, circumscissile-dehiscent above middle. Seeds 4–6, subovate, with membranous wing at apex.

• Two species: disjunct between N China and SW China.

1a. Leaves palmately 5-fid, lobes 3–5-lobed; calyx segments and corolla segments ca. 2.5 mm; stamens free, connective not papillose; ovary rarely verrucose; fruit smooth ..... 1. *B. paniculatum*

1b. Leaves suborbicular; calyx segments and corolla segments to 6–8 mm; stamens connate at base of filaments in pairs, connective elongate; ovary densely verrucose; fruit spinescent ..... 2. *B. biglandulosum*

**1. *Bolbostemma paniculatum*** (Maximowicz) Franquet, Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 327. 1930.

假贝母 jia bei mu

*Mitrosicyos paniculatus* Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 113. 1859; *Actinostemma multilobum* Harms; *A. paniculatum* (Maximowicz) Cogniaux; *Schizopepon fargesii* Gagnepain.

Stem herbaceous, glabrous. Petiole slender, 1.5–3.5 cm; leaf blade ovate-orbicular,  $4-11 \times 3-10$  cm, palmately 5-partite; lateral lobes ovate-oblong, acute; central lobe oblong-lanceolate, acuminate; basal lobe with a gland at apex, glabrous or pilose on veins. Tendrils filiform, 2-fid. Inflorescence paniculate, 4–10 cm; pedicel filiform, 1.5–3.5 cm; calyx and corolla similar, yellow-green; segments ovate-lanceolate, ca. 2.5 cm; stamens free; filaments 0.3–0.5 mm; anthers ca. 0.5 mm; ovary ovoid, 3-locular; ovules 2 in each locule. Fruit cylindric,  $1.5-3 \times 1-1.2$  cm, circumscissile-dehiscent, conical at apex. Seeds 6,  $8-10 \times$  ca. 5 mm, testa rugose, margin denticulate, with a long membranous wing at apex, wing 8–10 mm. Fl. Jun–Aug, fr. Aug–Sep.

• Montane slopes. Gansu, Hebei, Henan, NW Hunan, Shaanxi, Shandong, Shanxi, E and S Sichuan.

This plant is used medicinally.

**2. *Bolbostemma biglandulosum*** (Hemsley) Franquet, Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 328. 1930.

刺儿瓜 ci er gua

Branches slender, slightly pilose when young, ultimately glabrous. Petiole slender, 2–5 cm; leaf blade broadly oblong or suborbicular,  $2.5-7 \times 3-7$  cm, membranous, glabrous, 5-lobed, base broadly cordate, apex acute or obtuse, with a gland at apex of lowest 2 lobes. Tendrils filiform, 2-fid, pilose or glabrous. Male inflorescence paniculate, to 12 cm; rachis and pedicels filiform; pedicels 1–1.5 cm; calyx segments linear-lanceolate;

corolla segments pale yellow-green, narrowly lanceolate,  $6-8 \times 0.8-1.2$  mm, glabrous, apex long caudate; stamens inserted at base of corolla tube, connate in pairs, 1 free; filaments ca. 0.8 mm; anthers yellow, ca. 1 mm; connective caudate at apex, 1–1.2 mm. Female flowers solitary; pedicels filiform, 10–15 mm; ovary densely verrucose. Fruit yellow-green, cylindric,  $3.5-4$  cm, covered with slender spines, spines 5–7 mm, circumscissile when mature. Seeds irregularly ovate, margin irregularly dentate, ca.  $10 \times 7$  mm, with membranous wing at apex, wing ca. 10 mm, apex lobate. Fl. Sep, fr. Oct.

• Forest margins, thickets under forests; 1000–1400 m. NW and SE Yunnan.

1a. Leaf blade suborbicular,  $\pm$  as long as broad,  $4-7 \times 4-7$  cm ..... 2a. var. *biglandulosum*

1b. Leaf blade broadly oblong, shorter than broad,  $2.5-3.5 \times 3-4.5$  cm ..... 2b. var. *sinuatolobulatum*

**2a. *Bolbostemma biglandulosum* var. *biglandulosum***

刺儿瓜(原变种) ci er gua (yuan bian zhong)

*Actinostemma biglandulosum* Hemsley, Hooker's Icon. Pl. 27: t. 2622. 1899; *Hemsleya esquirolii* H. Léveillé.

Leaf blade suborbicular,  $\pm$  as long as broad,  $4-7 \times 4-7$  cm. Calyx segments linear-lanceolate; corolla segments narrowly lanceolate,  $6-8 \times 1-1.2$  mm.

• Forest margins; 1300–1400 m. SE Yunnan (Mengzi).

**2b. *Bolbostemma biglandulosum* var. *sinuatolobulatum*** C. Y. Wu, Acta Phytotax. Sin. 6: 238. 1957.

波裂叶刺儿瓜 bo lie ye ci er gua

Leaf blade broadly oblong, shorter than broad,  $2.5-3.5 \times 3-4.5$  cm. Calyx- and corolla segments narrowly lanceolate,  $6-8 \times 0.8-1$  mm.

• Thickets under forests; ca. 1000 m. NW Yunnan (Lijiang).

## 7. ACTINOSTEMMA Griffith, Account Bot. Coll. Cantor, 24. 1845.

盒子草属 *he zi cao shu*

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Mitrosicyos* Maximowicz.

Herbs, scandent. Leaves petiolate; blade cordate-hastate, cordate-ovate, broadly ovate, or lanceolate-triangular, unlobed or 3–5-lobed, margins dentate. Tendrils 2-fid or rarely simple. Plants monoecious or rarely bisexual. Flowers unisexual. Male inflorescence racemose or paniculate, rarely flowers solitary or paired; calyx rotate, segments linear-lanceolate; corolla rotate, segments lanceolate, acuminate; stamens 5(or 6), free; filaments short, filiform; anthers subovoid, extrorse, basifixed, 1-celled; anther cell oblong; connective papillose on back. Female flowers solitary or fasciculate; calyx and corolla as in male flowers; ovary ovoid, verrucose, 1-locular; style short; stigmas 3, reniform; ovules 2(–4), attached to wall near apex of locule, pendulous. Fruit ovoid, conical at apex, semi-superior, echinate, circumscissile-dehiscent near middle. Seeds 2–4, compressed, testa rugose, margin denticulate.

One species: E Asia and India.

**1. *Actinostemma tenerum*** Griffith, Account Bot. Coll. Cantor, 25. 1845.

盒子草 *he zi cao*

Branches slender, slightly pilose when young, ultimately glabrous. Petiole filiform, slightly puberulent, 2–6 cm; blade very variable, ovate or sagittate-ovate, 3–12 × 2–8 cm, abaxially slightly pilose, ultimately glabrous, adaxially indistinctly punctate-scabrid, 3-lobed, base deeply emarginate, margin minutely denticulate or coarsely serrate, apex long, acute-acuminate. Tendrils filiform, 2-fid. Male inflorescence racemose, sometimes paniculate, shortly villous, many flowered, main rachis 1–13 cm, shortly villous; bract linear, ca. 3 mm, villous; calyx segments linear-lanceolate, 2–3 × 0.5–1 mm, margin dentate; corolla segments lanceolate, 2–3 × 1–1.5 mm at base, scarcely villous, 1- or 3-veined, apex narrowly subulate; staminal filaments slightly dilated at apex, ca. 0.5 mm, pilose; anthers ca. 0.3 mm. Female flowers solitary or fasciculate; calyx and corolla as in male flowers; ovary ovoid, verrucose. Fruit ovoid or oblong-ellipsoid, 1.6–2.5 × 1–2 cm, verrucose, operculate, 2–4-seeded. Seed plano-convex, broadly ovoid, 11–13 × 8–9 mm, 3–4 mm thick, both surfaces reticulate, base slightly attenuate. Fl. Jul–Sep, fr. Sep–Nov.

Growing on watersides. Anhui, Fujian, Guangxi, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Sichuan, S Xizang, W Yunnan, Zhejiang [India, Japan, Korea, Laos, Thailand, Vietnam].

The whole plant and its seeds are used medicinally.

1a. Flowers unisexual; stamens 5 ..... 1a. var. *tenerum*

1b. Flowers bisexual; stamens 6 ..... 1b. var. *yunnanense*

**1a. *Actinostemma tenerum* var. *tenerum***

盒子草(原变种) *he zi cao* (yuan bian zhong)

*Actinostemma japonicum* (Miquel) Miquel; *A. lobatum* (Maximowicz) Franchet & Savatier; *A. lobatum* var. *japonicum* Maximowicz; *A. lobatum* f. *longilobum* Komarov; *A. lobatum* var. *palmatum* Makino; *A. lobatum* f. *subintegrum* Komarov; *A. palmatum* (Makino) Makino; *A. parvifolium* Cogniaux; *A. racemosum* (Maximowicz) Cogniaux; *Mitrosicyos lobatus* Maximowicz; *M. racemosus* Maximowicz; *Pomasterion japonicum* Miquel.

Flowers unisexual. Stamens 5.

Grasslands at watersides. Anhui, Fujian, Guangxi, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, S Xizang, W Yunnan, Zhejiang [India, Japan, Korea, Laos, Thailand, Vietnam].

**1b. *Actinostemma tenerum* var. *yunnanense*** A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 4(2): 127. 1984 [“*yunnanensis*”].

云南盒子草 *yun nan he zi cao*

Flowers bisexual. Stamens 6.

● W Yunnan.

## 8. INDOFEVILLEA Chatterjee, Nature 158: 345. 1946.

藏瓜属 *zang gua shu*

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Woody climbers, large. Stem angular-sulcate. Leaves petiolate; leaf blade ovate, cordate, entire, pedately veined at base. Tendrils 2-fid. Plants dioecious. Male flowers in panicle; rachis elongate; pedicels short; bracts linear, apex acuminate; calyx segments 5, 3- or 4-veined, acute; corolla segments 5, shorter than calyx segments, 3–5-veined; stamens 5, 4 in pairs, 1 free; filaments very short; anthers reniform, 1-celled, pubescent; staminodes and rudimentary ovary absent. Fruit oblong, indehiscent, in clusters of 3–6 on a very long peduncle, with a thick woody rind. Seeds many, large, ovate, compressed, faintly margined.

One species: SW China, NE India.

**1. *Indofevillea khasiana*** Chatterjee, Nature 158: 345. 1946.

藏瓜 *zang gua*

Stem branched, robust, pubescent at first, ultimately glabrous. Tendrils smooth, glabrous, to 20–30 cm. Petiole robust, 1.5–8 cm, pubescent at first, later glabrous; leaf blade broadly

ovate-cordate, 15–25 × 12–20 cm, leathery, margin entire or rarely in younger leaves distinctly and minutely toothed near base, scabrous on veins, otherwise glabrous on both surfaces, apex shortly acuminate. Male panicle to 17 cm; rachis and branches scabrous; bracts 5–9 mm; bracteoles 2–3 mm; calyx segments ovate-lanceolate, longer than corolla segments, ca. 6

mm; corolla segments ovate-lanceolate, ca. 4 mm, outside sparsely and minutely hairy, inside papillose. Fruit oblong, 3–6 in clusters on a long stalk, ca. 30 cm, indehiscent with a thick woody rind. Seeds 3.5–4 × ca. 2 cm, ca. 0.5 cm thick. Fl. and fr. Aug.

Open forests on mountain slopes; ca. 900 m. S Xizang [NE India].

## 9. *SIRAITIA* Merrill, Pap. Michigan Acad. Sci. 19: 200. 1934.

罗汉果属 *luo han guo shu*

Lu Anmin (路安民 *Lu An-ming*); Charles Jeffrey

*Neoluffa* Chakravarty.

Herbs, perennial, scandent, verrucose-glandular. Tuber spheroid, enlarged. Stems angular-sulcate. Leaf blade unlobed, margin sparsely dentate, abaxially pilose or densely tomentose. Tendrils spiralled above and below branch, 2-fid. Plants dioecious. Male flowers: inflorescence paniculate, bracteate; calyx segments 5, triangular, densely pubescent; corolla segments 5, lanceolate or obovate-lanceolate, base often with 5 scales; stamens 5, 4 connected in pairs, 1 free; anthers sigmoid. Female flowers solitary, paired, or 3 or 4 in raceme; staminodes 5, glanduliform; ovary ovoid; ovules numerous, horizontal; style stout, apex 3-lobed; stigma 2-lobed. Fruit subglobose or cylindric. Seeds subovoid or ovoid, winged, wing corky.  $2n = 28$ .

Four species: China, India (Sikkim), Indonesia, Malaysia, Thailand, Vietnam; three species (one endemic) in China.

- 1a. Male inflorescence cymose-paniculate, many flowered ..... 1. *S. sikkimensis*  
 1b. Male inflorescence racemose or paniculate, 6–10-flowered.  
 2a. Seeds with 3-layered wing, wing marginally obtusely dentate; calyx segments 3–5 × 7–9 mm ..... 3. *S. siamensis*  
 2b. Seeds with 2-layered wing, wing marginally only sparsely dentate; calyx segments 3–4 × 3–4 mm ..... 2. *S. grosvenorii*

**1. *Siraitia sikkimensis*** (Chakravarty) C. Jeffrey, Kew Bull. 36: 737. 1982.

锡金罗汉果 *xi jin luo han guo*

*Neoluffa sikkimensis* Chakravarty, J. Bombay Nat. Hist. Soc. 50: 895. 1952.

Stem angular, tomentose. Petiole 5–8 cm, tomentose; leaf blade cordate, 7–15 × 7–15 cm, abaxially tomentose, adaxially glabrous, margin entire, lowest lateral veins running parallel with margin of basal lobes. Male flowers yellow, 20–35 crowded on 8–14 cm axillary peduncle; rachis 3–5 cm; pedicels 1–2 cm; bracts leaflike, 7–15 mm; calyx tube campanulate, 10–15 mm in diam., tomentose; segments acute, 3–5 mm; corolla segments oblong-ovate, 8–10 × 3–4 mm, entire, ± constricted at apex, apex acute; stamens free, inserted at base of calyx tube, 1–2 mm; filaments 0.5–1 mm; anthers 1-celled, sinuate; connective broad, granular. Female flowers and fruit unknown.

S Yunnan (Mengla) [India (Sikkim)].

**2. *Siraitia grosvenorii*** (Swingle) C. Jeffrey ex A. M. Lu & Zhi Y. Zhang, Guihaia 4: 29. 1984.

罗汉果 *luo han guo*

*Momordica grosvenorii* Swingle, J. Arnold Arbor. 22: 198. 1941; *Thladiantha grosvenorii* (Swingle) C. Jeffrey.

Plant: all parts with yellow-brown pubescence and black glandular scales. Root enlarged, fusiform or subglobose. Stem and branches slightly robust. Petiole 3–10 cm; leaf blade ovate-cordate, 12–23 × 5–17 cm, membranous, apex acuminate or long acuminate; sinus semicircular or broadly ovate-cordate. Male flowers: inflorescence racemose, 6–10-flowered; peduncle 7–13 cm; pedicels slender, 5–15 mm; calyx tube broadly campanulate, 4–5 × ca. 8 mm, usually with 3 membranous

scales; segments triangular, ca. 4.5 × 3 mm, 3-veined, apex long acuminate; corolla yellow; segments oblong, 10–15 × 7–8 mm, 5-veined, apex acute; filaments puberulent, ca. 4 mm; anthers ca. 3 mm. Female flowers solitary or 2–5 on 6–8 mm peduncle; calyx and corolla as in male flowers but slightly larger; staminodes 2–2.5 mm; ovary oblong, 10–12 × 5–6 mm, densely yellow-brown velvety, base obtuse-rounded; style ca. 2.5 mm; stigmas 3, enlarged, ca. 1.5 mm. Fruit globose or oblong, 6–11 × 4–8 cm, densely yellow-brown velvety and black glandular-scaly, ultimately glabrous. Seeds numerous, pale yellow, broadly ovate, compressed, 15–18 × 10–12 mm, base obtuse-rounded, with 2-layered wings, wings sinuate. Fl. May–Jul, fl. Jul–Sep.

• Forests on mountain slopes, riversides, thickets. Guangdong, Guangxi, Guizhou, S Hunan, Jiangxi.

The fruit is used medicinally.

**3. *Siraitia siamensis*** (Craib) C. Jeffrey ex S. Q. Zhong & D. Fang, Guihaia 4: 23. 1984.

翅子罗汉果 *chi zi luo han guo*

*Thladiantha siamensis* Craib, Bull. Misc. Inform. Kew 1914: 7. 1914; *Momordica tonkinensis* Gagnepain.

Plants to 20 m; all parts densely yellow-brown pubescent and red (black when dry) glandular-scaly. Roots enlarged. Petiole 3.5–10 cm; leaf blade ovate-cordate, 10–27 × 2–5.5 cm, membranous, palmately 5–7-veined. Male flowers: 5–15 (to many) in a raceme or panicle; peduncle 2–12 cm; pedicels 15–30 mm; calyx tube broadly campanulate, 12–15 mm in diam.; segments ovate-triangular, 3–5 × 7–9 mm, 3-veined, apex obtuse; corolla pale yellow, 3.4–4 cm in diam.; segments ovate-oblong, 15–20 × 9–13 mm, margin with glandular hairs, base with 3 membranous scales, 5-veined, apex obtuse; filaments

sparsely glandular hairy. Female flowers solitary or paired; calyx and corolla as in male flowers but smaller; staminodes (3–)5; corolla base with 3 scales; ovary ovoid, 12–15 × 9–10 mm, densely velvety and glandular-scaly, base obtuse-rounded, apex truncate; style 4–5 mm, glabrous, 3-lobed; stigma reniform. Fruit subglobose, ca. 6 cm in diam., velvety at first, glabrescent. Seeds numerous, pale brown, ovoid, 12–14 × 11–13

mm, ca. 4 mm thick, with 3-layered wings; wing corky, margin irregularly dentate, median 3–5 mm wide, lateral 1–2 mm wide. Fl. Apr–Jun, fr. Jul–Sep.

Forests on mountain slopes; 300–700 m. W Guangxi, SE Yunnan [Indonesia, Malaysia, Thailand, N Vietnam].

The tuber is used medicinally.

# 10. SINOBALJIANIA C. Jeffrey & W. J. de Wilde, Bot. Zhurn. 91: 769. 2006.

白兼果属 bai jian guo shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, perennial, scandent. Root spheroid, enlarged. Stem and branches sulcate and angular, without verrucose glands, sparsely puberulent. Leaf blade ovate-cordate or triangular-cordate, membranous, abaxially hispid on veins, adaxially strigose-punctate, margin entire or 2- or 3-lobed. Male inflorescence racemose, 5–8-flowered, bracteate; calyx segments triangular-ovate, valvate, sparsely pilose; corolla oblong or ovate; stamens 5; anthers curved. Female flowers 1–3, ovoid or cylindric; ovules numerous, horizontal. Fruit subglobose or cylindric. Seeds ovate or ovate-oblong, apex truncate or obtuse, unwinged.  $2n = 32$ .

Four species: S China, Laos, Thailand; three species (two endemic) in China.

One of us (Lu) does not recognize “micro-genera” such as this; however, for the purposes of this Flora, the treatment by the co-author (Jeffrey) is followed.

- 1a. Leaves 3–5-parted; fruit subglobose ..... 3. *S. taiwaniana*  
 1b. Leaves entire, undulate, crenate, or lobed; fruit cylindric.  
   2a. Leaves entire, undulate; seeds triangular-ovate, apex obtuse and apiculate ..... 1. *S. decipiens*  
   2b. Leaves crenate or lobed; seeds ovate, apex broadly truncate ..... 2. *S. yunnanensis*

**1. Sinobaljiania decipiens** C. Jeffrey & W. J. de Wilde, Bot. Zhurn. 91: 769. 2006.

白兼果 bai jian guo

Stem and branches setose and pubescent at first, ultimately glabrous. Petiole 2–6 cm; leaf blade narrowly ovate-cordate, 8–15 × 5–10 cm, membranous or papery, abaxially sparsely puberulent or subglabrous, adaxially setose at first, ultimately strigose-punctate, pubescent on veins, base cordate, margin entire or callose-serrate, apex acuminate; sinus semicircular or suborbicular, 1.5–2.5 cm deep, 2–3 cm wide. Tendrils 2-fid. Plants dioecious. Male inflorescence racemose or paniculate; rachis 3–14 cm, pubescent, 7–15-flowered; pedicel 5–10 mm, pubescent, base with a lanceolate or narrowly ovate, 2–3 mm bract; calyx tube cupular, 2.5–3 mm, ± puberulent; segments lanceolate, 6–7.5 mm, base 2–3 mm wide, 3-veined, apex acuminate; corolla yellow; segments narrowly ovate, 6–6.5 mm, apex acute; stamens 4 in pairs and 1 free; filaments ca. 1 mm; anthers terete, 1-celled, ca. 3 mm, cells curved, puberulent. Female flowers solitary, or 2- or 3-flowered at apex of peduncle; pedicel ca. 5 mm, puberulent; calyx and corolla as in male flowers; ovary oblong, ca. 8 × 4 mm, densely hispid or pubescent; style ± long, filiform, ca. 7 mm, 3-fid; stigma 2-lobed, enlarged. Fruiting pedicel stout, sulcate-angular, 2–2.5 cm, densely pubescent and setose, ultimately glabrous; fruit red-brown when mature, oblong or subglobose, 5.5–6.5 × 4–5 cm, pubescent at first, ultimately glabrous. Seeds numerous, pale yellow-brown, triangular-ovate, ca. 8 × 7 cm, ca. 3 mm thick, both surfaces smooth, base obtuse-rounded, constricted above, apex truncate. Fl. Jun–Aug, fr. Sep–Dec.

• Forests, river valleys. Guangdong, SE Xizang (Mêdog), SE Yunnan (Xichou).

**2. Sinobaljiania yunnanensis** (A. M. Lu & Zhi Y. Zhang) C. Jeffrey & W. J. de Wilde, Bot. Zhurn. 91: 769. 2006.

云南白兼果 yun nan bai jian guo

*Siraitia borneensis* (Merrill) C. Jeffrey ex A. M. Lu & Zhi Y. Zhang var. *yunnanensis* A. M. Lu & Zhi Y. Zhang, Guihaia 4: 31. 1984; *Baijiana yunnanensis* (A. M. Lu & Zhi Y. Zhang) A. M. Lu & J. Q. Li; *S. borneensis* var. *lobophylla* A. M. Lu & Zhi Y. Zhang.

Tuber complanate-spheroid, 10–13 × 6–8 cm. Stem angular-sulcate, sparsely puberulent. Petiole 3–9 cm; leaf blade ovate-cordate, 5–13 × 4–10 cm, membranous, abaxially pilose, hispid on veins, adaxially scabrous, margin irregularly dentate or slightly 3-lobed, apex acute. Tendrils 2-fid. Male flowers: 8 in raceme; peduncle 4–6 cm; bracts broadly obovate, 5–6 × 3–4 mm, pubescent; calyx segments triangular-ovate or ovate, 5.5–8 × 3–5 mm, 3-veined, apex acuminate; corolla segments oblong, 10–13 × 7–8 mm, villous, 5-veined, base truncate, apex obtuse; filaments 3–3.5 mm; anthers curved, 3.5–5 mm. Female flowers solitary or paired; pedicel 1–1.5 cm, pubescent; ovary cylindric, ca. 10 × 4 mm, densely villous. Fruit cylindric, ca. 5 × 3.3 cm. Seeds numerous, ovoid or ovoid-oblong, 7–8.5 × 4.5–6 mm, ca. 1.5 mm thick.

Valley sides, forests; 1000–1800 m. S and SW Yunnan [N Laos].

De Wilde and Duyfjes (Blumea 51: 497. 2006) cited evidence suggesting that the type of *Siraitia borneensis* var. *lobophylla* may represent a species of *Sinobaljiania* distinct from *S. yunnanensis*.

**3. Sinobaljiania taiwaniana** (Hayata) C. Jeffrey & W. J. de Wilde, Bot. Zhurn. 91: 770. 2006.

台湾白兼果 tai wan bai jian guo

*Thladiantha taiwaniana* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 119. 1911; *Baijiania taiwaniana* (Hayata) A. M. Lu & J. Q. Li; *Siraitia taiwaniana* (Hayata) C. Jeffrey ex A. M. Lu & Zhi Y. Zhang.

Stem and branches sulcate-angular, subglabrous. Petiole ca. 3 cm; leaf blade oblong-cordate or ovate-cordate, 5–12 × 5–10 cm, abaxially sparsely setose at first, ultimately glabrous, adaxially scabrous, punctate, 5-veined, base deeply cordate,

margin irregularly dentate, 3-lobed, apex acute; median lobe oblong, ca. 6 × 3.5 cm. Tendrils simple. Male flowers: inflorescence racemose, axillary, 6–7 cm; bracts broadly obovate, ca. 7 × 5 mm, pubescent; calyx tube ca. 4 mm in diam., pubescent; segments 5, triangular-ovate, ca. 4 × 2.5 mm, apex acuminate; corolla segments 5, oblong, apex obtuse. Fruit globose, ca. 2.5 cm in diam., pubescent.

• Taiwan.

## 11. THLADIANTHA Bunge, Enum. Pl. Chin. Bor. 29. 1833.

赤爬属 chi bao shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, perennial, climbing, scandent, or prostrate. Roots usually tuberous. Stems herbaceous, scabrous. Tendrils simple or 2-fid. Leaves mostly simple, vary rarely pedately 3–7-foliolate; leaf blade cordate, margin dentate. Plants dioecious. Male flowers in cymes-racemes or rarely solitary; calyx tube broadly campanulate or cupular; segments 5, linear, lanceolate, ovate-lanceolate, or oblong, 1–3-veined; corolla yellow, campanulate, 5-partite; segments oblong, broadly ovate, or obovate, usually 5–7-veined, entire; stamens 5, inserted on calyx tube, free, often 4 in pairs, other 1 free; filaments short; anthers oblong or ovoid, all 1-celled; anther cell erect; rudimentary ovary glandlike. Female flowers solitary or 2- or 3-fascicled on a short peduncle; calyx and corolla as in male flowers; ovary ovoid, oblong, or fusiform, smooth or verrucose; ovules numerous, horizontal; style 3-fid; stigmas 3, 2-lobed, reniform. Fruit fleshy, indehiscent, smooth or verrucose, many ribbed or not ribbed. Seeds numerous, horizontal.

Twenty-three species: Bhutan, China, India, Indonesia, Japan (introduced), Korea, Laos, Myanmar, Nepal, Thailand, Vietnam; 23 species (19 endemic) in China.

- 1a. Bracts in male flowers flabelliform, dentate.
  - 2a. Calyx segments entire, 0.6–3 mm wide ..... 1. *T. cordifolia*
  - 2b. Calyx segments dentate or irregularly lobed, (3–)4–11 mm wide.
    - 3a. Calyx segments (3–)4–6 mm wide, with 1–3 triangular lobes ..... 2. *T. grandisepala*
    - 3b. Calyx segments to 11 mm wide, flabelliform, margin irregularly lobed ..... 3. *T. medogensis*
- 1b. Male flowers without flabelliform bracts.
  - 4a. Ovary and fruit scaly or verrucose.
    - 5a. Leaf blade ovate-lanceolate or narrowly ovate-triangular; ovary and fruit verrucose ..... 23. *T. longifolia*
    - 5b. Leaf blade ovate-cordate; fruit with thick scales.
      - 6a. Ovary and fruit ovoid-globose, apex with a long rostrum, scales at base of fruit less than 5 mm, not adnate to pedicel ..... 21. *T. pustulata*
      - 6b. Ovary and fruit ovoid-oblong, apex without a rostrum, scales at base of fruit to 10 mm, adnate to pedicel ..... 22. *T. henryi*
  - 4b. Ovary and fruit not scaly or verrucose.
    - 7a. Leaves palmately deeply 5-lobed ..... 20. *T. palmatipartita*
    - 7b. Leaves not palmately deeply 5-lobed.
      - 8a. Male flowers congested at apex of rachis into pseudocapitulum.
        - 9a. Calyx segments lanceolate, apex acute, 1-veined ..... 18. *T. capitata*
        - 9b. Calyx segments linear, apex obtuse, 3-veined ..... 19. *T. davidii*
      - 8b. Male flowers in cyme-panicle, panicle, raceme, or rarely solitary, but not capitellate.
        - 10a. Plants sparsely hairy or subglabrous.
          - 11a. Calyx segments 1-veined.
            - 12a. Basal lateral vein along base of leaf blade; calyx segments linear, over 9 mm ..... 13. *T. oliveri*
            - 12b. Basal lateral vein not along base of leaf blade; calyx segments triangular-lanceolate, 4–5 mm ..... 14. *T. montana*
          - 11b. Calyx segments 3-veined.
            - 13a. Tendrils 2-fid, leaves not lobed or lobed ..... 17. *T. dentata*
            - 13b. Tendrils simple, leaves not lobed.
              - 14a. Leaf blade broadly ovate-cordate; tendrils filiform; pedicel in male flowers 1.2–2.5 cm; fruit with a long beak ..... 15. *T. maculata*
              - 14b. Leaf blade narrowly ovate or narrowly ovate-lanceolate; tendrils robust; pedicel 0.5–1 cm; fruit without beak ..... 16. *T. punctata*
    - 10b. Plants with dense multicellular setae, very rarely subglabrous.

- 15a. Leaves simple, unlobed or margin lobed or serrate, or pedately 3–5-foliolate ..... 4. *T. hookeri*  
 15b. Leaves unlobed, rarely irregularly lobed.  
   16a. Tendrils simple.  
     17a. Male flowers solitary or in a short raceme, bracts leaflike ..... 5. *T. dubia*  
     17b. Male flowers without bracts.  
       18a. Petiole less than 1.5 cm, leaf blade lanceolate or narrowly ovate ..... 6. *T. sessilifolia*  
       18b. Petiole over 2 cm, leaf blade ovate-cordate ..... 7. *T. villosula*  
   16b. Tendrils 2-fid.  
     19a. Male flowers dimorphic, solitary, and in raceme with (2 or)3(–5) flowers  
       in axil of same leaf ..... 8. *T. dimorphantha*  
     19b. Male flowers in panicle or raceme.  
       20a. Stem and leaves with pale yellow multicellular setae or very rarely  
         subglabrous, sinus at base of leaf closed; fruit orange-red when  
         mature ..... 9. *T. nudiflora*  
       20b. Stem and leaves with gray-white multicellular setae, sinus at base  
         of leaf open; fruit whitish yellow when mature.  
         21a. Calyx segments broadly lanceolate or obovate-oblong,  
             10–15 mm ..... 10. *T. longisepala*  
         21b. Calyx segments triangular-lanceolate, less than 10 mm.  
             22a. Ovary and fruit with dense yellow-brown spiniform setae;  
                 seeds 6.5–7 mm, sparsely irregularly verrucose on surface ... 11. *T. setispina*  
             22b. Ovary and fruit with long setae; seeds 4.5–5 mm, not  
                 verrucose on surface ..... 12. *T. lijiangensis*

**1. *Thladiantha cordifolia*** (Blume) Cogniaux in A. Candolle & C. Candolle, Monogr. Phan. 3: 424. 1881.

大苞赤爬 da bao chi bao

*Luffa cordifolia* Blume, Bijdr. 929. 1826; *Gymnopetalum piperifolium* Miquel; *Thladiantha calcarata* C. B. Clarke; *T. calcarata* var. *subglabra* Cogniaux; *T. calcarata* var. *tonkinensis* Cogniaux; *T. cordifolia* var. *tomentosa* A. M. Lu & Zhi Y. Zhang; *T. cordifolia* var. *tonkinensis* (Cogniaux) A. M. Lu & Zhi Y. Zhang; *T. globicarpa* A. M. Lu & Zhi Y. Zhang; *T. omeiensis* T. Y. Zhu; *T. tonkinensis* Gagnepain; *Trichosanthes javanica* Miquel.

Vines, climbing, herbaceous, pubescent. Stems much branched, robust, angular-sulcate. Petiole slender, 4–10(–12) cm; leaf blade ovate-cordate, 8–15 × 6–11 cm, membranous or papery, adaxially scabrous, pubescent, or with setae on an enlarged base, veins densely pubescent, both surfaces densely pale yellow pubescent, basal vein along margin of base of blade, base cordate, margin irregularly dentate, apex acuminate or shortly so; sinus at base often open, sometimes closed, 1–3 cm deep, 0.5–2 cm wide. Tendrils simple, pubescent at first, glabrescent. Male flowers: 3 to several in dense short raceme; peduncle robust, 4–15 cm, pubescent; bracts imbricate, flabelliform, 1.5–2 cm, both surfaces pubescent; pedicels slender, ca. 5 mm; calyx tube campanulate, 5–6 mm, 5-partite; segments linear, ca. 10 × 1 mm, 1-veined, apex caudate-acuminate; corolla segments ovate or elliptic, ca. 17 × 7 mm, apex shortly acuminate or acute; filaments ca. 4 mm; rudimentary ovary semiglobose. Female flowers solitary; calyx and corolla as in male flowers; ovary oblong, base obtuse, pubescent; styles 3-fid; stigmas enlarged, reniform, 2-lobed. Fruit oblong, 3–5 × 2–3 cm, with scabrous rind, slightly pubescent, with 10 longitudinal striae, obtuse at both ends. Seeds broadly ovate, 4–5 × 3–3.5 mm, ca. 2 mm thick, reticulate. Fl. and fr. May–Nov.

Streamsides, forests; 800–2600 m. Guangdong, Guangxi, Sichuan, Yunnan [India, Indonesia, Laos, Myanmar, Nepal, Thailand, Vietnam].

De Wilde and Duyfjes (Blumea 51: 513–514. 2006) considered *Thladiantha calcarata* var. *tonkinensis* (as *T. tonkinensis* Gagnepain) and *T. globicarpa* to be species distinct from *T. cordifolia*, differing in their smaller, non-fenestrate fruit and the latter from the former by its narrower calyx segments.

**2. *Thladiantha grandisepala*** A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1–2): 67. 1981.

大萼赤爬 da e chi bao

Vines, climbing, herbaceous. Stems and branches slender, angular-sulcate, at first densely pubescent, glabrescent. Petiole 4–8 cm; leaf blade narrowly ovate-cordate, 10–16 × 6–11 cm, membranous, adaxially scabrous, with setae on an enlarged base, veins densely pubescent, basal vein along margin of base of leaf, base cordate, margin dentate, apex shortly acuminate; sinus at base open, semicircular, 1–2 cm deep, 0.5–1 cm wide. Male flowers: 5–9 in pedunculate raceme; bracts flabelliform, 12–15 × 15–17 mm, both surfaces pubescent, margin irregularly dentate; pedicels slender, 5–10 mm, pubescent; calyx tube campanulate, ca. 4 mm; segments broadly lanceolate to narrowly ovate, slightly irregular, ca. 1.5 cm × 4–6 mm, distinctly 3-veined, apex usually irregularly 2- or 3-lobed; corolla segments narrowly oblong, ca. 2 × 1 cm, apex shortly acuminate; filaments pubescent; rudimentary ovary semiglobose. Female flowers solitary; pedicels 2–5 cm, pubescent; calyx segments broadly lanceolate or narrowly ovate, to 18 × ca. 6 mm, 3-veined, margin often 2- or 3-lobed, apex acuminate; corolla segments ca. 3 × 1.4 cm; ovary narrowly oblong, 15–18 × 4–6 mm, densely yellow villous, base narrow, apex subtruncate; style filiform, 3-fid; stigma enlarged, 2-lobed. Fruiting pedicel robust, 3–5 cm, subglabrous; fruit elliptic, 2.5–3 × ca. 1.5 cm, pubescent, obtuse at both ends. Fl. Jun–Aug, fr. Aug–Oct.

● Mountain slopes, forests; 2100–2400 m. Yunnan.

**3. *Thladiantha medogensis*** A. M. Lu & J. Q. Li, Acta Bot. Yunnan. 14: 133. 1992.

墨脱赤爬 mo tuo chi bao

Herbs, scandent. Stem slender, angular-sulcate, sparsely puberulent. Petiole 3.5–5 cm, pubescent and sparsely setose; leaf blade ovate-cordate, 8–11 × 5–5.6 cm, papery or submembranous, abaxially sparsely pubescent and setose, adaxially densely setose at first, ultimately punctate-scabrous, basal lateral veins along margin of sinus, base emarginate, margin callose-dentate, apex shortly acuminate. Tendrils simple, pubescent. Male flowers in a raceme; peduncle robust, 8–24 cm; bracts ca. 2 × 2.2 cm, margin irregularly 5- or 6-obtusely dentate; pedicel slender, 7–10 mm, sparsely pubescent; calyx tube campanulate, ca. 2.5 × 3.5 mm; segments ca. 10 × 11 mm, 3-veined, margin irregularly 3–5-dentate; corolla segments narrowly oblong, 8–9 × 3–3.5 mm, apex acuminate; filaments ca. 1.5 mm, sparsely pubescent; anthers oblong, ca. 3 mm; rudimentary ovary subglobose, ca. 2 mm in diam. Fruit solitary, subcylindric, ca. 3.2 × 2 cm, longitudinally striate, rounded at apex and base.

• About 1800 m. SE Xizang (Mêdog).

**4. *Thladiantha hookeri*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 2: 631. 1879.

异叶赤爬 yi ye chi bao

*Hemsleya tonkinensis* Cogniaux; *H. trifoliolata* Cogniaux; *H. yunnanensis* Cogniaux; *Thladiantha digitata* H. Léveillé; *T. heptadactyla* Cogniaux; *T. hookeri* var. *heptadactyla* (Cogniaux) A. M. Lu & Zhi Y. Zhang; *T. hookeri* var. *palatifolia* Chakravarty; *T. hookeri* var. *pentadactyla* (Cogniaux) A. M. Lu & Zhi Y. Zhang; *T. hookeri* f. *quinquefoliata* Chakravarty; *T. hookeri* f. *trifoliolata* (Cogniaux) Chakravarty; *T. pentadactyla* Cogniaux; *T. trifoliolata* (Cogniaux) Merrill.

Vines, climbing, herbaceous. Tuber olate-spheroid. Stems 2–4(–10) m, to 10 mm in diam., much branched, subglabrous. Petiole 3–6 cm, glabrous or puberulent; leaf blade pedately 3–7-foliolate or undivided; leaflets oblong-lanceolate, broadly lanceolate, lanceolate, or linear-lanceolate, median leaflet 6–15 × 1–3 cm, membranous, abaxially subglabrous, adaxially scabrous, margin dentate, apex acuminate. Tendrils filiform, simple, smooth. Male flowers in raceme or solitary; rachis filiform, 2–4 cm, glabrous, ebracteate; pedicel of solitary flowers to 2.5 cm; calyx tube broadly campanulate, 3–4 × 6–7 mm, sparsely pubescent; segments erect, narrowly triangular, ca. 4 × 1.5 mm, 3-veined; corolla segments ovate, 10–12 × ca. 5 mm; filaments 2–3 mm, glabrous; anthers oblong, ca. 2 mm. Female flowers solitary; pedicel filiform, 2–4 cm, at first puberulent, ultimately glabrous; calyx and corolla as in male flowers; calyx segments ca. 10 mm; corolla segments ca. 2 cm; ovary fusiform, 1–2 cm × 2–3 mm, densely yellow-brown pubescent, attenuate at both ends; style ca. 4 mm, 2-fid; stigmas enlarged, ca. 3 mm. Fruit oblong, 4–6 × 2–3 cm, smooth, rounded at both ends. Seeds broadly ovate, 6–7 × ca. 5 mm, smooth, base obtuse-rounded. Fl. and fr. Apr–Oct.

Forest margins on mountain slopes; 1200–1800 m. Yunnan [Bhutan, NE India, Laos, Myanmar, Thailand, Vietnam].

**5. *Thladiantha dubia*** Bunge, Enum. Pl. Chin. Bor. 29. 1833.

赤爬 chi bao

Plants climbing, herbaceous, pale yellow pubescent-hirsute. Roots tuberous. Stems robust, angular-sulcate. Petiole robust, 2–6 cm; leaf blade broadly ovate-cordate, 5–8 × 4–9 cm, both surfaces scabrous, hirsute on veins, basal lateral veins along margin of blade base, base cordate, margin irregularly dentate, apex acute or shortly acuminate; sinus deep, suborbicular or semicircular, 1–1.5 cm deep, 1.5–3 cm wide. Tendrils filiform, simple. Male flowers solitary or several congested on short rachis into pseudoraceme; pedicel filiform, 1.5–3.5 cm, pubescent; calyx tube very short, subrotate, 3–4 × 7–8 mm; segments reflexed, lanceolate, 12–13 × 2–3 mm; stamens 4 connected in pairs and 1 free, 2–2.5 mm, puberulent; anthers ovoid, ca. 2 mm; rudimentary ovary semiglobose. Female flowers solitary; pedicels slender, 1–2 cm, pubescent; calyx and corolla as in male flowers; staminodes 5; ovary oblong, 5–8 mm, densely pale yellow pubescent; style 3-fid; stigma enlarged, reniform, 2-lobed. Fruit orange-yellow, ovoid-oblong, 4–5 cm × ca. 28 mm, pubescent, with 10 longitudinal striae, base slightly attenuate. Seeds black, ovate, 4–4.3 × 2.5–3 mm, ca. 1.5 mm thick, smooth. Fl. Jun–Aug, fr. Aug–Oct.

Forest margins, valleys; 300–1800 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Ningxia, Shaanxi, Shandong, Shanxi, N Sichuan [Korea; introduced in Japan].

The fruit and roots are used medicinally.

**6. *Thladiantha sessilifolia*** Handel-Mazzetti, Symb. Sin. 7: 1061. 1936.

短柄赤爬 duan bing chi bao

Vines, herbaceous. Roots tuberous. Stem and branches slender, at first sparsely puberulent, glabrescent. Petiole very short, 5–15(–40) mm, pubescent or subglabrous; leaf blade lanceolate or ovate-lanceolate, 8–16 × 2–4.5 cm, papery, abaxially densely pubescent, adaxially scabrous, subglabrous, base cordate, margin sparsely dentate, apex acuminate; sinus closed, basal lateral veins not along blade base. Tendrils filiform, usually simple. Male flowers 2–5 in pedunculate short raceme, sometimes solitary; bract ovate, ca. 2 mm; pedicels slender, 5–10 mm, pubescent or subglabrous; calyx tube campanulate, ca. 3 × 5 mm, sparsely pubescent; segments lanceolate, ca. 5 × 1.5 mm, 3-veined, apex subulate-acuminate; corolla segments ovate, ca. 15 × 7–8 mm, often 5-veined, apex acuminate; stamens inserted on limb of calyx tube; filaments ca. 3 mm; anthers elliptic, 2–3 mm; rudimentary ovary yellow, semiglobose. Female flowers solitary; pedicel slender, 2–3 cm, puberulent or subglabrous; calyx and corolla as in male flowers; ovary oblong, 15–22 × 5–10 mm, densely yellow-brown villous, apex attenuate; style slender, 3-fid; stigma enlarged, reniform, 2-lobed; staminodes 2–3 mm. Fruit ovoid-oblong. Fl. May–Aug, fr. Aug–Nov.

• Thickets or forests on mountain slopes, wetlands on ditch sides. SW Sichuan, Yunnan.

The tuberous roots are used medicinally.

1a. Petiole very short, 5–15 mm, pubescent

..... 6a. var. *sessilifolia*

1b. Petiole longer, 20–40 mm, subglabrous

..... 6b. var. *longipes*

**6a. *Thladiantha sessilifolia* var. *sessilifolia***

短柄赤爬(原变种) duan bing chi bao (yuan bian zhong)

Petiole very short, 5–15 mm, pubescent; leaf blade lanceolate or ovate-lanceolate. Tendrils simple.

• Thickets on mountain slopes, wetlands on ditch sides. SW Sichuan.

The tuberous roots are used medicinally.

**6b. *Thladiantha sessilifolia* var. *longipes*** A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1–2): 77. 1981.

沧源赤爬 cang yuan chi bao

Petiole longer, 20–40 mm, subglabrous. Tendrils simple or 2-fid.

• Forests; ca. 1000 m. Yunnan.

**7. *Thladiantha villosula*** Cogniaux in Engler, Pflanzenr. 66(IV. 275. I): 44. 1916.

长毛赤爬 chang mao chi bao

*Thladiantha villosula* var. *nigrita* A. M. Lu & Zhi Y. Zhang.

Vines, climbing, herbaceous, densely glandular-villous and sparsely multicellular-setose. Stem much branched; branches slender. Petiole slender, 3–6 cm; leaf blade adaxially dark green, ovate-cordate, broadly ovate-cordate, or suborbicular, 6–12 × 5–10 cm, membranous, abaxially pubescent, basal lateral veins along margin of blade base, base cordate, margin dentate, apex shortly acuminate; sinus rounded, 1–2 cm deep, 1–1.5 cm wide. Tendrils filiform, simple. Male flowers usually 2–7 in a raceme; peduncle 1–3 cm, usually bearing leaflike bract; bract 1–1.5 × ca. 1 cm, densely pubescent, margin dentate, apex acuminate; pedicel 1–2.5 cm; calyx tube broadly campanulate; segments yellow-green, narrowly lanceolate, 4–6 × ca. 1.5 mm, 3-veined; corolla segments ovate or narrowly ovate, 12–15 × 6–8 mm, 5-veined, apex obtuse; stamens 4 connected in pairs and 1 free; filaments filiform, 2–3 mm; anthers oblong, ca. 2 mm; rudimentary ovary semiglobose. Female flowers solitary; pedicels slightly robust; calyx segments narrowly lanceolate, 5–6 × ca. 1 mm, 3-veined, apex acuminate; corolla segments narrowly ovate, ca. 20 × 15 mm, 5-veined, apex acuminate; staminodes glandular; ovary narrowly oblong, 15–18 × 3–4 mm, densely pale yellow glandular villous; style stout, 3-fid; stigma enlarged, reniform, 2-lobed. Fruiting pedicel stout, 2–3 cm; fruit red-brown, oblong, to 7 × ca. 3.5 cm, both surfaces reticulate, base obtuse, apex attenuate. Fl. and fr. summer.

• Ditch sides in forests or thickets; 2000–2800 m. Gansu, Guizhou, S Henan, W Hubei, S Shaanxi, Sichuan.

**8. *Thladiantha dimorphantha*** Handel-Mazzetti, Oesterr. Bot. Z. 83: 235. 1934.

山西赤爬 shan xi chi bao

Vines, climbing, herbaceous. Stem and branches angular-

sulcate, pubescent and white setose at first, later glabrescent. Petiole 4–8 cm; leaf blade broadly ovate-cordate, 6–12 × 4–10 cm, undivided, abaxially pubescent, adaxially scabrous, densely setose, margin dentate, apex shortly acuminate or acute; basal sinus open, semicircular, 5–15 mm deep, 10–25 mm wide. Tendrils filiform, simple or 2-fid. Male flowers dimorphic, solitary one larger, smaller ones in a raceme; pedicel slender, 10–18 mm, pubescent; calyx pubescent; tube broadly campanulate, 3–4 mm; segments lanceolate, 4–6 mm, 3-veined, apex acuminate; corolla segments ovate, 10–12 × 5–6 mm, apex acute; filaments 2–2.5 mm; anthers elliptic, 3–3.5 mm. Female flowers solitary or binary; pedicels 5–10 mm; calyx and corolla as in male flowers; corolla segments obovate, 20–25 × ca. 10 mm, apex slightly obtuse; staminodes 5, sparsely puberulent, apex slightly enlarged; ovary fusiform, densely villous; style 3-fid, ca. 2 mm; stigma enlarged, 2-lobed.

• Mountain slopes, roadsides; 1800–2400 m. E Shaanxi, S Shanxi.

**9. *Thladiantha nudiflora*** Hemsley, J. Linn. Soc., Bot. 23: 316. 1887.

南赤爬 nan chi bao

Plants densely pubescent-hispid. Roots tuberous. Stems herbaceous, angular-sulcate. Petiole stout, 3–10 cm; leaf blade ovate-cordate, broadly ovate-cordate, or suborbicular-cordate, 5–15 × 4–12 cm, abaxially densely pale yellow pubescent, adaxially densely setose, basal lateral veins along blade base, margin serrate, apex acuminate or acute; basal sinus open or sometimes closed, 2–2.5 cm deep, 1–2 cm wide. Tendrils densely hispid, 2-fid. Male raceme many flowered; peduncle filiform, 4–8 cm, densely pubescent; pedicels filiform, 1–1.5 cm; calyx densely villous; tube broadly campanulate, 5–6 mm in diam.; segments ovate-lanceolate, 5–6 × ca. 2.5 mm, 3-veined, apex acute; corolla segments ovate-oblong, 12–16 × 6–7 mm, 5-veined, apex acute or obtuse; filaments puberulent, ca. 4 mm; anthers ovoid-oblong, ca. 2.5 mm. Female flowers solitary; pedicels slender, 1–2 cm, villous; calyx and corolla as in male flowers; ovary narrowly oblong, 12–15 × 4–5 mm, densely villous-hispid, base obtuse-rounded, apex attenuate; style 3-fid; stigma enlarged, reniform, 2-lobed; staminodes 5, ca. 1.5 mm. Fruiting pedicel robust, 2.5–5.5 cm; fruit red or red-brown when mature, oblong, 4–5 × 3–3.5 cm, glabrescent, apex obtuse. Seeds ovate or broadly so, ca. 5 × 3.5–4 mm, 1–1.5 mm thick, reticulate, base rounded, apex acute. Fl. May–Aug, fr. Aug–Nov.

Forest margins on mountain slopes. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Zhejiang [Philippines].

1a. Male flowers ebracteate ..... 9a. var. *nudiflora*  
1b. Male flowers with leaflike bracts ..... 9b. var. *bracteata*

**9a. *Thladiantha nudiflora* var. *nudiflora***

南赤爬(原变种) nan chi bao (yuan bian zhong)

*Cucumis courtoisii* H. Léveillé; *Thladiantha formosana* Hayata; *T. harmsii* Cogniaux; *T. nudiflora* var. *macrocarpa* Z. Zhang; *T. nudiflora* var. *membranacea* Z. Zhang.

Male flowers ebracteate.

Forest margins on mountain slopes. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Zhejiang [Philippines].

**9b. *Thladiantha nudiflora* var. *bracteata*** A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1-2): 84. 1981.

西固赤爬 xī gu chì páo

Male flowers with leaflike bracts; bracts broadly ovate-cordate, 10–12 × ca. 5 mm, pubescent, margin dentate.

• Gansu (Xigu).

**10. *Thladiantha longisepala*** C. Y. Wu, A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1-2): 86. 1981.

长萼赤爬 cháng ē chì páo

Herbs, climbing. Stem and branches angular-sulcate, at first puberulent and sparsely setose, glabrescent. Petiole slender, 4–7 cm, puberulent; leaf blade ovate-cordate or broadly ovate-cordate, 8–14 × 6–10 cm, membranous, abaxially puberulent, adaxially densely setose, base cordate, margin serrate, apex shortly acuminate; sinus 1–2 cm deep, 1.5–3 cm wide. Tendrils robust, elongate, 2-fid. Male panicle much branched, 5–13 cm, sparsely pubescent, usually with a leaflike bract at base of branch; bract ovate, 15–25 × 10–15 mm, apex acuminate or long acuminate. Male flowers: pedicel slender, 1–4 cm, pubescent; calyx tube campanulate; segments broadly lanceolate, 12–15 × 3–4 mm, distinctly 3-veined, apex acuminate, reflexed; corolla segments narrowly ovate, 20–22 × 8–9 mm, 5-veined, apex acuminate; filaments ca. 4 mm, puberulent; anthers ovoid, ca. 3 mm; rudimentary ovary semiglobose. Female flowers: 2–5 on a short peduncle; pedicels 3–6 cm; ovary densely setose and pubescent, oblong, ca. 1 cm. Fruiting peduncle robust, 3–6 cm, puberulent; fruit oblong, scabrous, yellow-brown pubescent and setose, apex and base obtuse. Fl. and fr. Jun–Oct.

• Thickets on mountain slopes and riversides; 2400–3500 m. NW Yunnan.

**11. *Thladiantha setispina*** A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1-2): 87. 1981.

刚毛赤爬 gāng máo chì páo

Herbs, climbing. Stems and branches sparsely puberulent, ultimately glabrous, smooth, angular-sulcate. Petiole slender, 3.5–5.5 cm, glabrous; leaf blade ovate-cordate, 6–8(–14) × 4–6(–10) cm, membranous or papery, abaxially densely pale yellow pubescent, adaxially setose, basal lateral veins along blade base, base cordate, margin serrulate, apex acuminate; sinus open, semicircular, 1–1.5 cm deep, 1–2 cm wide. Tendrils filiform, glabrous, 2-fid. Male flowers numerous in a ca. 17 cm panicle; peduncle robust, sparsely pubescent, usually with a bract at base of branches; bract 2–2.5 × 1.5–2 cm; pedicel 1–1.5 cm; calyx tube campanulate; segments triangular-lanceolate, 5–6 × ca. 2.5 mm, 3-veined, apex acuminate; corolla segments oblong, 18–20 × 6–8 mm, glabrous, 5-veined, apex acuminate; filaments ca. 4 mm, puberulent; anthers elliptic, ca. 3 mm. Female flowers solitary, or 3–5 on a 3–4 cm peduncle; pedicel slender, 3–5 cm, sparsely puberulent; calyx tube campanulate; segments ca. 7.5 mm, ca. 2.5 mm wide at base, glabrous, 3-

veined, apex acuminate; corolla segments 4–4.5 × 1.8–2 cm; ovary oblong, 10–12 × 6–7 mm, densely yellow-brown setose; style 3-fid; stigma enlarged, reniform, 2–2.5 mm, 2-lobed. Fruiting peduncle robust, 3–6 cm, glabrescent; fruit black-brown, oblong, 3–3.5 × 2–2.5 cm, scabrous, yellow-brown setose, apex and base obtuse. Seeds yellow-brown when dry, narrowly ovate, 6–7 × 3–3.5 mm, ca. 1.5 mm thick, smooth, base subrounded, apex obtuse. Fl. and fr. Jun–Oct.

• Mountain slopes, roadsides; ca. 3000 m. W Sichuan, E Xizang.

**12. *Thladiantha lijiangensis*** A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1-2): 88. 1981.

丽江赤爬 lì jiāng chì páo

*Thladiantha cinerascens* C. Y. Wu ex A. M. Lu & Zhi Y. Zhang; *T. henryi* Hemsley var. *subtomentosa* Handel-Mazzetti; *T. lijiangensis* var. *latiseppala* A. M. Lu & Zhi Y. Zhang.

Herbs, climbing. Root robust. Stem and branches distinctly angular-sulcate, at first pubescent, glabrescent. Petiole slender, 2–6 cm, pubescent and sparsely setose; leaf blade ovate-cordate, 4–11 × 3–7 cm, membranous, abaxially glaucous and setose, adaxially pale yellow pubescent, base cordate, margin dentate, apex acuminate; sinus 1–2 cm deep, 1–2.5 cm wide. Male panicle much branched, with many flowers; peduncle 7–16 cm, usually with a leaflike bract at base of branches; bract ovate, 1–2 cm; pedicels filiform, 1–2 cm, puberulent; calyx pubescent; tube campanulate; segments triangular-lanceolate, ca. 5 × 1.5–2 mm, 1-veined, apex shortly acuminate; corolla segments ovate, 12–15 × ca. 6 mm, 5-veined, apex acute; filaments ca. 2.5 mm; anthers narrowly ovoid, ca. 2.5 mm; rudimentary ovary semiglobose, ca. 1.5 mm in diam. Female flowers larger than male flowers, solitary or binary, sometimes 3 at apex of 15–25 mm peduncle; pedicels 4–6 cm; calyx segments lanceolate, ca. 6 × 1.5 mm, sparsely puberulent, 1-veined; corolla segments ovate, 30–35 × ca. 13 mm, puberulent, 5-veined, apex acuminate; ovary ellipsoid, 10–13 × 6–7 mm, densely yellow hispidulous, base subrounded, apex truncate; style ca. 4 mm, 3-fid; stigma reniform, 2–2.5 mm wide, 2-lobed. Fruiting peduncle 3–4 cm, puberulent; fruit 3–4 × 2–2.5 cm. Seeds gray-black, broadly ovate, ca. 5.5 × 4 mm, smooth. Fl. and fr. May–Oct.

• Forests, mountain slopes; 2400–3200 m. NW Yunnan.

**13. *Thladiantha oliveri*** Cogniaux ex Mottet, Rev. Hort. 75: 473. 1903.

鄂赤爬 è chì páo

*Thladiantha glabra* Cogniaux.

Herbs, climbing. Stem and branches slender, glabrous, angular-sulcate. Petiole 5–15 cm, subglabrous; leaf blade broadly ovate-cordate, 10–20 × 8–18 cm, membranous, abaxially sparsely setose, adaxially scabrous, basal lateral veins along base of sinus, margin dentate, apex acute or acuminate; sinus open, 1.5–3 cm deep. Tendrils glabrous, 2-fid. Male flowers numerous at apex of peduncle; peduncle over 20 cm; pedicels 5–10 mm, slender; calyx tube broadly campanulate; segments reflexed, linear, 7–9 mm, 1-veined, apex acuminate; corolla segments ovate-oblong, 18–22 × 7–9 mm, 5-veined, apex acuminate; filaments 2–3 mm, sparsely puberulent; anthers ovoid-

oblong, ca. 2 mm; rudimentary ovary globose. Female flowers solitary or 2–4 on a 10–15 mm peduncle; pedicels 2–4 cm, subglabrous; calyx segments reflexed, linear, 10–12 mm; corolla segments 2–4 × ca. 1.2 cm; staminodes linear, ca. 2 mm; ovary ovoid, 10–12 mm, base truncate, apex attenuate. Fruit ovoid, 3–4 × 2–2.5 cm, glabrous, smooth, base truncate, apex attenuate. Seeds ovate, compressed, 5–6 × 3–3.5 mm, ca. 1.5 mm thick, base obtuse, apex attenuate. Fl and fr. May–Oct.

• Thickets, roadsides, or wetlands in river valleys; 600–2100 m. Gansu, Guizhou, NW Hubei, S Shaanxi, E and S Sichuan.

**14. *Thladiantha montana*** Cogniaux in Engler, Pflanz. 66(IV. 275. I): 48. 1916.

山地赤爬 shan di chi bao

Herbs, climbing, glabrous. Stem and branches angular-sulcate. Petiole slender, 8–10 cm; leaf blade ovate-cordate or broadly ovate-cordate, 10–16 × 8–12 cm, submembranous or thickly papery, adaxially scabrous, base cordate, margin dentate, apex acuminate; sinus suborbicular. Tendrils 2-fid. Male flowers 5–10 in raceme or panicle, sometimes 3 or 4 inflorescences in same leaf axil; rachis slender, 6–10 cm; pedicels filiform, 5–10 mm; calyx tube cupular; segments triangular-lanceolate, ca. 4 × 1 mm, 1-veined, apex obtuse; corolla segments narrowly ovate, 8–12 × ca. 5 mm, 5-veined, apex acuminate; stamens inserted on tube; filaments 4 connected in pairs and 1 free, 2–3 mm, sparsely pubescent; anthers oblong, ca. 2 mm; rudimentary ovary subglobose, ca. 2 mm in diam. Female flowers solitary, or 2 or 3 on a 1–2.5 cm peduncle; pedicels slender, 1–4 cm, glabrous; calyx and corolla as in male flowers; staminodes 2.5–3 mm, glandular, with 3 membranous scales; scales oblong, 3–4 mm, apex obtuse; ovary narrowly oblong, 10–15 × 3–4 mm, smooth, subglabrous, base truncate, apex attenuate; style slender, 5–6 mm, 3-fid; stigma suborbicular, 4.5–5 mm wide, 2-lobed. Fruiting peduncle smooth; fruit oblong, 4–6 × 3–4 cm, both ends obtuse-rounded. Seeds narrowly ovate, 4–5 × 2–3 mm, ca. 1.5 mm thick, base rounded. Fl. Aug–Oct, fr. Oct–Nov.

• Forests, mountain slopes, valley sides; 800–3200 m. Yunnan.

**15. *Thladiantha maculata*** Cogniaux in Engler, Pflanz. 66(IV. 275. I): 49. 1916.

斑赤爬 ban chi bao

Herbs, climbing. Roots tuberous. Stem and branches slender, angular, puberulent or subglabrous. Petiole slender, 4–9 cm, puberulent; leaf blade broadly ovate-cordate, 7–13 × 5–10 cm, membranous, abaxially puberulent, adaxially setose, basal lateral veins along base of blade, base cordate, margin dentate or irregularly serrate, apex shortly acuminate; sinus open, semicircular. Tendrils filiform, simple, subglabrous or sparsely puberulent. Male flowers in a raceme of 3–6(–8) flowers; rachis slender, 3–4 cm, puberulent; pedicels filiform, 12–25 mm, smooth; calyx tube broadly campanulate; segments narrowly triangular-lanceolate, ca. 4 mm, pubescent, 3-veined, apex acuminate; corolla segments ovate, 12–15 × ca. 7 mm, 5-veined, apex acute or shortly acuminate; filaments ca. 3 mm, puberulent; anthers oblong, ca. 2 mm; rudimentary ovary semiglobose. Female flowers solitary; pedicels filiform, 25–35 mm, pubescent; calyx segments linear-subulate, 7–8 mm, puberulent; co-

rolla segments as in male flowers; ovary oblong or narrowly fusiform, ca. 10 mm, densely pale yellow pubescent, base truncate, apex acuminate; style 3-fid; stigma enlarged, reniform, 2-lobed. Fruiting peduncle 3–4 cm, puberulent, glabrescent; fruit orange-red, fusiform, 5–7 × 2–2.8 cm, smooth, subglabrous, base attenuate, apex acuminate, rostrate. Seeds narrowly ovate, 4–5 × ca. 2.5 mm, ca. 1.5 mm thick, smooth. Fl. May–Aug, fr. Oct.

• Valleys, forests; 500–1800 m. Henan, W Hubei.

**16. *Thladiantha punctata*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 119. 1911.

台湾赤爬 tai wan chi bao

Herbs, climbing; whole plant subglabrous. Stems and branches with obvious longitudinal striae. Petiole 3–12 cm, sometimes sparsely shortly setose in upper part; leaf blade abaxially pale green, adaxially dark green, narrowly ovate or narrowly ovate-lanceolate, 8–16(–20) × 6–10(–12) cm, membranous, glabrous, lateral veins at base not bordering sinus, margin dentate or sinuate-dentate, apex acuminate; basal sinus semicircular, 1–2 cm deep, 0.5–1.5 cm wide. Tendrils simple. Male flowers: inflorescences racemose or paniculate, rarely flowers solitary; peduncles slender, 4–8 cm; pedicels filiform, 0.5–1 cm; calyx tube broadly campanulate, 5–6 mm; segments lanceolate, ca. 8 mm, ca. 2 mm wide at base, 3–5-veined, acuminate at apex; stamens 4 in pairs and 1 free; filaments ca. 4 mm, base pubescent; anthers oblong, 2–3 mm; rudimentary ovary semiglobose, 2–3 mm in diam., with 3 membranous scales at base; scales yellow, ca. 3 mm. Female flowers usually solitary, rarely 2 at apex of peduncle; peduncles ca. 1 cm; pedicels 2–5 cm, glabrous; calyx and corolla as in male flowers but corolla usually larger than in male flowers; segments 2–2.5 × 1.1–1.2 cm, acuminate at apex; staminodes 4 in pairs and 1 free, ca. 1 mm; ovary ovoid, 1–1.3 × 0.4–0.6 cm, slightly pubescent, glabrescent, base rounded, apex attenuate; styles 2–3 mm, 3-fid; stigma reniform, expanded, 1.5–2 mm in diam. Fruiting pedicel 3–7 cm, glabrous; fruit ovoid or oblong, 3–5 × 2–3.5 cm, smooth, base obtuse-rounded, apex mucronate. Seeds brown, broadly ovoid, 5–6 × 3–4 mm, ca. 1 mm thick, base rounded, apex slightly narrowed. Fl. May–Jun, fr. Jul–Aug.

• Mountain slopes, forests, wet places; 600–900 m. Anhui, Fujian, Jiangxi, Taiwan, Zhejiang.

**17. *Thladiantha dentata*** Cogniaux in Engler, Pflanz. 66(IV. 275. I): 44. 1916.

齿叶赤爬 chi ye chi bao

Herbs, climbing, stout; whole plant almost glabrous. Stem and branches smooth, angular-sulcate. Petiole robust, 5–16 cm; leaf blade ovate-cordate or broadly ovate-cordate, 12–20 × 8–12 cm, abaxially glabrous, adaxially scabrous, basal lateral veins not along margin of blade, margin dentate, apex shortly acuminate; basal sinus open or sometimes closed. Tendrils 2-fid. Male flowers: inflorescence racemose or paniculate; rachis slender, 8–12 cm; pedicels filiform, 1–1.5 cm; calyx tube cupular; segments oblong-lanceolate, ca. 5 × 1.5 mm, 3-veined, apex obtuse; corolla segments ovate-oblong, ca. 12 × 5–6 mm, 3–5-veined, apex acute; stamens 4 in pairs and 1 free; filaments ca. 4 mm; anthers elliptic, ca. 2 mm; rudimentary ovary semi-

globose, ca. 2 mm in diam., with 3 scales at base; scales yellow, ca. 3 mm. Female flowers solitary, or 2–5 at apex of 1–1.5 cm peduncle; pedicels 3–6 cm, glabrous; calyx segments lanceolate, 4–5 × ca. 1.5 mm, 3-veined, apex acute; corolla segments ovate-oblong, ca. 15 × 7–8 mm, 5-veined, apex acute; stamens 5, 4 in pairs, other free, ca. 2.5 mm; ovary narrowly oblong, 13–16 × 4–6 mm, smooth, base slightly rounded or truncate, apex attenuate; style 2–3 mm, 3-fid; stigma reniform, 2-lobed. Fruiting peduncle 2–3.5 cm; fruit narrowly ellipsoid or narrowly ovoid, 3.5–6 × 2.5–3.5 cm, smooth, rounded at both ends, apex mucronate. Seeds yellow-white, narrowly ovate, ca. 6 × 3.5 mm, smooth, base rounded, apex slightly attenuate. Fl. summer, fr. Oct–Nov.

• Roadsides, valley sides, thickets, mountain slopes; 500–2000 m. Guizhou, W Hubei, Hunan, Sichuan.

**18. *Thladiantha capitata*** Cogniaux in Engler, Pflanzenr. 66(IV. 275. I): 51. 1916.

头花赤瓠 tou hua chi bao

Vines, climbing, herbaceous. Stem and branches angular-sulcate, subglabrous. Petiole slender, 7–9 cm, glabrous; leaf blade abaxially pale green, broadly ovate or broadly ovate-triangular, 10–15(–20) × 8–12(–15) cm, membranous, both surfaces glabrous, adaxially scabrous, basal lateral veins along margin of sinus, margin sparsely dentate, apex acuminate; basal sinus 1.5–3 cm deep, 2–3.5 cm wide. Tendrils glabrous, 2-fid. Male flowers at apex of peduncle in congested subumbel, umbelliform raceme, or pseudocapitulum, usually 8–15-flowered; peduncle (2–)5–11(–17) cm, glabrous, sometimes with a bract; bract ovate, 1.5–3 × 1–2.8 cm; pedicels filiform, 4–8 mm; calyx tube obconical, ca. 5 mm; segments linear-lanceolate, ca. 10 × 1.5 mm, abaxially puberulent, adaxially glabrous, 1-veined, apex acute; corolla segments narrowly ovate, 10–12 × 5–6 mm, adaxially pubescent, 5-veined, apex acute; filaments 4–4.5 mm, puberulent; anthers ovoid-oblong, 2–2.2 mm. Female flowers solitary, or 2 or 3 flowers at apex of peduncle; pedicels 3–5 cm when flowers solitary; calyx segments linear-lanceolate, 8–12 × 1.5–1.8 mm, 1-veined; corolla segments oblong, 15–28 × 1–12 mm, 5-veined, apex acuminate; ovary narrowly oblong, 15–18 mm, smooth, base subtruncate, apex attenuate; style slender, ca. 5 mm, 3-fid; stigma enlarged, reniform, ca. 2 mm wide. Fruit oblong, ca. 4 × 2.5 cm. Fl. and fr. May–Nov.

• Forest margins, thickets, mountain slopes; 1000–2700 m. W Sichuan.

**19. *Thladiantha davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 8: 243. 1885 [“*davidi*”].

川赤瓠 chuan chi bao

*Thladiantha legendrei* Gagnepain.

Herbs, climbing. Stems and branches glabrous, longitudinally angular-sulcate. Petiole 6–8 cm, glabrous; leaf blade ovate-cordate, 10–20 × 6–12 cm, membranous, abaxially glabrous, adaxially densely setose, basal lateral veins along margin of sinus, margin dentate, apex acuminate; basal sinus rounded, sometimes closed. Tendrils 2-fid. Male flowers 10–20 at apex of peduncle in congested subumbelliform raceme; peduncle 10–20 cm, sometimes with a leaflike bract; bract 15–20 × 10–13

mm; pedicels slender, 3–6 mm or sometimes to 15 mm; calyx tube obconical; segments lanceolate-oblong, 10–12 × ca. 2.5 mm, abaxially puberulent, distinctly 3-veined, apex obtuse or acute; corolla segments ovate, ca. 15 × 9 mm, adaxially glandular pubescent, 5-veined, apex obtuse, base of corolla with 2 yellow scales; filaments 3–4 mm, sparsely puberulent; anthers elliptic, ca. 1.5 mm. Female flowers solitary, or 2 or 3 at apex of peduncle; peduncle ca. 1(–3) cm; pedicels 1.5–3 cm; calyx tube obconical; segments lanceolate-oblong, 10–15 × ca. 3 mm, distinctly 3-veined, base slightly narrowed, apex obtuse; corolla segments oblong, 2.5–2.7 × 1–1.2 cm, 5-veined, apex acuminate; ovary narrowly oblong, ca. 15 × 5–6 mm, smooth, subglabrous, base truncate, apex slightly attenuate; style 3-fid; stigma 2-lobed, reniform. Fruit oblong, 3–4.5 × 2–2.4 cm, base and apex obtuse. Seeds yellow-white, ovate, compressed, 3–4 × ca. 2.5 mm, smooth. Fl. and fr. May–Nov.

• Roadsides, valleys, thickets; 1100–2100 m. Guizhou, W Sichuan.

**20. *Thladiantha palmatipartita*** A. M. Lu & C. Jeffrey, Novon 10: 398. 2000.

掌叶赤瓠 zhang ye chi bao

Herbs, scandent. Stems sulcate-angular, 1–3 m, puberulent or glabrescent. Tendrils simple, pubescent. Petiole 3–7 cm, puberulent; leaf blade broadly ovate or orbicular in outline, 8–17 × 9–16 cm, papery, abaxially densely pubescent, adaxially densely punctate, palmately deeply 5-lobed; lobes oblong, margin irregularly dentate, apex acute or acuminate. Flowers unisexual. Male flowers: panicle short, many flowered; peduncle 2.5–3 cm, robust, puberulent; pedicels slender, filiform, 5–12 mm; calyx tube cupular, pubescent; segments 5, broadly lanceolate, 1.2–1.5 × ca. 0.5 cm, 3-veined, apex acuminate; corolla campanulate; segments 5, narrowly oblong or lanceolate-oblong, 1.5–1.8 × ca. 0.6 cm, 3-veined, apex acuminate; filaments ca. 2 mm; anthers ca. 3 mm, 1-celled. Female flowers solitary or paired; calyx and corolla as in male flowers; ovary narrowly oblong, 1.5–2 cm, villous; style columnar, apically 3-fid; stigma dilated, 2-lobed. Fruit oblong, ca. 7.5 × 3.5 cm, smooth, base attenuate, apex rounded. Seeds numerous, horizontal, ca. 6 × 3 mm, smooth. Fl. Jun, fr. Sep.

• Open situations in scrub; ca. 3000 m. Yunnan.

**21. *Thladiantha pustulata*** (H. Léveillé) C. Jeffrey ex A. M. Lu & Zhi Y. Zhang, Bull. Bot. Res., Harbin 1(1–2): 74. 1981.

云南赤瓠 yun nan chi bao

Herbs, climbing. Roots tuberous. Stem and branches angular-sulcate, pubescent and villous. Petiole slender, 3–7 cm, pubescent and villous; leaf blade ovate-cordate, 6–11 × 4–9 cm, abaxially puberulent and setose on veins, adaxially densely setose, scabrous, basal lateral veins along margin of sinus, base cordate, margin irregularly serrate, apex shortly acuminate; sinus open, semicircular, 15–20 mm deep, 10–20 mm wide. Tendrils simple, pubescent. Male flowers 3–6 at apex of peduncle in sparse racemes; peduncle 2–5 cm, pubescent; pedicels filiform, 2–4 cm; calyx tube campanulate, ca. 4 × 4–5 mm; segments slightly reflexed, linear or linear-lanceolate, 4–12 mm, 3-veined, apex acuminate; corolla segments ovate-lanceolate, ca. 15 × 6 mm, apex acute; filaments filiform, 3–4 mm,

puberulent; anthers oblong, ca. 2 mm. Female flowers solitary, larger than male flowers; pedicel slender, pubescent; calyx segments linear, 8–9 mm; corolla segments ovate-lanceolate, ca. 20 × 7 mm, distinctly 3–5-veined, apex shortly acuminate; ovary ovoid, ca. 7 × 6 mm, pubescent and villous, apex shortly rostrate; style ca. 5 mm, 3-fid; stigma enlarged, 2-lobed, reniform. Fruiting pedicel 2–3 cm, sparsely pubescent; fruit ovoid, 2–3 cm in diam., verrucose. Seeds broadly ovate, 6–7 × ca. 3.5 mm, ca. 1.5 mm thick, punctate, base slightly obtuse. Fl. and fr. Apr–Nov.

• Valleys, thickets, forest margins; 1100–2600 m. Chongqing, Guizhou, Sichuan, Yunnan.

- 1a. Leaf blade lobed; calyx segments  
4–8 mm ..... 21a. var. *pustulata*  
1b. Leaf blade dentate, undivided;  
calyx segments 9–12 mm ..... 21b. var. *jingfushanensis*

### 21a. *Thladiantha pustulata* var. *pustulata*

云南赤爬(原变种) *yun nan chi bao* (*yuan bian zhong*)

*Melothria pustulata* H. Léveillé, Cat. Pl. Yun-Nan, 65. 1916; *M. mairei* H. Léveillé; *Thladiantha yunnanensis* Gagnepain.

Leaf blade lobed. Calyx segments 4–8 mm.

• Valleys, thickets; 1500–2600 m. Guizhou, Yunnan.

### 21b. *Thladiantha pustulata* var. *jingfushanensis* A. M. Lu & J. Q. Li, Acta Bot. Yunnan. 14: 134. 1992.

金佛山赤爬 *jin fo shan chi bao*

Leaf blade margin dentate, undivided. Calyx segments 9–12 mm.

• Wetlands in valleys, forest margins; 1100–1800 m. Chongqing (Jinfo Shan), Sichuan.

### 22. *Thladiantha henryi* Hemsley, J. Linn. Soc., Bot. 23: 316. 1887.

皱果赤爬 *zhou guo chi bao*

*Thladiantha dictyocarpa* Handel-Mazzetti; *T. henryi* var. *verrucosa* (Cogniaux) A. M. Lu & Zhi Y. Zhang; *T. verrucosa* Cogniaux.

Vines, climbing. Roots tuberous, enlarged. Stem and branches longitudinally angular-sulcate, sparsely puberulent, glabrescent. Petiole slender, 4–12 cm, puberulent; leaf blade broadly ovate-cordate, 8–16 × 7–14 cm, membranous, abaxially puberulent, adaxially white setose, basal lateral veins along

base of blade, base cordate, margin dentate, sometimes irregularly triangular-serrate, apex acute or shortly acuminate; sinus open, semicircular, 1–3 cm deep, 1–2 cm wide. Tendrils filiform, 2-fid or simple. Male flowers 6–10 at apex of peduncle in raceme or panicle; peduncle 5–12 cm, puberulent; pedicel 1–3 cm, puberulent; calyx tube campanulate, 5–7 mm in diam.; segments lanceolate, 10–12 mm, puberulent, 1-veined, apex acuminate; corolla segments oblong-elliptic or oblong, ca. 20 × 6 mm, 5-veined, apex shortly acuminate or acute; stamens 4 connected at base in pairs and 1 free; filaments 4–5 mm, puberulent, with 3 scales at base; anthers oblong, ca. 4 mm; rudimentary ovary absent. Female flowers solitary, or 2 or 3 to many in a raceme; pedicels 2–6 cm; calyx and corolla as in male flowers; staminodes 5, ca. 2.5 mm; ovary narrowly ovoid or ovoid-oblong, verrucose-rugose; style 3–4 mm; stigma enlarged, reniform, 2-lobed. Fruiting pedicel 6–9 cm; fruit ellipsoid, 5–10 × 3–4 cm, rugose, base attenuate at pedicel to 10 mm. Seeds narrowly ovate, 5–6 × 2–2.5 mm, smooth. Fl. and fr. Jun–Nov.

• Thickets, forests, roadsides; 1100–2000 m. W Hubei, W Hunan, S Shaanxi, E Sichuan.

### 23. *Thladiantha longifolia* Cogniaux ex Oliver, Hooker's Icon. Pl. 23: t. 2222. 1892.

长叶赤爬 *chang ye chi bao*

Vines, climbing. Stems and branches slender, angular, glabrous or sparsely pubescent. Petiole 2–7 cm, glabrous or shortly pubescent; leaf blade ovate-lanceolate or narrowly ovate-triangular, 8–18 × 4–8 cm, membranous, abaxially subglabrous, adaxially white setose, basal lateral veins not along base of blade, base cordate, margin dentate, apex acute or shortly acuminate; sinus open, semicircular, 1.5–2 cm deep, 1.5–2.5 cm wide. Tendril filiform, simple, glabrous. Male flowers 3–9 (–12) at apex of peduncle in a raceme; peduncle slender, 2–2.5 cm; pedicels 1–2 cm, sparsely pubescent, glabrescent; calyx tube shortly campanulate, ca. 0.6 cm wide at apex, pubescent on veins; segments triangular, 7–8 mm, 1-veined; corolla segments oblong or elliptic, 1.5–2 × 0.8–1 cm, 5-veined, apex slightly obtuse; stamens 4 connected in pairs at base and 1 free; filaments ca. 3 mm; anthers oblong, 2.5–3 mm. Female flowers solitary, or 2 or 3 flowers on short peduncle; pedicels 2–4 cm; calyx and corolla as in male flowers; staminodes 5, subulate, ca. 1.5 mm, 4 in pairs, 1 free; ovary ovoid, acuminate at both apex and base, base emarginate and with lobules, rugose; style 3-fid; stigma enlarged, reniform. Fruit broadly ovoid, ca. 4 cm, verrucose, base slightly emarginate. Seeds ovate, 6–8 × 3–4.5 mm, 1–1.5 mm thick, apex obtuse. Fl. Apr–Jul, fr. Aug–Oct.

• Mountain slopes, forests, valleys, thickets; 1000–2200 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan.

## 12. MOMORDICA Linnaeus, Sp. Pl. 2: 1009. 1753.

苦瓜属 *ku gua shu*

Lu Anmin (路安民 *Lu An-ming*); Charles Jeffrey

Herbs, annual or perennial, scandent or creeping. Tendrils unbranched or 2-fid. Petiole usually glandular; leaf blade suborbicular or ovate-cordate, palmately 3–7-lobed, rarely undivided, entire or dentate. Plants dioecious or monoecious. Male flowers solitary or in a raceme; pedicel often with a large bract; bract orbicular-reniform; calyx tube short, campanulate or cupular; segments ovate, lanceolate, or oblong-lanceolate; corolla yellow or white, rotate or broadly campanulate, 5-lobed; segments obovate, oblong, or

ovate-oblong; stamens (2 or)3(or 5); filaments short, free; anthers coherent at first, one 1-celled, other 2-celled; anther cells reflexed, straight, or curved; connective not produced; rudimentary ovary glandular or absent. Female flowers: ovary oblong or fusiform; style elongate; stigmas 3, undivided or 2-lobed; ovules numerous, horizontal. Fruit ovoid, oblong, elliptic, or fusiform, undivided or 3-valved, usually verrucose or spinescent. Seeds few or numerous, ovate or oblong, smooth or reticulate.

Forty-five species: most in tropical Africa, some cultivated in tropical regions; three species (one introduced) in China.

- 1a. Plants monoecious; bract on middle of male pedicel; leaf blade 5–7-partite; stamens 3; fruit fusiform or cylindric, verrucose ..... 1. *M. charantia*  
 1b. Plants dioecious; bract at apex of male pedicel.  
 2a. Petiole eglandular; anther cells conduplicate; fruit smaller than 5 cm, ovoid or ovoid-oblong, verrucose or longitudinally sulcate ..... 2. *M. subangulata*  
 2b. Petiole with 2–5 median glands; anther cells reflexed; fruit larger than 5 cm, ovoid, densely spinescent ..... 3. *M. cochinchinensis*

**1. *Momordica charantia* Linnaeus, Sp. Pl. 2: 1009. 1753.**

苦瓜 ku gua

*Cucumis argyi* H. Léveillé; *Momordica chinensis* Sprengel; *M. indica* Linnaeus; *M. sinensis* Sprengel; *Sicyos fauriei* H. Léveillé.

Plants annual, scandent, many branched; stem and branches pubescent. Tendrils to 20 cm, puberulent, simple. Petiole slender, 4–6 cm, white pubescent at first, glabrescent; leaf blade ovate-reniform or suborbicular, 4–12 × 4–12 cm, membranous, puberulent on veins, 5–7-partite; lobes ovate-oblong, veins palmate, margin crenate or irregularly lobed, apex obtuse or acute; sinus semicircular. Plants monoecious. Male flowers solitary in axils of leaves; pedicel slender, 3–7 cm, puberulent, with a median bract; bract reniform or orbicular, 5–15 mm, entire, both surfaces puberulent; calyx segments ovate-lanceolate, 4–6 × 2–3 mm, white pubescent, apex acute; corolla yellow; segments obovate, 15–20 × 8–12 mm, pubescent, obtuse or retuse; stamens 3, free; anther cells conduplicate. Female flowers solitary; pedicel 10–12 cm, with a bract at base; ovary fusiform, densely verrucose; stigmas expanded, 2-lobed. Fruit orange when mature, fusiform or cylindric, 10–20 cm, verrucose, 3-valved from apex. Seeds numerous, oblong, 15–20 × 10–15 mm. Fl. and fr. May–Oct.

Commonly cultivated in China [pantropical, also cultivated in temperate and tropical regions].

The fruit is used as a vegetable; all parts of the plant are used medicinally.

**2. *Momordica subangulata* Blume, Bijdr. 928. 1826.**

凹萼木鳖 ao e mu bie

Plants scandent. Stem and branches sulcate-angular, glabrous or puberulent at nodes. Petiole slender, 3–8 cm, glabrous, eglandular; leaf blade ovate-cordate or broadly ovate-cordate, 6–13 × 4–11 cm, membranous, both surfaces puberulent at first, glabrescent, base cordate, sinus subquadrate, margin dentate, usually undivided or sometimes 3–5-lobed, apex acute or acuminate. Tendrils filiform, simple. Plants dioecious. Male flowers solitary in leaf axil; pedicel slender, 5–8(–14) cm, puberulent, apex bracteate; bract orbicular-reniform, 10–30 × 10–40 mm, both surfaces puberulent, glabrescent, base retuse, apex rounded to subacute; calyx segments ovate-oblong or lanceo-

late, 7–9 × 4–5 mm, pubescent, apex obtuse, retuse, broadly rounded, or acute; corolla yellow; segments oblong or obovate, 20–30 × 15–25 mm, 5-veined, apex obtuse-rounded; stamens 3 or 5; filaments filiform, ca. 3 mm, glabrous; anthers 2.5–3 mm; anther cells conduplicate. Female flowers solitary; pedicel filiform, 5–10 cm, usually with a minute bract at base; calyx and corolla as in male flowers; ovary ovoid-oblong or fusiform, 8–12 × 2–4 mm, ridged or verrucose, base attenuate. Fruiting pedicel slender, glabrous; fruit ovoid or ovoid-oblong, 3–7 × 2.5–4 cm, longitudinally sulcate or with rows of tubercles, both ends attenuate. Seeds gray or yellow-brown, oblong, ovoid, or globose, 7–14 × 5–8 mm, both surfaces slightly sculptured. Fl. Jun–Aug, fr. Aug–Nov.

Mountain slopes, thickets, roadsides; 800–2500 m. Guangdong, Guangxi, Guizhou, Yunnan [Bangladesh, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

- 1a. Plant slender; bract of male flower 10–20 × 10–20 mm; fruit 3–5 cm with irregularly undulate longitudinal ribs, glabrous or almost so ..... 2a. subsp. *subangulata*  
 1b. Plant more robust; bract of male flower 20–30 × 20–40 mm; fruit 5–7 cm, with longitudinal rows of flattened tubercles or undulate ridges, hispid-verrucose ..... 2b. subsp. *renigera*

**2a. *Momordica subangulata* subsp. *subangulata***

凹萼木鳖(原亚种) ao e mu bie (yuan ya zhong)

*Momordica eberhardtii* Gagnepain; *M. laotica* Gagnepain.

Stems slender. Leaf blade puberulent at first on both surfaces, glabrescent. Bract of male flower 10–20 × 10–20 mm. Calyx segments ovate-oblong, pubescent, apex obtuse, retuse. Fruit ovoid or ovoid-oblong, 3–5 cm, longitudinally sulcate, not verrucose, glabrous or almost so. Fl. Jun–Aug, fr. Aug–Oct.

Mountain slopes, roadsides; 800–1500 m. Guangdong, Guangxi, Guizhou, Yunnan [Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**2b. *Momordica subangulata* subsp. *renigera* (Wallich ex G. Don) W. J. de Wilde, Bot. Zhum. 87: 147. 2002.**

云南木鳖 yun nan mu bie

*Momordica renigera* Wallich ex G. Don, Gen. Hist. 3: 36. 1834.

Stem robust. Leaf blade abaxially puberulent, yellow-brown pubescent on veins or glabrescent. Bract of male flower 20–30 × 20–40 mm. Calyx segments lanceolate, apex acute. Fruit ovoid or broadly ovoid, 5–7 cm, with longitudinal rows of flattened tubercles or undulate ridges, verrucose. Fl. Jun–Aug, fr. Aug–Nov.

Roadsides on mountain slopes, thickets; 1400–2500 m. Yunnan [Bangladesh, India, Myanmar, Thailand].

The Chinese record of *Momordica dioica* Willdenow (FRPS 73(1): 192. 1986) is based on a misidentification of *M. subangulata* subsp. *renigera*.

**3. *Momordica cochinchinensis*** (Loureiro) Sprengel, Syst. Veg. 3: 14. 1826.

木鳖子 mu bie zi

*Muricia cochinchinensis* Loureiro, Fl. Cochinch. 2: 596. 1790; *Momordica macrophylla* Gage; *M. meloniflora* Handel-Mazzetti; *M. mixta* Roxburgh.

Climbers, strong, to 15 m. Root tuberous. Stem and branches glabrous or puberulent, sometimes tomentose at nodes. Tendrils robust, simple. Petiole robust, 5–10 cm, slightly yellow-brown pubescent or glabrescent, 2–4-glandular at base or middle; leaf blade cordate or broadly ovate-orbicular, 10–20 × 10–20 cm, 3–5-lobed; median lobe obovate or oblong-lanceolate, 6–10(–15) × 3–6(–9) cm, margin undulate-dentate, apex acute or acuminate; lateral lobes ovate or oblong-lanceolate, 3–7(–11) × 2–4(–7) cm, base cordate. Plants dioecious. Male flowers solitary or in a short raceme; pedicels robust, 3–5 cm, or 6–12 cm when solitary, bracteate at apex; bract orbicular-reniform, 3–5 × 5–8 cm, entire, retuse at apex; calyx tube funnel-form; segments broadly lanceolate or oblong, 12–20 × 6–8 mm, apex acute or acuminate; corolla yellow; segments ovate-oblong, 5–6 × 2–3 cm, yellow glandular at base, apex acute or acuminate; stamens 3; anther cells reflexed. Female flower solitary; pedicel 5–10 cm, bracteate at middle; bract ca. 2 mm; calyx and corolla as in male flowers; ovary ovoid-oblong, ca. 1 cm, densely spinescent. Fruit red, ovoid, 12–15 cm in diam., fleshy, densely spinescent, apex rostellate. Seeds numerous, ash gray, ovoid or square, 26–28 × 18–20 mm, 5–6 mm thick, both surfaces sculptured, margin undulate-sublobulate. Fl. Jun–Aug, fr. Aug–Oct.

Forest margins and roadsides on mountain slopes; 400–1100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, India, Malaysia, Myanmar].

The seeds, roots, and leaves are used medicinally.

### 13. **ECBALLIUM** A. Richard in Bory, Dict. Class. Hist. Nat. 6: 19. 1824, nom. cons.

喷瓜属 pen gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Elaterium* Miller.

Herbs, creeping. Roots perennial. Stem and branches setose. Tendrils absent. Leaf blade cordate. Plants monoecious or dioecious. Male inflorescence a raceme; calyx tube shortly campanulate; segments 5, linear-lanceolate; corolla yellow, broadly campanulate or almost rotate; segments ovate-oblong, apex acute; stamens 3, linear; filaments short, free; anthers: one 1-celled, two 2-celled; anther cells reflexed; connective broad, not produced; pistillode absent. Female flowers solitary; calyx and corolla as in male flowers; staminodes 3, ligulate; ovary oblong, hispid; ovules numerous, horizontal; style short; stigmas 3, 2-lobed. Fruit oblong, hispid, scabrous, watery inside, when mature separating from peduncle and contracting at base, dispersing seeds by elastic contraction (squirting seeds). Seeds numerous, brown or nearly black, oblong, compressed, narrowly marginate.

One species: Mediterranean region to SW Asia (east to Iran); introduced elsewhere, including China.

**1. *Ecballium elaterium*** (Linnaeus) A. Richard in Bory, Dict. Class. Hist. Nat. 6: 19. 1824.

喷瓜 pen gua

*Momordica elaterium* Linnaeus, Sp. Pl. 2: 1010. 1753.

Roots elongate, robust. Stem ca. 1.5 m, scabrous. Petiole somewhat robust, 5–15 cm, densely setose; leaf blade ovate-oblong or hastate, 8–20 × 6–15 cm, scabrous, abaxially white pubescent, adaxially white setose, margin sinuous or slightly divided, apex slightly obtuse; sinus semicircular, sometimes truncate. Male flowers in a raceme; peduncle densely yellow-brown pubescent and setose; pedicels filiform, 1–3 cm; calyx segments lanceolate, 5–6 × 1.2–2 mm, densely pubescent and hispid; corolla yellow, ca. 3 cm in diam.; segments ovate-oblong; filaments ca. 3 mm, base villous. Fruit oblong or ovoid-oblong, 4–5 × 1.5–2.5 cm, scabrous, yellow-brown hispid, both ends obtuse. Seeds ca. 4 mm.

Dry mountain slopes, grasslands. Xinjiang [native to SW Asia and Mediterranean region].

### 14. **SCHIZOPEPON** Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 110. 1859.

裂瓜属 lie gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, scandent. Stem and branches slender. Tendrils 2-fid. Leaves long petiolate; leaf blade ovate-cordate or broadly ovate-

cordate, rarely hastate, margin irregularly dentate, usually 5–7-lobed. Plants dioecious or monoecious; flowers small, unisexual or rarely bisexual. Male flowers usually in a raceme; female flowers solitary or few in a raceme; calyx tube cupular or campanulate; segments 5, lanceolate or subulate; corolla segments 5, white, ovate; stamens 3, free or connate; filaments short; anthers: one 1-celled, two 2-celled; anther cells erect; connective produced or not; ovary ovoid or conical, 3-locular or irregularly 3-locular, 1 ovule in each locule; ovule pendulous; style short, 3-fid or sometimes 5-fid; stigma slightly expanded, 2-lobed. Fruit small, ovoid or conical, smooth or punctate, apex acute or long acuminate, 3-valved or indehiscent, 1–3-seeded. Seeds pendulous, ovate, compressed, margin irregularly dentate.

Eight species: E Asia to the Himalaya; eight species (five endemic) in China.

- 1a. Fruit conical, apex acuminate, rostrate; connective produced, subulate, rarely not produced; ovary irregularly 3-locular, ovule pendulous from middle of locule.
  - 2a. Connective not produced ..... 6. *S. bomiensis*
  - 2b. Connective produced, appendage subulate.
    - 3a. Leaf blade ovate-cordate, usually unlobed, papery ..... 7. *S. bicirrhosus*
    - 3b. Leaf blade hastate, 5-lobed, membranous ..... 8. *S. xizangensis*
- 1b. Fruit ovoid or ovate, apex acute; connective not produced; ovary 3-locular, ovule pendulous from apex of locule.
  - 4a. Flowers bisexual; stamens free ..... 1. *S. bryoniifolius*
  - 4b. Flowers unisexual; plant monoecious or dioecious; stamens connate.
    - 5a. Plants monoecious; male and female flowers in same inflorescence, with many male flowers above and 1 or 2 female flowers below; filaments connate, anthers free; ovary and fruit smooth ..... 2. *S. monoicus*
    - 5b. Plants dioecious.
      - 6a. Filaments and anthers both connate; flowers larger; calyx segments ca. 3 mm; corolla segments ca. 9 mm ..... 5. *S. macranthus*
      - 6b. Filaments connate, anthers free or connate at base.
        - 7a. Pedicels 2–5 mm; flowers small; calyx segments ca. 1 mm; corolla segments 2–3.5 mm; fruit punctate ..... 3. *S. dioicus*
        - 7b. Pedicels 5–10 mm; flowers slightly larger; calyx segments ca. 2 mm; corolla segments 3–5 mm .... 4. *S. longipes*

**1. *Schizopepon bryoniifolius*** Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 111. 1859.

裂瓜 lie gua

*Schizopepon bryoniifolius* var. *japonicus* Cogniaux; *S. bryoniifolius* var. *paniculatus* Komarov.

Plants annual. Stem 2–3 m. Branches slender, subglabrous or slightly puberulent. Tendrils filiform, glabrous. Petiole slender, 4–13 cm, sometimes puberulent; leaf blade ovate or broadly ovate-cordate, 6–10 × 5–9 cm, membranous, puberulent, palmately 5–7-veined, 3–7-angular or -lobed, margin irregularly dentate, apex acuminate; sinus semicircular. Flowers very small, bisexual, solitary or in 3–5-flowered racemes; peduncle filiform, 1–1.5 cm, puberulent; calyx segments lanceolate, ca. 1.5 mm, 1-veined, entire; corolla rotate; segments white, ca. 2 × 0.8–1 mm, 3-veined; stamens inserted at base of calyx tube, free, ca. 1 mm, glabrous; filaments linear; anthers ca. 0.5 mm; anther cells erect, connective not produced; ovary ovoid, 3-locular; style short; stigmas 3. Fruit broadly ovoid, 10–15 mm, apex acute, 3-valved, 1–3-seeded. Seeds ovate, ca. 9 × 5.5 mm, compressed, margin irregularly dentate, apex truncate. Fl. and fr. Jun–Nov.

River valleys, forests; 500–1500 m. Hebei, Heilongjiang, Jilin, Liaoning [E Russia].

**2. *Schizopepon monoicus*** A. M. Lu & Zhi Y. Zhang, Acta Phytotax. Sin. 23: 112. 1985.

峨眉裂瓜 e mei lie gua

Plants slender. Stem and branches glabrous, angular-sul-

cate. Tendrils filiform. Petiole slender, 3–4 cm, glabrous; leaf blade ovate-cordate, 5–7 × 3–4 cm, membranous, palmately 5–7-lobed; median lobe triangular, apex long acuminate; lateral lobes acute, margin irregularly dentate, palmately 7-veined, both surfaces setose at first; sinus semicircular. Plants monoecious. Male and female flowers in same racemose inflorescence; peduncle slender, 2–4 cm, glabrous. Male flowers: pedicel filiform, 1–2 mm; calyx tube broadly campanulate; segments subulate, ca. 1.5 mm; corolla segments ovate, ca. 5 mm, 1-veined; filaments connate, ca. 0.3 mm; anthers free, ca. 0.4 mm; anther cells erect. Female flowers: pedicel ca. 2 mm; calyx segments ovate, ca. 0.8 mm; ovary ovoid, ca. 0.8 mm, glabrous; style 3-fid; stigma expanded. Fruiting pedicel ca. 1 cm, slender; fruit subglobose, 3-locular with 1 seed in each locule. Fl. and fr. May–Nov.

• Roadsides on mountain slopes. Sichuan (Emei Shan).

**3. *Schizopepon dioicus*** Cogniaux ex Oliver, Hooker's Icon. Pl. 23: t. 2224. 1892.

湖北裂瓜 hu bei lie gua

Plants annual. Stem and branches slender. Tendrils filiform. Petiole 3.5–7.5 cm; leaf blade broadly ovate-cordate, 5–9 × 3–7 cm, membranous, usually 2- or 3-angled on each side, both surfaces glabrous, palmately 5–7-veined, margin dentate, apex acuminate; sinus semicircular. Plants dioecious. Male flowers in a raceme; peduncle filiform, 5–10 cm; pedicels filiform, 2–3 mm; calyx segments linear-subulate or narrowly lanceolate, 1–1.2 × 0.5–0.8 mm; corolla white, rotate; segments lanceolate or oblong-lanceolate, 2–3.5 × 1.5–2 mm, 1-veined;

filaments connate, ca. 0.8 mm; anthers free or united only at base, ca. 0.5 mm; connective not produced. Female flowers solitary or a few aggregated at apex of a short peduncle; ovary ovoid, glabrous or pubescent, apex shortly acuminate, 3-locular, 1 ovule in each locule; styles 3-fid; stigma slightly expanded. Fruiting pedicel filiform, 1–2 cm; fruit pale brown to black-brown when mature, broadly ovoid, ca. 1.2 cm × 8 mm, glabrous or pubescent, smooth or verrucose, base rounded, apex acute, 3-valved from apex, usually with 2 seeds. Seeds pale brown when mature, ovoid, ca. 8 × 5 mm, base slightly wider, ca. 2 mm thick, irregularly dentate, contracted above, apex truncate.

• Grasslands, thickets, and roadsides on mountain slopes; 1000–2400 m. Guizhou, W Hubei, NW Hunan, S Shaanxi, E and W Sichuan.

1a. Ovary and fruit densely pubescent ..... 3c. var. *trichogynus*

1b. Ovary and fruit glabrous.

2a. Leaf blade ovate-cordate, apex  
acuminate ..... 3a. var. *dioicus*

2b. Leaf blade narrowly ovate-cordate,  
apex caudate-acuminate ..... 3b. var. *wilsonii*

### 3a. *Schizopepon dioicus* var. *dioicus*

湖北裂瓜(原变种) hu bei lie gua (yuan bian zhong)

Leaf blade ovate-cordate, apex acuminate. Ovary and fruit glabrous; fruit pale brown when mature, verrucose.

• Grasslands and roadsides on mountain slopes; 1000–2400 m. W Hubei, NW Hunan, S Shaanxi, E Sichuan.

3b. *Schizopepon dioicus* var. *wilsonii* (Gagnepain) A. M. Lu & Zhi Y. Zhang, Acta Phytotax. Sin. 23: 113. 1985.

四川裂瓜 si chuan lie gua

*Schizopepon wilsonii* Gagnepain, Bull. Mus. Natl. Hist. Nat. 24: 378. 1918.

Leaf blade narrowly ovate-cordate, 3–5 lobed, apex caudate-acuminate. Ovary and fruit glabrous; fruit black-brown, smooth.

• Roadsides and thickets on mountain slopes; 1500–2400 m. NW Guizhou, E and W Sichuan.

3c. *Schizopepon dioicus* var. *trichogynus* Handel-Mazzetti, Oesterr. Bot. Z. 85: 219. 1936.

毛蕊裂瓜 mao rui lie gua

Ovary and fruit densely pubescent.

• Guizhou, W Hubei.

4. *Schizopepon longipes* Gagnepain, Bull. Mus. Natl. Hist. Nat. 24: 378. 1918.

长柄裂瓜 chang bing lie gua

Stem and branches slender. Tendrils filiform. Petiole 4–7 cm, slightly puberulent; leaf blade ovate, 4–6 × 3–5 cm, irregularly 3–5-lobed; median lobe larger, triangular, apex acuminate; lateral lobes smaller, both surfaces puberulent, palmately 5-veined, margin dentate; sinus semicircular. Male flowers

many in a raceme, flowers on upper part of peduncle; rachis filiform, 10–15 cm; pedicels linear, 0.5–1 cm, glabrous or puberulent; calyx segments lanceolate, 1.8–2 mm; corolla segments narrowly ovate, 3–5 × 1.5–2.5 mm, 1-veined, apex acuminate; filaments united, ca. 0.5 mm; anthers free, 0.8–1 mm; connective not produced; cells erect, linear. Fl. Jul–Oct.

Valleys, roadsides; 2000–3000 m. W Sichuan, NW Yunnan [Bhutan, NE India (Darjeeling)].

This species was recorded from Bhutan and India in Fl. Bhutan (2(1): 260. 1991).

5. *Schizopepon macranthus* Handel-Mazzetti, Symb. Sin. 7: 1064. 1936.

大花裂瓜 da hua lie gua

Plants annual. Stem and branches slender, sulcate-angular. Tendrils filiform, glabrous. Petiole slender, 6–9 cm, subglabrous; leaf blade broadly ovate-cordate, 8–10 × 6–8 cm, membranous, both surfaces puberulent, palmately 7-veined, margin irregularly dentate, apex caudate-acuminate; sinus subquadrate, 1–1.5 cm deep, 1.5–2 cm wide. Plants dioecious. Male flowers in a raceme; peduncle slender, 6–8 cm; pedicels filiform, 2–5 cm; calyx segments lanceolate-subulate, ca. 3 mm; corolla pale yellow, rotate, glandular hairy at base; segments broadly lanceolate, ca. 9 mm, 1-veined, apex acuminate; filaments free, ca. 0.8 mm, glabrous; anthers connate at base, elliptic; cells erect, puberulent; rudimentary ovary absent. Fl. Jul–Sep.

• Roadsides on mountain slopes; 2300–3000 m. W Sichuan, NW Yunnan.

6. *Schizopepon bomiensis* A. M. Lu & Zhi Y. Zhang, Acta Phytotax. Sin. 18: 385. 1980.

喙裂瓜 hui lie gua

Stems and branches slender, sulcate-angular, puberulent at first or glabrescent. Tendrils slender. Petiole slender, 1–2(–3) cm, subglabrous; leaf blade ovate-hastate or ovate-triangular, 2.5–5 × 2–3.5 cm, membranous, usually 5-lobed, lobe margin dentate, both surfaces puberulent, apex shortly acuminate; sinus suborbicular, 6–8 mm deep. Plants dioecious. Male flowers in a raceme; peduncle pale yellow-green, 2.5–7 cm; pedicels ca. 3 mm; calyx tube cupular; segments linear, ca. 1.2 mm; corolla campanulate; segments narrowly ovate, ca. 2 mm; filaments nearly free, ca. 0.4 mm; anthers connate, one 1-celled, other 2-celled, ca. 0.4 mm. Female flowers solitary in leaf axil; pedicels filiform, 5–10 mm, glabrous; calyx segments subulate, 1.2–1.5 mm, apex acuminate; corolla yellow; segments narrowly ovate, ca. 2 × 1 mm, apex acuminate; staminodes glandular; ovary conical, ca. 3 mm, puberulent, base rounded, apex elongate; style filiform. Fruiting pedicel slender, ca. 1 cm; fruit ca. 1.5 × 0.5 cm, glabrous, base rounded, apex rostrate. Fl. and fr. Jul–Oct.

• Forests or thickets on mountain slopes; 2200–2600 m. E and SE Xizang.

7. *Schizopepon bicirrhosus* (C. B. Clarke) C. Jeffrey, Kew Bull. 34: 802. 1980.

新裂瓜 xin lie gua

*Melothria bicirrhosa* C. B. Clarke in J. D. Hooker, Fl. Brit. India 2: 627. 1879; *Schizopepon wardii* Chakravarty.

Branches ± slender, sulcate-angular, glabrous. Tendrils usually 2-fid, glabrous. Petiole slender, 2–4 cm, glabrous or puberulent; leaf blade 3–10 × 2–7 cm, membranous, both surfaces slightly pubescent, margin undulate or 1- or 2-angled on each side, irregularly dentate, apex caudate-acuminate; sinus semicircular. Plants dioecious. Male flowers 7–16 in a raceme; peduncle 3–7 cm; pedicels slender, 3–10 mm; calyx tube campanulate, 4–5 mm; segments subulate, ca. 2 mm, glandular pubescent; corolla segments lanceolate, ca. 2.5 mm; stamens connate, inserted on base of corolla tube; filaments ca. 1 mm, glabrous; anthers puberulent; anther cells erect, ca. 1.5 mm; connective produced; appendage ca. 1.5 mm. Female flowers solitary; pedicels slender, 2–4 cm; calyx segments subulate, ca. 3 mm; corolla segments lanceolate, 5–6 mm, 3-veined; ovary conical, ca. 8 × 3 mm, pubescent, base obtuse-rounded, apex attenuate; ovules 3, solitary in each locule, pendulous; styles ca. 2 mm, 3-fid, apex expanded. Fruiting pedicel slender, 8–10 cm,

glabrous; fruit narrowly conical, ca. 3 cm × 6 mm, white pubescent, apex attenuate, rostrate.

Thickets; 2700–2800 m. S Xizang [Bhutan, N India, Myanmar].

**8. *Schizopepon xizangensis*** A. M. Lu & Zhi Y. Zhang, Acta Phytotax. Sin. 23: 116. 1985.

西藏裂瓜 xi zang lie gua

Plants glabrous. Branches slender, filiform. Tendrils filiform. Petiole slender, 2–3 cm; leaf blade hastate, 4–6.5 × 3–4 cm, thin, membranous, 5-lobed, lobe margin dentate, apex caudate-acuminate; sinus subquadrate. Plants dioecious. Male flowers solitary, or 2–7 in a short raceme; calyx tube cupular, ca. 3 mm in diam.; segments subulate, ca. 2 mm; corolla yellow; segments triangular-ovate, ca. 6 mm; stamens connate; filaments short, ca. 1 mm; anthers ovoid, one 1-celled, other 2-celled; connective produced; appendage subulate, ca. 1 mm. Female flowers and fruit unknown.

● Herbage on mountain slopes; ca. 2100 m. SE Xizang (Mêdog).

## 15. *BISWAREA* Cogniaux, Bull. Soc. Roy. Bot. Belgique 21(2): 16. 1882.

三裂瓜属 san lie gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Warea* C. B. Clarke, J. Linn. Soc., Bot. 15: 127. 1876, non Nuttall (1834).

Herbs, scandent. Tendrils 2-fid. Leaf blade 5–7-lobed. Plants dioecious; flowers yellow. Male flowers mostly racemose; calyx tube narrowly tubular below, dilated above and broadly campanulate, 5-partite; segments linear; corolla broadly campanulate, 5-partite; segments ovate, entire; stamens 3, inserted on calyx tube; filaments free; anthers connate, one 1-celled, others 2-celled; anther cells linear, triplicate; rudimentary ovary subulate. Female flowers: calyx and corolla as in male flowers; ovary oblong, with 3 placentas; styles filiform, elongate; stigmas 3, enlarged, ovules numerous, horizontal. Fruit oblong, 3-angled, 6-ribbed, fibrous, 3-valved nearly to base. Seeds compressed, smooth.

One species: SW China, NE India, Myanmar, Nepal.

**1. *Biswarea tonglensis*** (C. B. Clarke) Cogniaux, Bull. Soc. Roy. Bot. Belgique 21(2): 16. 1882.

三裂瓜 san lie gua

*Warea tonglensis* C. B. Clarke, J. Linn. Soc., Bot. 15: 129. 1876.

Stem and branches slender, puberulent or subglabrous. Petiole robust, 6–10 cm; leaf blade broadly ovate-cordate or suborbicular-cordate, 14–17 × 12–16 cm; lobes triangular-ovate, margin dentate, apex acute or acuminate. Male inflorescence usually 5–8-flowered; peduncle 8–10 cm; bracts 2–3 mm;

calyx tube ca. 3 cm, base ca. 3 mm in diam., apex ca. 15 mm in diam.; segments narrowly lanceolate, 6–7(–20) mm, puberulent, apex subulate; corolla segments ovate, 22–30 × ca. 11 mm; apex acute; filaments filiform, 4–5 mm, glabrous; anthers connected, ca. 7 mm; rudimentary ovary subulate, 8–9 mm. Female flower solitary; pedicel 25–30 mm; ovary densely tomentose, ca. 12 mm; calyx tube ca. 4.2 cm, apex ca. 11 mm in diam.; segments and corolla segments as in male flowers. Fruit 10–12 × 4–4.5 cm. Seeds numerous, pale brown, elliptic, 10–15 × 7–10 mm.

NW Yunnan [NE India (Darjeeling, Sikkim), Myanmar, Nepal].

## 16. *HERPETOSPERMUM* Wallich ex J. D. Hooker in Bentham & J. D. Hooker, Gen. Pl. 1: 834. 1867.

波棱瓜属 bo leng gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, climbing, annual. Roots spreading. Tendrils simple. Plants dioecious. Male flowers in raceme or rarely solitary; calyx tube elongate, funnel-shaped; segments subulate; corolla broadly campanulate, 5-partite; segments entire; stamens 3, included in calyx tube; filaments free; anthers connate, one 1-celled, two 2-celled; anther cells linear, conduplicate; rudimentary ovary subulate. Female flowers solitary; calyx and corolla as in male flowers; staminodes 3, subulate or absent; ovary oblong, 3-locular, 4–6 ovules

in each locule, pendulous; filaments filiform, elongate; stigmas 3, dilated. Fruit broadly oblong, 3-valved from apex nearly to base. Seeds pendulous, oblong or obovate, compressed, smooth, margins obtuse.

One species: Bhutan, SW China, India, Nepal.

**1. *Herpetospermum pedunculatum*** (Seringe) C. B. Clarke, J. Linn. Soc., Bot. 15: 115. 1876.

波棱瓜 *bo leng gua*

*Bryonia pedunculata* Seringe in Candolle, Prodr. 3: 306. 1828; *Herpetospermum caudigerum* Wallich ex Chakravarty; *H. grandiflorum* Cogniaux.

Stem and branches slender, puberulent at first. Petiole 4–8(–10) cm; leaf blade ovate-cordate, 6–12 × 4–9 cm, membranous, both surfaces scabrous, yellow-brown pubescent at first, base cordate, margin dentate, apex caudate-acuminate. Male

flowers usually in a raceme or solitary; inflorescence 12–40 cm, 5–10-flowered, puberulent; calyx tube 20–25 cm, apex 8–9 mm in diam.; segments linear, 8–9 mm; corolla yellow; segments elliptic, 20–22 × 12–15 mm; filaments 2–3 mm; anthers 5–6 mm; rudimentary ovary subulate, 4–5 mm. Female flowers: calyx tube narrowly tubular, ca. 15 mm, densely yellow pubescent; segments linear, ca. 9 mm; corolla segments oblong, 20–25 × 15–20 mm; ovary oblong-ovoid, densely yellow hispid. Fruit 7–8 × 3–4 cm, fibrous. Seeds pale gray, oblong, ca. 12 × 5 mm, 2–3 mm thick, base truncate. Fl. and fr. Jun–Oct.

Thickets and forest margins on mountain slopes; 2300–2500 m. Xizang, Yunnan [Bhutan, India, Nepal].

## 17. *EDGARIA* C. B. Clarke, J. Linn. Soc., Bot. 15: 113. 1876.

三棱瓜属 *san leng gua shu*

Lu Anmin (路安民 *Lu An-ming*); Charles Jeffrey

Herbs, climbing. Stem and branches slender. Tendrils 2-fid. Petiole slender; leaf blade ovate-cordate, membranous, pubescent at first, ultimately glabrescent, scabrous, margin irregularly dentate. Plants dioecious. Male flowers in raceme or rarely solitary; calyx tube elongate, narrowly funnelform; segments 5, linear; corolla yellow, subrotate, 5-partite; segments obovate, entire; stamens 3, included, inserted on calyx tube; filaments free, short; anthers connate, one 1-celled, others 2-celled; anther cells straight; connective narrow; pistillode subulate. Female flowers solitary; calyx and corolla as in male flowers; staminodes absent; ovary narrowly ovoid, 3-locular, 1 or 2 ovules in each locule; ovules ± horizontal; style filiform, elongate; stigmas 3, oblong, apex 2-lobed. Fruit broadly fusiform, distinctly 3-angled, ribbed, dry, deeply 3-valved. Seeds subquadrate, compressed, slightly corrugate.

One species: Bhutan, SW China, N India, Nepal.

**1. *Edgaria darjeelingensis*** C. B. Clarke, J. Linn. Soc., Bot. 15: 114. 1876.

三棱瓜 *san leng gua*

Petiole 4–6 cm, pubescent at first, ultimately glabrous; leaf blade ovate-cordate, 8–12 × 6–10 cm, membranous, abaxially hispidulous on veins, adaxially sparsely puberulent at first, ultimately scabrous, margin sinuous-dentate, apex acute or shortly acuminate; basal sinus 2–2.5 cm deep. Male flowers usually 10–16 in a raceme or rarely solitary; peduncle slender, 12–15

cm; pedicel filiform, 5–8 mm; calyx tube 1.5–2 cm, apex 3–4 mm in diam.; segments 3–4 mm; corolla segments narrowly ovate, 10–15 × 3–5 mm, 3-veined, apex acuminate; filaments ca. 5 mm; pistillode 3–4 mm. Fruiting pedicel stout, 2–10 cm; fruit ovoid-3-angled, 6–7 cm, 3–4 cm in diam., glabrous or sparsely puberulent, apex 3-valved when mature. Seeds 13–14 × ca. 9 mm, ca. 2 mm thick. Fl. May–Aug.

Broad-leaved forests, grasslands; ca. 1700 m. Xizang [Bhutan, N India, Nepal].

## 18. *LUFFA* Miller, Gard. Dict. Abr., ed. 4, [806]. 1754.

丝瓜属 *si gua shu*

Lu Anmin (路安民 *Lu An-ming*); Charles Jeffrey

Herbs, scandent, annual, glabrous or puberulent. Tendrils bi- or multifid. Petiole eglandular; leaf blade usually 5–7-lobed. Plants monoecious. Male flowers in a raceme; calyx tube obconical; segments 5, triangular or lanceolate; corolla segments 5, free, spreading, entire or erose; stamens 3 or 5, free; anthers: one 1-celled, other 2-celled or all 1-celled when stamens 5; anther cells linear, sigmoid-flexuous; connective usually dilated; pistillode glandular or absent. Female flowers solitary; calyx and corolla as in male flowers; staminodes 3, or rarely 4 or 5; ovary cylindric; ovules numerous, horizontal; stigmas 3. Fruit oblong or cylindric, terete or acutely costate, smooth or echinate, inside fibrous, apex operculately dehiscent. Seeds numerous, oblong, compressed.

Six species: tropical and subtropical regions throughout the world; two species (both introduced) in China.

- 1a. Stamens often 5, anther cells all 1-celled; fruit smooth, ecostate ..... 1. *L. aegyptiaca*  
 1b. Stamens 3, anthers: one 1-celled, others 2-celled; fruit with 8–10 acute ribs ..... 2. *L. acutangula*

**1. *Luffa aegyptiaca*** Miller, Gard. Dict., ed. 8, *Luffa* no. 1. 1768.

丝瓜 si gua

*Momordica luffa* Linnaeus, Sp. Pl. 2: 1009. 1753; *Luffa cylindrica* (Linnaeus) M. Roemer; *M. cylindrica* Linnaeus.

Stem and branches scabrous, sulcate-angular, puberulent. Tendrils rather robust, usually 2–4-fid. Petiole 10–12 cm, scabrous, subglabrous; leaf blade triangular or suborbicular, 10–20 × 10–20 cm, often palmately 5–7-lobed; lobes triangular, median lobe 8–12 cm, base deeply cordate, margin dentate, apex acute or acuminate; sinus 2–3 cm deep, 2–2.5 cm wide. Male flowers usually 15–20 in a raceme; peduncle somewhat robust, 12–14 cm, pubescent; pedicels 1–2 cm; calyx broadly campanulate, 5–9 mm, puberulent; segments reflexed above, ovate-lanceolate or subtriangular, 8–13 × 4–7 mm, densely puberulent, 3-veined, apex acuminate; corolla yellow, rotate, 5–9 cm in diam.; segments oblong, 2–4 × 2–2.8 cm, inside densely yellow-white villous, base attenuate, apex rounded-obtuse. Stamens usually 5, rarely 3; filaments 6–8 mm, base white pubescent, connate at first, later free. Female flowers solitary; pedicel 2–10 cm; ovary narrowly cylindric, puberulent; stigmas expanded. Fruit cylindric, straight or slightly curved, 15–45 × 3–6 cm, smooth, ecostate, inside strongly fibrous when mature. Seeds usually black, ovate, smooth or very sparingly tuberculate, margin slightly winged. Fl. and fr. summer and autumn.

Commonly cultivated in China [widely cultivated throughout tropical and temperate regions].

The fruit is eaten as a vegetable.

**2. *Luffa acutangula*** (Linnaeus) Roxburgh, Hort. Bengal. 70. 1814.

广东丝瓜 guang dong si gua

*Cucumis acutangulus* Linnaeus, Sp. Pl. 2: 1011. 1753; *Luffa acutangula* var. *subangulata* (Miquel) Cogniaux; *L. subangulata* Miquel.

Stem rather robust, sulcate-angular, pubescent. Tendrils robust, often 3-fid, puberulent. Petiole 8–12 cm; leaf blade suborbicular, 15–20 × 15–20 cm, membranous, often 5–7-lobed; median lobe broadly triangular, lateral lobes smaller, both surfaces puberulent, margin dentate, apex acute or acuminate; sinus subrounded. Male flowers 17–20 in raceme at apex of peduncle; peduncle 10–15 cm; pedicels 1–4 cm, white puberulent; calyx tube campanulate, 5–8 × ca. 10 mm; segments lanceolate, 4–6 × 2–3 mm, densely white pubescent, 1-veined, apex acuminate, slightly reflexed; corolla yellow, rotate; segments obcordate, 15–25 × 10–20 mm, both surfaces subglabrous; stamens 3, free; filaments 4–5 mm; anthers puberulent. Female flowers solitary; ovary terete, longitudinally 8–10-angled; style short; stigmas expanded, 2-lobed. Fruit cylindric or clavate-oblong, 8–10-angled, 15–40 × 6–10 cm, glabrous. Seeds black, ovoid, 11–12 × 7–8 mm, ca. 1.5 mm thick, margin without wing. Fl. and fr. summer and autumn.

Cultivated in S China [S and SW Asia; also cultivated in tropical regions].

The fruit is eaten as a vegetable.

## 19. GYMNOPETALUM Arnott, Madras J. Lit. Sci. 12: 52. 1840.

金瓜属 jin gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Scotanthus* Naudin; *Tripodanthera* M. Roemer.

Herbs, climbing, slender. Tendrils simple or 2-fid. Leaf blade ovate-cordate, angularly 3–5-lobed. Plants monoecious or dioecious. Male flowers solitary or in a raceme, ebracteate or bracteate; calyx tube elongate, tubular; segments 5, subulate; corolla white or yellow, rotate, 5-partite; segments oblong or obovate; stamens 3, inserted on middle of calyx tube; filaments short, free; anthers connate, one 1-celled, others 2-celled; anther cells conduplicate; rudimentary ovary erect. Female flowers solitary; calyx and corolla as in male flowers; staminodes 3, linear; ovary ovoid or oblong; ovules numerous, horizontal; placentae 3; style filiform. Fruit oblong or subglobose, acute or obtuse at both ends, indehiscent. Seeds obovate or oblong, compressed, marginate.

Four species: S Asia; two species in China.

- 1a. Leaf blade membranous, both surfaces slightly setose, 5-angular or 3–5-lobed or -partite, apex acuminate, margin dentate; fruit oblong-ovoid, acute at both ends, 10-ribbed ..... 1. *G. chinense*  
 1b. Leaf blade papery, both surfaces densely setose and villous, undivided or undulate 3–5-lobed, apex obtuse, margin serrate; fruit subglobose, both ends obtuse, without ribs ..... 2. *G. scabrum*

**1. *Gymnopetalum chinense*** (Loureiro) Merrill, Philipp. J. Sci. 15: 256. 1919.

金瓜 jin gua

*Euonymus chinensis* Loureiro, Fl. Cochinch. 1: 156. 1790; *Bryonia cochinchinensis* Loureiro; *Gymnopetalum cochinchinense* (Loureiro) Kurz; *G. heterophyllum* Kurz; *G. quinquelobatum* Merrill; *G. quinquelobum* Miquel; *Melothria touchanensis* H. Léveillé; *Momordica tubiflora* Roxburgh; *Scotanthus tubi-*

*florus* (Roxburgh) Naudin, nom. superfl.; *Tripodanthera cochinchinensis* (Loureiro) M. Roemer.

Plants perennial. Stem and branches slender, hispid or villous, glabrescent. Petiole 2–4 cm; leaf blade ovate-cordate, 4–8 × 4–8 cm, membranous, 5-angular or 3–5-lobed; middle lobe larger, triangular, both surfaces scabrous, base cordate, apex acuminate. Plants monoecious. Male flowers solitary, or 3–8 in a raceme; peduncle slender, 10–15 cm; bracts leaflike, 1–2.5 cm, yellow-brown villous, 3-lobed; calyx tube tubular,

elongate, ca. 2 cm; segments linear, ca. 7 mm; corolla white; segments oblong-ovate, 15–20 × 10–12 mm, ± villous; filaments ca. 0.5 mm; anthers ca. 7 mm. Female flowers solitary; pedicels 1–4 cm; ovary oblong, 10–12 × ca. 5 mm, yellow-brown villous, acute at both ends; style 5–8 mm; stigmas 3. Fruit orange, oblong-ovoid, 4–5 cm, smooth, 10-ribbed, acute at both ends. Seeds oblong, ca. 7 × 3–3.5 mm, both ends obtuse. Fl. Jul–Sep, fr. Sep–Dec.

Forests and thickets on mountain slopes; 400–900 m. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

**2. *Gymnopetalum scabrum*** (Loureiro) W. J. de Wilde & Duyfjes, *Reinwardtia* 12: 268. 2008.

风瓜 feng gua

*Trichosanthes scabra* Loureiro, *Fl. Cochinch.* 2: 589. 1790; *Cucumis integrifolius* Roxburgh; *Gymnopetalum integrifolium* (Roxburgh) Kurz; *G. integrifolium* var. *penicaudii* (Gagnepain) W. J. de Wilde & Duyfjes; *G. leucostictum* Miquel; *G. monoicum* Gagnepain; *G. monoicum* var. *incisum* Gagnepain; *G. penicaudii* Gagnepain; *G. scabrum* var. *penicaudii* (Gagnepain)

W. J. de Wilde & Duyfjes; *Trichosanthes integrifolia* (Roxburgh) Kurz.

Plants annual. Stem and branches slender, villous. Petiole 1.5–3 cm, densely villous; leaf blade reniform or ovate-cordate, 6–8 × 6–8 cm, papery, undivided or undulate 3–5-lobed; lobes triangular, both surfaces scabrous, setose and villous, base cordate, margin serrate, apex obtuse. Plants monoecious. Male flowers solitary, or in a raceme; peduncle 4–6 cm, densely villous; bracts leaflike, divided, densely yellow-brown villous; calyx tube 1.5–2 cm; segments lanceolate, ca. 8 mm; corolla segments obovate, 18–20 × 10–12 mm; filaments ca. 0.4 mm. Female flowers solitary; pedicels 10–15 mm, densely villous; calyx and corolla as in male flowers; ovary ovoid-globose, ca. 10 mm, villous. Fruit orange-red when mature, subglobose, 2–3 cm in diam., smooth, not ribbed. Seeds narrowly oblong, ca. 9 × 3–3.5 mm, ca. 1.5 mm thick, both surfaces smooth, both ends obtuse. Fl. Jun–Sep, fr. Sep–Nov.

Mountain slopes and herbage; 400–800 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

## 20. *HODGSONIA* J. D. Hooker & Thomson, *Proc. Linn. Soc. London* 2: 257. 1854.

油渣果属 you zha guo shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Climbers, woody, large. Stem and branches stout. Tendrils robust, 2–5-fid. Plants dioecious. Male flowers in a raceme; calyx tube elongate, campanulate; segments short; corolla rotate, 5-partite, lobes connate at base; segments obcuneate, apex truncate, very long fimbriate; stamens 3; filaments inconspicuous; anthers connate, linear, one 1-celled, two 2-celled; anther cells conduplicate. Female flowers solitary; calyx and corolla as in male flowers; ovary globose, 1-locular; ovules 12, horizontal; placentae 3, parietal with pairs of ovules attached on each side; style long; stigma 3-lobed; lobes 2-fid, exserted. Fruit large, depressed, 12-grooved. Perfect seeds usually 6, each having a rudimentary or barren seed attached to its side. Seeds large, flat, ellipsoid.

Two species: tropical Asia; one species in China.

**1. *Hodgsonia heteroclita*** (Roxburgh) J. D. Hooker & Thomson, *Proc. Linn. Soc. London* 2: 257. 1854.

油渣果 you zha guo

*Trichosanthes heteroclita* Roxburgh, *Fl. Ind.*, ed. 1832, 3: 705. 1832; *Hodgsonia heteroclita* subsp. *indochinensis* W. J. de Wilde & Duyfjes.

Plants to 20–30 m. Stem and branches glabrous. Petiole robust, 4–8 cm, striate, glabrous; leaf blade 15–24 × 15–24 cm, leathery, both surfaces glabrous, 3–5-lobed, mostly 5-lobed; lobes ovate-oblong, base truncate, apex acuminate. Male pe-

duncle thick, 15–30 cm, striate, glabrous or puberulent; bracts oblong-lanceolate, 5–10 mm, fleshy; pedicels short, thick, glabrous or puberulent; calyx tube yellowish, narrowly tubular, 7–10(–12) cm × 7–9 mm, dilated only at very apex; segments triangular-lanceolate, 2–4 mm; corolla yellow outside, white inside; segments ca. 5 cm, fimbriate fringes up to 15 cm. Female pedicels robust, short; ovary subglobose, 2–2.2 cm in diam. Fruit reddish brown, compressed globose, 10–16 × ca. 20 cm, smooth or shallowly grooved. Seeds oblong, ca. 7 × 3 cm, mostly compound. Fl. and fr. Jun–Oct.

Thickets, mountain slopes; 300–1500 m. Guangxi, SE Xizang, S Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

## 21. *TRICHOSANTHES* Linnaeus, *Sp. Pl.* 2: 1008. 1753.

栝楼属 gua lou shu

Huang Luqi (黄璐琦), Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Anguina* Miller; *Cucumeroides* Gaertner; *Involucraria* Seringe.

Herbs, climbing, annual or perennial. Leaf blade simple, unlobed or palmately 3–7(–9)-lobed, rarely compound and 3–5-foliate, margin usually denticulate. Tendrils usually 2–5-fid, rarely simple. Plants dioecious, rarely monoecious; flowers usually white, rarely pink or red. Male flowers usually in racemes, rarely solitary, sometimes male peduncles in axillary pairs, one 1-flowered, caducous, other bearing a raceme; bracts variable in size and form, rarely absent; calyx tube cylindric, frequently dilated at apex;

segments 5, entire, serrate, or laciniate; corolla segments 5, usually long fimbriate; stamens 3, inserted on calyx tube; filaments very short, free; anthers connate, two 2-celled, other 1-celled, cells conduplicate. Female flowers solitary, very rarely in racemes; calyx and corolla as in male flowers; ovary inferior, ovoid or fusiform, 1-loculed with 3 parietal placentas; ovules usually many, generally horizontal, half pendulous; style slender; stigmas 3, entire or bifid. Fruit globose, ovoid, or fusiform, fleshy, usually glabrous and smooth, many seeded, indehiscent. Seeds packed in pulp, 1-loculed, oblong or ovate, and compressed, or 3-loculed, turgid, with 2 lateral locules empty.

About 100 species: Asia and N Australia; 33 species (14 endemic, one introduced) in China.

- 1a. Seeds subquadrangular, obovate-triangular, oblong, or 4-angled, 3-loculed, turgid, surrounded by thick ridges.
  - 2a. Seeds 4-angled, with narrow middle ridge, 2 lateral locules broad; leaf blade abaxially glabrous or puberulent on veins ..... 33. *T. tetragonosperma*
- 2b. Seeds subquadrangular, obovate-triangular, or oblong, 2 lateral locules narrow; leaf blade abaxially densely pubescent.
  - 3a. Leaves unlobed or irregularly shortly 3-lobed.
    - 4a. Leaf blade ovate, thinly membranous, unlobed; fruit ovoid, smooth, glabrous ..... 30. *T. baviensis*
    - 4b. Leaf blade broadly cordate, papery, unlobed or shortly 3-lobed; fruit ovoid-oblong or oblong, densely white villous ..... 31. *T. trichocarpa*
  - 3b. Leaves usually 3–7-lobed.
    - 5a. Bracts lanceolate or oblanceolate, ca. 1.6 × 0.5–0.6 cm, margin triangular-dentate; leaves adaxially glabrous or puberulent ..... 29. *T. pilosa*
    - 5b. Bracts linear-lanceolate, 2–3 mm, entire; leaves adaxially tomentose ..... 32. *T. cucumeroides*
- 1b. Seeds elliptic, ovate-elliptic, or oblong, 1-loculed, compressed or turgid.
  - 6a. Plants monoecious or dioecious; male flowers in racemes, bract very small, less than 5 mm; seed margin undulate-dentate.
    - 7a. Plants dioecious; bracts absent or ca. 5 mm; fruit cylindric, ca. 20 × 7 cm ..... 3. *T. dafangensis*
    - 7b. Plants monoecious; bracts 1–3 mm or very small or absent; fruit cylindric and 100–200 cm, or ovoid-oblong and 5–7 cm.
      - 8a. Bracts 1–3 mm; fruit cylindric, 100–200 × 3–4 cm; leaf lobes obovate ..... 1. *T. anguina*
      - 8b. Bracts absent or very small; fruit ovoid-oblong, 5–7 × 2.5–3.5 cm; leaf lobes rhombic or triangular ..... 2. *T. cucumerina*
  - 6b. Plants dioecious; male flowers solitary or in racemes or rarely in a panicle; bracts 1–6.5 cm or rarely ca. 5 mm; seed margin crenellate.
    - 9a. Leaves simple, leaf blade smooth on both surfaces; bract in male flower spreading, margin entire or sinuate-dentate.
      - 10a. Male racemes densely villous.
        - 11a. Leaves leathery, unlobed, leaf blade pubescent on veins ..... 13. *T. reticulinnervis*
        - 11b. Leaves papery, unlobed or 3–5-lobed.
          - 12a. Leaves unlobed; seeds subovate, 10–13 × 7–8 mm, margin undulate ..... 11. *T. kerrii*
          - 12b. Leaves 3–5-lobed or deeply lobed.
            - 13a. Leaf blade abaxially densely white sericeous; male flowers solitary, densely white sericeous ..... 12. *T. sericeifolia*
            - 13b. Leaf blade abaxially densely brownish villous; male raceme densely brownish villous ..... 20. *T. villosa*
      - 10b. Male racemes slightly hairy or villous, one peduncle 1-flowered, other bearing a raceme.
        - 14a. Leaves ovate or ovate-oblong, subleathery or leathery, unlobed or rarely 3-lobed.
          - 15a. Leaf blade papery, base cordate; fruit oblong, 7–10 × 6–7 cm ..... 10. *T. homophylla*
          - 15b. Leaf blade subleathery or leathery.
            - 16a. Leaf blade subleathery, unlobed, base rounded; fruit globose, ca. 7 cm in diam. .... 8. *T. smilacifolia*
            - 16b. Leaf blade leathery, unlobed or shortly to deeply 2- or 3-lobed, base truncate; fruit oblong, 12–18 × 5–10 cm ..... 9. *T. truncata*
        - 14b. Leaves ovate-cordate or orbicular-cordate, papery, 3–9-lobed to middle or nearly to base.
          - 17a. Male flowers solitary, smaller than 3 cm in diam.; calyx tube narrowly campanulate ..... 7. *T. hylonoma*
          - 17b. Male flowers in raceme; flowers larger than 3 cm in diam.; calyx tube narrowly funnellform or cylindric.
            - 18a. Leaves usually 3–5(–7)-lobed.
              - 19a. Bracts in male flowers ca. 3 cm, margin entire; calyx tube funnellform, ca. 3 cm, segments linear-lanceolate, 10–15 × 1.5–2.5 mm; leaves ovate-cordate ..... 4. *T. jinggangshanica*

- 19b. Bracts in male flowers less than 2.5 cm, margin sinuate-dentate; calyx tube cylindric, dilated at apex, 20–40 × ca. 10 mm; leaves suborbicular ..... 5. *T. kirilowii*
- 18b. Leaves deeply 3–7-lobed usually up to base.
  - 20a. Leaf lobes rhombic; fruiting peduncle 12–16.5 cm ..... 6. *T. mianyangensis*
  - 20b. Leaf lobes linear-lanceolate or oblanceolate; fruiting peduncle 4.5–8 cm ..... 14. *T. rosthornii*
- 9b. Leaves simple or 3–5-foliolate; leaf blade white punctate; bracts large, conspicuous, margin dentate.
  - 21a. Leaves 3–5-foliolate; bracts rhombic-lanceolate.
    - 22a. Leaflets remotely denticulate at margin ..... 27. *T. pedata*
    - 22b. Leaflets entire at margin ..... 28. *T. quinquefolia*
  - 21b. Leaves simple; bracts broadly ovate or oblong.
    - 23a. Flowers red, pale red, or purple.
      - 24a. Seeds ovoid, turgid ..... 22. *T. dunniana*
      - 24b. Seeds oblong or oblong-ovate, compressed.
        - 25a. Seeds oblong, truncate at both ends, ca. 18 mm; flowers purple; calyx tube ca. 2.5 cm, segments linear; fruit orange-yellow ..... 25. *T. rugatisemina*
        - 25b. Seeds oblong-ovate, 10–15 mm; flowers pale red.
          - 26a. Leaf blade deeply (3–)5(–7)-lobed; calyx tube 4–6 cm, segments ovate-lanceolate, denticulate; fruit red ..... 23. *T. rubriflos*
          - 26b. Leaf blade shortly 5–7-lobed or lobed to middle; calyx tube ca. 4 cm, segments narrowly lanceolate, entire; fruit orange-red ..... 24. *T. subrosea*
  - 23b. Flowers white.
    - 27a. Bracts entire.
      - 28a. Bracts ovate, 3.5–4.3 × ca. 2.5 cm, with 2 rows of brownish puncta beside main vein; calyx segments 2–3 cm, margin sharply 2- or 3-lobed; seeds triangular-ovate; leaves membranous, abaxially glabrous, adaxially punctate, petiole 5–11 cm ..... 18. *T. quinquangulata*
      - 28b. Bracts oblong, ca. 4 × 1–1.5 cm; calyx segments ca. 1 cm, entire; seeds subquadangular; leaves papery, hirsute, petiole 14–17 cm ..... 19. *T. cordata*
    - 27b. Bract margin dentate or lacerate.
      - 29a. Leaves leathery.
        - 30a. Bracts suborbicular, margin lacerate; calyx segments narrowly ovate, margin lacinate; leaves suborbicular ..... 17. *T. lepiniana*
        - 30b. Bracts obovate-oblong, margin dentate; calyx segments narrowly lanceolate, margin dentate; leaves ovate-cordate ..... 26. *T. tricuspidata*
      - 29b. Leaves membranous or papery.
        - 31a. Leaves papery ..... 21. *T. laceribractea*
        - 31b. Leaves membranous.
          - 32a. Leaf blade suborbicular, deeply palmately 5–7-lobed; bract margin crenulate; calyx segments ca. 15 mm, entire ..... 15. *T. wallichiana*
          - 32b. Leaf blade orbicular-cordate or broadly ovate-cordate, unlobed or irregularly 2- or 3(–5)-lobed; bract margin lobulate with linear-lanceolate lobes; calyx segments ca. 10 mm, entire or serrate ..... 16. *T. fissibractea*

**1. *Trichosanthes anguina* Linnaeus, Sp. Pl. 2: 1008. 1753.**

蛇瓜 she gua

*Trichosanthes cucumerina* Linnaeus var. *anguina* (Linnaeus) Haines.

Plants annual. Stems slender, branched, angular, puberulent. Petiole 3–7 cm; leaf blade suborbicular or orbicular-reniform, 8–16 × 6–18 cm, membranous, ± deeply 5(rarely 3–7)-lobed; lobes usually obovate, abaxially densely puberulent, adaxially subglabrous, margin finely denticulate. Plant monoecious. Male raceme usually 8–15-flowered; peduncle 10–18 cm, puberulent; pedicel erect, 5–12 cm, minutely spreading bracteate, bracts 3(–5) mm; calyx tube subcylindric, slightly dilated at apex, 2.5–3 × 4–5 mm, puberulent; segments re-

flexed, ca. 2 mm. Female flowers solitary; peduncle up to 1 cm; ovary narrowly fusiform, ± villous. Fruit very long, cylindric, 100–200 × 3–4 cm, smooth, sometimes contorted. Seed oblong, 11–17 × 8–10 mm, finely rugulose, margin undulate. Fl. and fr. summer–autumn.

Cultivated in China [cultivated throughout the tropics].

The fruit is eaten as vegetable. The roots and seeds are used medicinally for treating diarrhea.

One of us (Jeffrey) treats this taxon as *Trichosanthes cucumerina* var. *anguina*.

**2. *Trichosanthes cucumerina* Linnaeus, Sp. Pl. 2: 1008. 1753.**

瓜叶栝楼 gua ye gua lou

*Trichosanthes brevibracteata* Kundu; *T. pachyrrhachis* Kundu.

Plants annual. Stems slender, profusely branched,  $\pm$  pubescent. Leaf blade reniform or broadly ovate, (5–)7–10  $\times$  8–11 cm, membranous,  $\pm$  deeply 5–7-lobed; lobes triangular or rhombic. Plants monoecious. Male peduncles in pairs, earlier 1-flowered, later bearing a raceme; raceme few flowered; peduncle slender, 15–20 cm, puberulent; pedicel erect, 0.5–1.5 cm, puberulent; bracts absent or very small; calyx tube somewhat dilated at apex, 15–16 mm. Female flowers solitary or sometimes replacing earlier male flower; ovary oblong. Fruit ovoid-oblong, 5–7  $\times$  2.5–3.5 cm, with 7–10 seeds. Seeds ovate-oblong, 9–12  $\times$  5–6 mm, compressed, rugulose, margin thick with toothed projections from both surfaces. Fl and fr. autumn.  $2n = 22$ .

Forests or thickets along valleys, thickets on mountain slopes; 400–1600 m. Guangxi, S Yunnan [Bangladesh, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka; N Australia].

The roots, fruit, and seeds are used medicinally.

One of us (Jeffrey) treats this taxon as *Trichosanthes cucumerina* var. *cucumerina*.

**3. *Trichosanthes dafangensis*** N. G. Ye & S. J. Li, Acta Phytotax. Sin. 27: 153. 1989.

大方油栝楼 da fang you gua lou

Leaf blade abaxially pale green, adaxially deep green, cordate, 10–22  $\times$  8–20 cm, membranous,  $\pm$  deeply palmately 5–7-lobed; lobes elliptic-obovate, puberulent, margin distantly denticulate, apex acuminate. Male flowers solitary, fascicled, or in short racemes; peduncle ca. 5 cm; bracts absent or ca. 5 mm; calyx tube funnelform, ca. 1 cm; segments linear-lanceolate, ca. 1 cm; pistillodes 3, claviform, ca. 5 mm. Female flowers solitary; pedicel ca. 2 cm; calyx tube shortly tubular; ovary ca. 2.5 cm, villous; staminodes 3. Fruit cylindric, ca. 20  $\times$  7 cm, with ca. 80 seeds. Seeds ovate, ca. 1 cm, compressed, verrucose, margin sulcate, crenellate.

• Mountain slopes, thickets; 1000–1800 m. Guizhou.

**4. *Trichosanthes jinggangshanica*** C. H. Yueh, Acta Phytotax. Sin. 18: 342. 1980.

井冈栝楼 jing gang gua lou

Stems slender, angular, puberulent. Petiole 3–8 cm, villous; leaf blade abaxially pale green, adaxially deep green, narrowly ovate-cordate to broadly ovate-cordate, 14–20  $\times$  10–15 cm, papery, usually  $\pm$  3–5-lobed, rarely unlobed; middle lobe ovate-triangular or ovate-lanceolate, abaxially glabrous or villous on veins, adaxially villous. Male peduncles in axillary pairs, one 1-flowered, other bearing a raceme; peduncle 4–11 cm, villous; bracts ovate or orbicular-cordate, 2–2.5  $\times$  1.5–4 cm, base rounded, margin entire, apex acuminate, shortly stipitate; calyx tube narrowly funnelform, ca. 3 cm; segments linear-lanceolate, 10–15  $\times$  1.5–2.5 mm. Female flowers solitary; pedicel ca. 1.5 cm; calyx tube ellipsoidal, ca. 2 cm; ovary oblong. Fruiting peduncle ca. 6 cm; fruit oblong, 8–10 cm, smooth. Fl. Mar–Jul, fr. Nov.

• Forests, thickets; 700–1500 m. SW Jiangxi.

Locally, the roots and fruit are used medicinally as “tian hua fen” and “gua lou.”

**5. *Trichosanthes kirilowii*** Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 482. 1859.

栝楼 gua lou

*Trichosanthes obtusiloba* C. Y. Wu ex C. Y. Cheng & C. H. Yueh.

Petiole 2–6 cm, striate, villous; leaf blade adaxially deep green, suborbicular, 5–20  $\times$  5–20 cm, papery, usually 3–5(–7)-lobed up to middle, rarely deeply so (nearly up to base) or unlobed; lobes rhombic-obovate or oblong, adaxially rough, margin sometimes remotely shortly lobed, apex obtuse. Male raceme solitary or with solitary flowers in axillary pairs; peduncle 10–20 cm, robust, grooved, slightly hairy, 5–8-flowered at apex; bracts obovate or broadly ovate, 1.5–2.5(–3)  $\times$  1–2 cm, margin sinuate-dentate, shortly puberulent, stipitate; calyx tube cylindric, dilated at apex, 2–4  $\times$  ca. 1 cm; segments lanceolate, 10–15  $\times$  3–5 mm, entire. Female flowers solitary; pedicel ca. 7.5 cm, shortly puberulent; calyx tube cylindric, ca. 2.5  $\times$  1.2 cm; ovary oblong, 1.2–2  $\times$  ca. 1 cm. Fruiting peduncle 4–11 cm; fruit brown-yellow or orange-yellow, oblong or globose, 7–10.5 cm. Seeds sandy beige, oblong-ovate, 11–16  $\times$  7–12 mm, marginate. Fl. May–Aug, fr. Aug–Oct.  $2n = 88$ .

Open forests, shrublands, grasslands and fields beside villages; 200–1800 m. Gansu, Hebei, Henan, Jiangsu, Jiangxi, Shandong, Shanxi, Zhejiang [Japan, Korea].

This plant is the source of “tian hua fen” (the roots), “gua lou zi” (the seeds), and “gua lou pi” (the fruit rind), which are official source drugs in traditional Chinese medicine.

**6. *Trichosanthes mianyangensis*** C. H. Yueh & R. G. Liao, Bull. Bot. Res., Harbin 2(1): 115. 1992.

绵阳栝楼 mian yang gua lou

Stems densely shortly hairy and sparsely villous. Petiole 6–9 cm, punctate, puberulent; leaf blade orbicular-cordate, 11–17  $\times$  10–15 cm, papery, shortly 3–5-lobed or 7–9-lobed up to middle; lobes rhombic, both surfaces shortly puberulent, margin irregularly crenate-dentate, apex acuminate. Female flowers solitary; pedicel 5–7 cm, slightly villous; calyx segments linear, 10–12  $\times$  1–1.5 mm, entire; ovary oblong, 15–20  $\times$  8–9 mm. Fruiting peduncle 12–16.5 cm; fruit oblong, 10.5–11.5  $\times$  ca. 8.5 cm. Seeds up to 1.9 cm, smooth. Fl. May–Aug, fr. Aug–Oct.  $2n = 88^*$ .

• ?About 1000 m. Hubei, Sichuan.

**7. *Trichosanthes hylonoma*** Handel-Mazzetti, Symb. Sin. 7: 1066. 1936.

湘桂栝楼 xiang gui gua lou

*Trichosanthes leishanensis* C. Y. Cheng & C. H. Yueh; *T. parviflora* C. Y. Wu ex S. K. Chen.

Stems slender, with white lenticels. Petiole 3–9 cm; leaf blade broadly ovate or broadly cordate, 11–17  $\times$  10–16 cm, papery, usually 3–5-lobed up to middle, sometimes irregularly 5–9-lobed; lobes oblong or rhombic-ovate, glabrous, margin re-

motely denticulate, apex acuminate. Male flowers solitary; pedicel setiform, 4–7 cm; calyx tube narrowly campanulate, 1.2–1.5 × ca. 0.4 cm, glabrous or remotely villous; segments erect or reflexed, linear, 6–7 mm. Female flowers unknown. Fruit orange-red, ovoid-oblong, ca. 9 × 5–6 cm, attenuate at both ends. Seeds brown, oblong, 1–1.3 × ca. 0.9 cm, base rounded, margin crenellate, apex truncate. Fl. May–Jun, fr. Sep–Oct.

• Thickets along valleys; 800–1000 m. NE Guangxi, SE Guizhou, S Hunan.

**8. *Trichosanthes smilacifolia*** C. Y. Wu ex C. H. Yueh & C. Y. Cheng, *Acta Phytotax. Sin.* 18: 347. 1980.

菝葜叶栝楼 ba qia ye gua lou

Petiole 2–3 cm; leaf blade abaxially pale green, adaxially deep green, ovate-oblong, 9–13 × 7–9 cm, subleathery, unlobed, both surfaces smooth, base rounded, margin reflexed, denticulate. Male flowers paniculate; peduncle 8–15 cm, slightly puberulent; bracts ovate-orbicular, ca. 1 × 0.8 cm, margin triangular-bidentate to middle, apex acuminate; calyx tube cylindric, ca. 2 × 0.5 cm; segments ca. 7 mm, long acuminate. Female flowers unknown. Fruiting peduncle ca. 3 cm; fruit orange-yellow, globose, ca. 7 cm, smooth. Seeds brown, broadly oblong to suborbicular, ca. 1.8 × 1.5 cm, both surfaces densely rugose, margin undulate-crenate. Fl. autumn, fr. Nov–Dec.

• Evergreen broad-leaved forests; 600–1500 m. SE Xizang, S and SE Yunnan.

**9. *Trichosanthes truncata*** C. B. Clarke in J. D. Hooker, *Fl. Brit. India* 2: 608. 1879.

大子栝楼 da zi gua lou

*Trichosanthes crispispala* C. Y. Wu ex S. K. Chen; *T. ovata* Cogniaux.

Stems robust, angular-striate, glabrous and punctate. Petiole 1.5–4(–6.5) cm; leaf blade ovate, narrowly ovate, or ovate-oblong, 7–12 × 4.5–9 cm, leathery, unlobed or shortly to deeply 2- or 3-lobed, both surfaces glabrous, base rounded or truncate, margin usually entire or rarely distantly denticulate, apex acuminate. Male raceme 8–20-flowered; peduncle 7–15 cm, striate, flowering at apex; bracts ovate, shortly stipitate, margin entire or more usually with a few teeth; calyx tube dilated at apex, 1.8–4 × ca. 1 cm, shortly tomentose; segments linear-lanceolate, 20–30 × 1–1.5 mm, entire. Female flowers solitary; ovary oblong, 1–2 × ca. 0.8 cm. Fruiting peduncle 4–5 cm; fruit oblong, 12–18 × 5–10 cm, glabrous. Seeds brown, oblong-obovate, 10–23 × 5–20 mm, base truncate, apex obtuse. Fl. Apr–May, fr. Jul–Aug.  $2n = 22$ .

Montane forests, thickets; 300–1000 m. Guangdong, Guangxi, S Yunnan [Bangladesh, Bhutan, India, Thailand, Vietnam].

**10. *Trichosanthes homophylla*** Hayata, *Icon. Pl. Formosan.* 10: 8. 1921.

芋叶栝楼 yu ye gua lou

*Trichosanthes mushaensis* Hayata.

Stems slender. Petiole 2–3 cm, hairy; leaf blade triangular-cordate, 6–10 × 4–6 cm, papery, unlobed, margin dentate, adaxially

scabrous, apex acuminate or acute. Male raceme 5–10-flowered; peduncle 8–9 cm; pedicel ca. 3 mm; bracts obovate, 1–1.5 × 0.7–1.1 cm, margin irregularly crenate-dentate; calyx tube cylindric, dilated at apex, ca. 3 × 0.8 mm; segments linear, ca. 6 mm. Female flowers unknown. Fruit oblong, 7–10 × 6–7 cm. Seeds elliptic, flattened. Fl. Aug.

Taiwan [Japan].

**11. *Trichosanthes kerrii*** Craib, *Bull. Misc. Inform. Kew* 1914: 7. 1914.

长果栝楼 chang guo gua lou

*Trichosanthes tomentosa* Chakravarty.

Stems robust, brownish hirsute. Petiole 2–5 cm, tomentose; leaf blade adaxially deep green, ovate-cordate, 10–20 × 7–17 cm, papery, unlobed, abaxially densely felty-tomentose, adaxially sparsely and shortly hirsute, margin entire or remotely and obscurely serrate, apex long acuminate. Male peduncle ca. 2.5 cm; pedicel ca. 8 mm, tomentose; bracts linear, ca. 1.5 × 0.25 cm; calyx tube cylindric, 2–3.5 × ca. 0.8 cm; segments oblanceolate, ca. 1.8 × 0.45 cm, tomentose, apex acute. Female peduncle robust, 2.5–3.5 cm, tomentose, 1-flowered; calyx tube cylindric, ca. 1 cm, tomentose; segments narrowly triangular, ca. 1 cm, apex long acuminate; ovary oblong, 1.5–2 × ca. 1 cm, densely and softly tomentose. Fruiting peduncle robust, 2.5–5.5 cm, tomentose; fruit oblong, 8–10 × 4.5–6.5 cm. Seeds subovate, compressed, 10–13 × 7–8 mm, 1-veined at middle, base rounded or truncate, margin undulate and serrate, apex obtuse.

Forests along valleys or beside streams; 700–1900 m. SW Guangxi, SW Yunnan [India, Laos, Thailand, N Vietnam].

**12. *Trichosanthes sericeifolia*** C. Y. Cheng & C. H. Yueh, *Acta Phytotax. Sin.* 18: 346. 1980.

丝毛栝楼 si mao gua lou

Stems angular-striate, sparsely sericeous. Petiole slender, 3.5–7 cm, white sericeous; leaf blade adaxially deep green, ovate-cordate, 8–17 × 6–10 cm, papery, deeply 3–5-lobed; middle lobes narrowly lanceolate or ovate-lanceolate, abaxially densely white sericeous, adaxially sparsely sericeous, margin denticulate, apex acuminate. Male flowers solitary; pedicel and flowering bud densely white sericeous; mature flowers unknown. Female flowers solitary; pedicel 1.5–2.5 cm, densely white sericeous; calyx tube tubular, ca. 1 × 0.4 cm, densely white sericeous; segments linear-lanceolate, ca. 5 × 2 mm, entire; ovary oblong, ca. 1.5 × 0.7 mm, densely white sericeous. Fruit unknown. Fl. Apr–Jul.

• Thickets on mountain slopes or beside rivers; 700–1500 m. W Guangxi, SW Guizhou, SE Yunnan.

**13. *Trichosanthes reticulineris*** C. Y. Wu ex S. K. Chen, *Bull. Bot. Res., Harbin* 5(2): 114. 1985.

两广栝楼 liang guang gua lou

Stems moderately robust, grooved, striate, glabrous or pubescent at nodes. Petiole 4–6 cm, striate, densely pubescent; leaf blade ovate to broadly ovate-cordate, 1.5–2 × 1–1.8 cm, leathery, unlobed, both surfaces pubescent on veins, margin re-

motely denticulate, apex acuminate. Male flowers in racemes or narrow panicles, 5–6 cm; pedicels ca. 6 mm, densely chocolate-colored pubescent; bracts lanceolate, ca. 1.5 cm, densely chocolate-colored villous; calyx tube campanulate, ca.  $1.5 \times 1.5$  cm, densely villous; segments triangular-ovate, ca.  $1 \times 0.6$  cm. Female flowers solitary; pedicel stout, ca. 2 cm, densely villous; calyx tube ca.  $1 \times 0.7$  cm; segments linear, ca.  $1.2 \times 0.2$ – $0.3$  cm, entire, densely villous; ovary ovoid, ca.  $2.5 \times 2$  cm. Fruiting peduncle ca. 2.5 cm, stout, densely villous; fruit ovoid, ca.  $6 \times 5$  cm, densely villous. Seeds pale brown, ovate, compressed, ca.  $1.1 \times 0.7$  cm, base rounded, apex obtuse. Fl. May–Jun, fr. Jul–Aug.

- Forests of low elevations; 200–400 m. Guangdong, Guangxi.

**14. *Trichosanthes rosthornii*** Harms in Engler, Bot. Jahrb. Syst. 29: 603. 1901.

中华栝楼 zhong hua gua lou

Stems grooved, sparsely puberulent. Petiole 2.5–4 cm, striate, sparsely puberulent; leaf blade abaxially pale green, adaxially deep green, broadly ovate to suborbicular, (6–)8–12(–20)  $\times$  (5–)7–11(–16) cm, papery, deeply 3–7-lobed, usually deeply 5-lobed nearly to base; lobes linear-lanceolate, lanceolate, or oblanceolate, abaxially glabrous, adaxially shortly hairy, margin denticulate, apex acuminate. Male raceme solitary or with one 1-flowered peduncle in axillary pairs; peduncle 8–10 cm; pedicels up to ca. 7 cm; bracts rhombic-obovate, 6–14  $\times$  5–11 mm, puberulent, attenuate at base, margin irregularly sinuate-dentate; calyx tube narrowly cylindric, dilated at apex, 2.5–3(–3.5) cm. Female flowers solitary; pedicel 5–8 cm, puberulent; calyx tube cylindric, 20–25  $\times$  5–8 mm; ovary oblong, 10–20  $\times$  5–10 mm, puberulent. Fruiting peduncle 4.5–8 cm; fruit orange-yellow, globose or oblong, 8–16  $\times$  7–10 cm, smooth, glabrous. Seeds brown, ovate-oblong, compressed, 1.5–2.2  $\times$  0.8–1.4 cm, marginate. Fl. Jun–Aug, fr. Aug–Oct.

- Dense forests along valleys, thickets or grasslands on mountain slopes; 400–1900 m. S Anhui, N Guangdong, Guangxi, Guizhou, NE Jiangxi, Sichuan, Yunnan.

The roots and fruit are used medicinally as “tian hua fen” and “gua lou.”

- 1a. Leaf blade deeply 5-lobed ..... 14d. var. *huangshanensis*  
 1b. Leaf blade deeply 3–7-lobed.  
     2a. Tendrils 4–6-fid ..... 14c. var. *multicirrata*  
     2b. Tendrils 2- or 3-fid.  
         3a. Fruit 8–11  $\times$  7–10 cm; seeds  
             1.5–1.8  $\times$  0.8–0.9 cm ..... 14a. var. *rosthornii*  
         3b. Fruit 12–16  $\times$  6.5–8.5 cm;  
             seeds 2–2.2  $\times$  1.2–1.4 cm ..... 14b. var. *scabrella*

**14a. *Trichosanthes rosthornii* var. *rosthornii***

中华栝楼(原变种) zhong hua gua lou (yuan bian zhong)

*Trichosanthes crenulata* C. Y. Cheng & C. H. Yueh; *T. guizhouensis* C. Y. Cheng & C. H. Yueh; *T. stylopodifera* C. Y. Cheng & C. H. Yueh; *T. uniflora* K. S. Hao.

Leaf blade deeply 3–7-lobed. Fruit 8–11  $\times$  7–10 cm. Seeds 1.5–1.8  $\times$  0.8–0.9 cm.

- Guizhou, E Sichuan, Yunnan.

**14b. *Trichosanthes rosthornii* var. *scabrella*** (C. H. Yueh & D. F. Gao) S. K. Chen, Fl. Reipubl. Popularis Sin. 73(1): 244. 1986.

糙籽栝楼 cao zi gua lou

*Trichosanthes scabrella* C. H. Yueh & D. F. Gao in C. H. Yueh & C. Y. Cheng, Acta Phytotax. Sin. 18: 345. 1980.

Fruit large, 12–16  $\times$  6.5–8.5 cm. Seeds 20–22  $\times$  12–14 mm, both surfaces slightly rugose.

- W Sichuan.

**14c. *Trichosanthes rosthornii* var. *multicirrata*** (C. Y. Cheng & C. H. Yueh) S. K. Chen, Fl. Reipubl. Popularis Sin. 73(1): 244. 1986.

多卷须栝楼 duo juan xu gua lou

*Trichosanthes multicirrata* C. Y. Cheng & C. H. Yueh, Acta Phytotax. Sin. 12: 430. 1974; *T. damiaoshanensis* C. Y. Cheng & C. H. Yueh.

Leaf blade thick; lobes broad. Tendrils 4–6-fid, villous. Calyx tube ca.  $2 \times 1.3$  cm, densely pubescent.

- Forests, thickets, grasslands; 600–1500 m. N Guangdong, Guangxi, Guizhou, Sichuan.

**14d. *Trichosanthes rosthornii* var. *huangshanensis*** S. K. Chen, Bull. Bot. Res., Harbin 5(2): 116. 1985.

黄山栝楼 huang shan gua lou

Leaf blade deeply 5-lobed near to base; lobes further dissected; lobules 1 or 2, linear.

- S Anhui, NE Jiangxi.

**15. *Trichosanthes wallichiana*** (Seringe) Wight, Madras J. Lit. Sci. 12: 52. 1840.

薄叶栝楼 bao ye gua lou

*Involucraria wallichiana* Seringe, Mém. Soc. Phys. Genève 3(1): 25. 1825; *Trichosanthes bracteata* (Lamarck) Voigt var. *scotanthus* (C. B. Clarke) Handel-Mazzetti; *T. grandibracteata* Kurz; *T. palmata* Roxburgh var. *scotanthus* C. B. Clarke.

Stems branched, angular-grooved, glabrous. Petiole robust, 6–10 cm, striate, puberulent; leaf blade suborbicular, 18–20  $\times$  18–20 cm, membranous or papery, deeply (nearly to base) palmately 5–7-lobed; lobes oblong, abaxially glabrous or slightly hairy on veins, adaxially glandular punctate and very rough, margin denticulate or irregularly crenate-dentate, apex acute or acuminate. Male raceme 6–15-flowered at apex; peduncle stout, 10–20(–30) cm, grooved, puberulent; bracts broadly ovate, 2–3 cm, crenulate, slightly puberulent, multiveined; calyx tube ca. 5  $\times$  1 cm; segments ca.  $1.5 \times 0.4$  cm, entire. Female flowers solitary; ovary ovoid-oblong, glabrous. Fruit ovoid or oblong, 5–10  $\times$  ca. 7 cm, apex acute or subacute. Seeds brown, oblong, 1.5–1.8  $\times$  0.8–1.2 cm. Fl. Jul–Sep, fr. Oct–Nov.

- Forests along valleys; 900–2200 m. Xizang, S Yunnan [Bhutan, India, Nepal].

**16. *Trichosanthes fissibracteata*** C. Y. Wu ex C. Y. Cheng & C. H. Yueh, *Acta Phytotax. Sin.* 12: 438. 1974.

裂苞栝楼 lie bao gua lou

Petiole 6–10 cm, glabrous, striate; leaf blade adaxially pale green, orbicular-cordate or broadly ovate-cordate, 11–25 × 9.5–20 cm, membranous to papery, unlobed or irregularly shortly 2- or 3-lobed or deeply 2- or 3-lobed, rarely 5-lobed; lobes broadly triangular-ovate, rarely ovate-oblong, adaxially glabrous, with large disk glands at base, margin subentire or remotely minutely denticulate, apex acuminate. Male raceme 9–20 cm; peduncle glabrous or very shortly puberulent, 2–5-flowered at apex; bracts ovate, 2.5–3 × 1.5–2 cm, cucullate, margin lobulate with 1.5–2 cm linear-lanceolate lobes; calyx tube ca. 3.5 cm; segments lanceolate, ca. 10 × 3–4 mm, entire or serrate. Female flowers unknown. Fruit subglobose, ca. 6 cm. Seeds brown, oblong, 1.1–1.5 × 0.5–0.6 cm, base retuse, apex truncate or obtuse. Fl. Aug–Sep, fr. Nov.

• Dense forests along valleys, thickets on mountain slopes; 1100–1300(–1500) m. SW Guangxi, SE Yunnan.

**17. *Trichosanthes lepiniana*** (Naudin) Cogniaux in A. Candolle & C. Candolle, *Monogr. Phan.* 3: 377. 1881.

马干铃栝楼 ma gan ling gua lou

*Involucraria lepiniana* Naudin in Huber, *Cat.* 11. 1868.

Stem robust, branched, glabrous. Petiole 4–7 cm, striate, glabrous or glandular-punctate; leaf blade adaxially deep green, suborbicular, 9–17(–20) cm, shortly 3–5-lobed up to middle, adaxially rough; lobe margin denticulate, apex acute or shortly acuminate. Male raceme 13–17 cm; peduncle robust, striate, glabrous; pedicels ca. 5 mm; bracts suborbicular, ca. 4 cm, cucullate, margin lacerate; calyx tube attenuate from apex toward base, ca. 7 cm, puberulent; segments narrowly ovate, ca. 1.5 × 0.4 cm, margin lacinate. Female flowers solitary; pedicel 2.5–3 cm, glabrous, striate; bracts ovate, ca. 1.5 × 1 cm, entire; calyx tube ca. 4 cm; ovary ovoid, ca. 1.5 × 1 cm, glabrous. Fruit red, ovoid, ca. 9 cm in diam., smooth. Seeds brown, broadly ovate, ca. 1.5 × 0.8–1 cm, base obtuse or attenuate, apex truncate. Fl. May–Jul, fr. Aug–Nov.

Evergreen broad-leaved forests along valleys, open forests and thickets on mountain slopes; 700–1200 m. SE Xizang, S and SE Yunnan [Bhutan, India].

De Wilde and Duyfjes (in Santisuk & Larsen, *Fl. Thailand* 9(4): 520. 2008) considered the Chinese material here treated as *Trichosanthes lepiniana* to represent a distinct species, *T. inthanonensis* Duyfjes & Pruesapan (*Thai Forest Bull., Bot.* 32: 86. 2004, type from N Thailand; the type of *T. lepiniana* is from peninsular India).

**18. *Trichosanthes quinquangulata*** A. Gray, *U.S. Expl. Exped., Phan.* 645. 1854.

五角栝楼 wu jiao gua lou

Petiole 5–11 cm, striate, punctate; leaf blade adaxially deep green, quinquangular or broadly ovate, 13–22 × 12–20 cm, membranous, shortly 5-lobed or up to middle; lobes broadly triangular or ovate-triangular, abaxially glabrous, adaxially glandular punctate and rough, margin denticulate, apex

long acuminate. Plants monoecious. Male raceme 17–30 cm; peduncle glabrous, striate, 8–10-flowered; bracts ovate, 3.5–4.3 × ca. 2.5 cm, with 2 rows of brownish puncta beside main vein, entire, apex long acuminate; calyx segments linear-lanceolate, 2–3 × 0.2–0.3 cm, margin sharply 2- or 3-lobed, apex long acuminate. Female flowers not seen. Fruiting peduncle 2–3 cm, glabrous; fruit red, globose, 5–7 cm, glabrous. Seeds brown, triangular-ovate, 1–1.2 × 0.4–0.5 cm, base attenuate, apex triangular. Fl. Jun–Oct, fr. Sep–Oct.

Low-elevation thickets, roadsides; 500–900 m. Taiwan, S Yunnan [Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam].

**19. *Trichosanthes cordata*** Roxburgh, *Fl. Ind.*, ed. 1832, 3: 703. 1832.

心叶栝楼 xin ye gua lou

*Involucraria cordata* (Roxburgh) M. Roemer; *Trichosanthes microsiphon* Kurz.

Stem robust, angular, grooved, glabrous or sparsely puberulent. Petiole 14–17 cm, striate, sparsely puberulent; leaf blade broadly ovate-cordate, 8–22 × 7–23 cm, papery, unlobed or rarely angular-sublobate, both surfaces scattered shortly hirsute, margin minutely denticulate, apex acute or shortly acuminate. Male raceme 4–8-flowered; peduncle 12–20 cm, stout, striate, sparsely puberulent; pedicels 1–2 mm, thick; bracts oblong, ca. 4 × 1–1.5 cm, entire, shortly hirsute; calyx tube attenuate from apex toward base, ca. 4.5 × 0.7 cm; segments erect or flexuous, linear-lanceolate, ca. 1.5 cm. Female flower solitary; pedicel ca. 1 cm; ovary oblong, slightly puberulent. Fruit red, globose, smooth. Seeds subquadrangular, 1–1.2 × 0.4–0.5 cm. Fl. Jul–Aug, fr. Aug.

Evergreen broad-leaved forests; ca. 1000 m. SE Xizang [Bhutan, India, Laos, Malaysia, Myanmar, Nepal, Singapore].

**20. *Trichosanthes villosa*** Bume, *Bijdr.* 934. 1826.

密毛栝楼 mi mao gua lou

Stems robust, long, densely brownish villous; petiole 10–12 cm, densely brownish villous; leaf blade adaxially deep green, broadly ovate, 11–18 × 11–17 cm, papery, unlobed or tricuspidate, abaxially densely villous-hirsute, adaxially densely and shortly brownish villous, margin denticulate, apex acuminate. Male raceme 10–20 cm, 15–20-flowered; peduncle densely brownish villous; bracts oblong, 3–5 × 2–4 cm, both surfaces brownish villous, margin irregularly dentate; calyx tube 2.5–3 × 0.6–1.2 cm, densely brownish villous; segments linear-lanceolate, ca. 2 × 0.3–0.4 cm, both surfaces villous, margin entire, apex long acuminate. Female flowers solitary; pedicel ca. 1.5 cm, densely long villous; calyx tube cylindric, ca. 1.5 × 0.7 cm; ovary oblong, ca. 1.5 × 1 cm, densely villous. Fruit brown-red, subglobose, 8–13 cm. Seeds oblong or obovate-triangular, 1.7–2.8 × 1–1.7 cm, 1-veined at middle, base obtuse, apex truncate. Fl. Dec–next Jul, fr. Sep–Nov.

Thickets or open forests on mountain slopes; 300–1000 m. S and SW Guangxi, S Yunnan [Indonesia, Laos, Malaysia, Philippines, Vietnam].

**21. *Trichosanthes laceribractea*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 117. 1911.

长萼栝楼 chang e gua lou

*Trichosanthes hupehensis* C. Y. Cheng & C. H. Yueh; *T. koshunensis* Hayata; *T. punctata* Hayata; *T. schizostroma* Hayata; *T. shikokiana* Makino; *T. sinopunctata* C. Y. Cheng & C. H. Yueh.

Stems angular, grooved, subglabrous. Petiole 1.5–9 cm, striate, hispidulous or white punctate; leaf blade abaxially pale green, adaxially deep green, suborbicular or broadly ovate, 5–16(–19) × 4–15(–18) cm, papery, 3–7-lobed shortly or nearly to base; lobes triangular, ovate, or rhombic-obovate, abaxially hispidulous on veins, adaxially densely hispidulous or white punctate, margin remotely mucronate-serrate, apex acuminate. Male peduncle robust, 10–23 cm, puberulent or sparsely hispidulous; bracts broadly ovate, 2.5–4 × 2.5–4 cm, cucullate, margin lacerate; calyx tube narrowly tubular, ca. 5 cm; segments erect, ovate, 1–1.3 × ca. 0.7 cm, margin lacinate, apex acuminate. Female flowers solitary; pedicel 1.5–2 cm, puberulent; calyx tube cylindric, ca. 4 × 5 cm; segments linear, 1–1.3 cm, entire; ovary ovoid, ca. 1 × 0.7 cm, smooth. Fruit globose to ovoid-globose, 5–8 cm in diam. Seeds oblong, 1–1.4 × 0.5–0.8 cm, both ends rounded or truncate. Fl. Jul–Aug, fr. Sep–Oct.  $2n = 22^*$ .

• Dense forests along valleys; 200–1100 m. Guangdong, Guangxi, Hubei, Jiangxi, Sichuan, Taiwan.

**22. *Trichosanthes dunniana*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 10: 148. 1911.

糙点栝楼 cao dian gua lou

*Trichosanthes prazeri* Kundu; *T. rubriflos* Thorel ex Cayla f. *macrosperma* C. Y. Cheng & C. H. Yueh; *T. tridentata* C. Y. Cheng & C. H. Yueh.

Stem moderately robust, grooved, punctate. Petiole slender, 4–5 cm, punctate; leaf blade abaxially pale green, adaxially green, suborbicular, 10–15 cm, papery, deeply palmately 5–7-lobed; lobes elliptic-obovate, abaxially glabrous, glandular punctate on veins, adaxially glandular punctate, narrowed toward base, cuspidate. Male racemes 8–10 cm; peduncle stout, striate, densely pubescent or punctate, 5–10-flowered; bracts brown, broadly ovate, ca. 5 × 4 cm, abaxially punctate, margin deeply serrate; calyx tube ca. 5 cm; segments pale red. Female flowers unknown. Fruit oblong, ca. 8 × 6 cm, smooth, apex acute. Seeds ovoid, turgid, ca. 1.2 × 0.8 cm. Fl. Jul–Sep, fr. Oct–Nov.

Dense forests along valleys or thickets; 900–1900 m. Guangxi, Guizhou, Sichuan, Yunnan [Laos, Myanmar, N Thailand].

**23. *Trichosanthes rubriflos*** Thorel ex Cayla, Bull. Mus. Natl. Hist. Nat. 14: 170. 1908.

红花栝楼 hong hua gua lou

*Trichosanthes majuscula* (C. B. Clarke) Kundu; *T. multi-loba* Miquel var. *majuscula* C. B. Clarke; *T. pubera* Blume subsp. *rubriflos* (Thorel ex Cayla) Duyfjes & Pruesapan.

Stems robust, branched, grooved, pubescent. Petiole 5–12(–18) cm, striate, pubescent; leaf blade adaxially deep green, broadly ovate or suborbicular, 7–20 cm, deeply palmately 3–7-lobed; lobes broadly ovate, oblong or lanceolate, abaxially pubescent, adaxially hispidulous or glandular punctate, margin denticulate or irregularly serrate, apex acuminate. Male raceme 10–20 cm; peduncle grooved, puberulent, (6–)11–14-flowered; bracts red, broadly ovate or obovate-rhombic, 2.5–4 × ca. 3 cm, puberulent, margin lacerate; calyx tube red, 4–6 cm; segments linear-lanceolate, 1.2–1.6 × 0.3–0.5 cm, margin entire or rarely denticulate, apex acuminate; corolla red or pale red. Female flowers solitary; pedicel ca. 2 cm, densely pubescent; calyx tube ca. 3 cm; ovary ovoid, ca. 2 × 1 cm. Fruiting peduncle robust, ca. 3 cm, striate, pubescent; fruit red, broadly ovoid or globose, 7–9.5 × 5.5–8 cm, smooth, apex acute. Seeds yellow-brown, oblong, ca. 1.2 × 0.4–0.5 cm, base truncate, apex attenuate. Fl. May–Nov, fr. Aug–Dec.

Dense forests along valleys, open forests or thickets on mountain slopes; (100–)400–1600 m. Guangdong, Guangxi, Guizhou, Xizang, Yunnan [Cambodia, NE India, Laos, Myanmar, Thailand, Vietnam].

**24. *Trichosanthes subrosea*** C. Y. Cheng & C. H. Yueh, Acta Phytotax. Sin. 18: 349. 1980.

粉花栝楼 fen hua gua lou

Stem glabrous, grooved. Petiole 4–6.5(–8) cm, striate, glabrous; leaf blade abaxially pale green, adaxially deep green, quinquangular-cordate or suborbicular, 11–15 cm, thinly papery, shortly 5–7-lobed or to middle; central lobe triangular or subrhombic, abaxially glabrous, adaxially hispidulous or glandular-punctate, margin triangular-dentate, apex long acute. Male peduncles occasionally in pairs, one early 1-flowered and other bearing a raceme; pedicel ca. 8 cm, striate, glabrous; bract ovate, 2.5–3 cm, cucullate, glabrous, subtire, apex obtuse; calyx segments narrowly lanceolate, 1.5–2 cm, entire; corolla pale red. Female flowers unknown. Fruiting peduncle stout, 2–2.5 cm; fruit orange-red, subglobose, 7–9 × 5–7.5 cm, smooth. Seeds oblong, base truncate, apex triangular. Fl. Jul–Aug, fr. Aug–Sep.

Forests; ca. 1700 m. S Guangxi, SW Yunnan [Myanmar].

**25. *Trichosanthes rugatisemina*** C. Y. Cheng & C. H. Yueh, Acta Phytotax. Sin. 12: 440. 1974.

皱籽栝楼 zhou zi gua lou

Stem grooved, densely villous. Petiole 3.5–5.5 cm, densely villous; leaf blade suborbicular, 10–15 cm, papery, 3–5-lobed up to middle; lobes ovate or obovate-elliptic, both surfaces pubescent, margin triangular-denticulate, apex acuminate. Male racemes 3–6 cm, densely brown villous, 3–5-flowered at apex; bracts ovate, 2.5–3.5 × 2–3 cm, cucullate, apex acuminate; calyx tube ca. 2.5 cm; segments ovate, ca. 15 mm, margin dentate; corolla red. Female flowers solitary; calyx tube cylindric, ca. 3 cm; segments linear, pubescent; ovary oblong, ca. 1.5 × 0.5 cm. Fruiting peduncle ca. 2 cm; fruit orange-yellow, ovoid, 8–9.5 × 5–6 cm, attenuate at apex. Seeds gray-green, ovate-oblong, ca. 1.5 × 0.7 cm, both ends truncate.

• Thickets. SE and SW Yunnan.

**26. *Trichosanthes tricuspidata*** Loureiro, Fl. Cochinch. 2: 589. 1790.

三尖栝楼 san jian gua lou

*Modecca bracteata* Lamarck; *Trichosanthes bracteata* (Lamarck) Voigt.

Stems robust, branched, angular-striate, grooved, glabrous. Petiole ca. 5 cm, striate, glabrous, punctate; leaf blade adaxially deep green, broadly ovate-cordate, 12–13 × 12–13 cm, thinly leathery, shortly 3-lobed; lobes ovate-triangular, abaxially glabrous, adaxially hispidulous or punctate, margin undulate-denticulate, apex acute or shortly acuminate. Male raceme 12–15 cm; peduncle stout, striate and grooved, glabrous; pedicel short; bracts obovate-oblong, ca. 4 × 2–2.5 cm, cucullate, both surfaces white squamose or pubescent, margin dentate, apex obtuse; calyx tube narrowly funnelform, ca. 6 × 1 cm; segments narrowly lanceolate, ca. 1 × 0.3 cm. Female flowers and fruit not seen.

Thickets on mountain slopes; ca. 900 m. Guizhou [Indonesia, Malaysia, Nepal, Thailand, Vietnam].

**27. *Trichosanthes pedata*** Merrill & Chun, Sunyatsenia 2: 20. 1934.

趾叶栝楼 zhi ye gua lou

*Trichosanthes pedata* var. *yunnanensis* C. Y. Cheng & C. H. Yueh.

Stem slender, striate, grooved, glabrous or pubescent at nodes. Leaves 3–5-foliolate; petiole 2.5–6 cm; leaflets abaxially pale green, lanceolate or oblong-oblancheolate, 9–12 × 2.5–3.5 cm, membranous, abaxially glabrous, adaxially hispidulous or white punctate, remotely denticulate, acuminate; petiolule 2–5(–11) mm. Male raceme 14–19 cm; peduncle and pedicels brown pubescent; bracts obovate or rhombic-ovate, 1–1.5 × ca. 0.8 cm, pubescent, margin entire or dentate, apex acuminate. Female flowers solitary; calyx tube cylindric, ca. 3 × 5 cm; ovary ovoid, ca. 1.5 × 0.8 cm, glabrous. Fruiting peduncle 1(–3) cm; fruit orange-yellow, globose, 5–6 cm, smooth. Seeds brown, ovoid, tumid, 1–1.2 × ca. 0.8 cm, base triangular, apex rounded. Fl. Jun–Aug, fr. Jul–Dec.  $2n = 22$ .

Open forests along valleys, thickets; 200–1500 m. Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Yunnan [Vietnam].

**28. *Trichosanthes quinquefolia*** C. Y. Wu ex C. Y. Cheng & C. H. Yueh, Acta Phytotax. Sin. 18: 351. 1980.

木基栝楼 mu ji gua lou

Stems striate, glabrous or pubescent at nodes. Petiole 3–4 cm, pubescent; leaf blade 3–5-foliolate; leaflets sessile; median leaflet abaxially pale green, lanceolate, 15–23 × 2–4 cm, membranous or thinly papery, abaxially glabrous, adaxially hispidulous or white punctate, base cuneate, margin entire, apex acuminate. Male raceme 11–26 cm; peduncle striate, pubescent, 5–15-flowered; bracts rhombic, 7–10 × ca. 5 mm, pubescent, margin crenate, apex obtuse; calyx tube narrowly funnelform, ca. 3 × 0.7 cm, densely pubescent; segments linear-lanceolate,

(3–)5–8 × ca. 3 mm, pubescent, margin entire, apex acuminate. Female flowers unknown. Fruit oblong, ca. 6 × 4 cm, smooth, apex acute. Seeds brown, ovoid-oblong, tumid, 12–15 × 8–10 mm, base rounded. Fl. Aug–Sep, fr. Oct–Nov.

Open forests; 900–1400 m. S Yunnan [Laos].

**29. *Trichosanthes pilosa*** Loureiro, Fl. Cochinch. 2: 588. 1790.

全缘栝楼 quan yuan gua lou

*Trichosanthes chingiana* Handel-Mazzetti; *T. himalensis* C. B. Clarke; *T. himalensis* var. *indivisa* Chakravarty; *T. okamotoi* Kitamura; *T. ovigera* Blume; *T. ovigera* var. *sikkimensis* Kundu.

Stems slender, grooved, pubescent. Petiole 4–12 cm, striate, densely pubescent; leaf blade ovate-cordate to suborbicular, 7–19 × 7–8 cm, papery, unlobed or very shortly 3-lobed or 3–5-lobed to middle or to base; median lobe ovate, oblong, or obovate-oblong, abaxially pubescent, adaxially glabrous or very shortly puberulent, margin distantly denticulate or dentate, apex acuminate. Male peduncle 10–26 cm, striate, densely pubescent; bracts lanceolate or oblanceolate, ca. 1.6 × 0.5–0.6 cm, attenuate to base, margin triangular-dentate, apex acuminate; calyx tube subcylindric, slightly dilated at apex, ca. 5 cm; segments triangular-ovate, 7–10 × 2–3 mm, entire. Female flowers solitary; pedicel 1–1.3 cm, striate, densely pubescent; calyx tube cylindric, 2–5 × 0.2–0.3 cm, glabrous or pubescent; ovary ovoid, 1–1.5 × 0.3–0.5 cm. Fruit ovoid or oblong, 5–7 × 2.5–4 cm, smooth, base rounded, apex acuminate, beaked. Seeds subquadrate, 7–9 × 7–8 mm, longitudinally surrounded by 2 thick ridges, thick near middle; 3-loculed with 2 lateral locules empty. Fl. May–Sep, fr. Sep–Dec.  $2n = 22$ .

Thickets along valleys, open forests on mountain slopes; 700–2500 m. Guangdong, Guangxi, Guizhou, Yunnan [India, Indonesia, Japan, Nepal, Thailand, Vietnam].

One of us (Jeffrey) treats the following three species (i.e., *Trichosanthes baviensis*, *T. trichocarpa*, and *T. cucumeroides*) as synonyms of *T. pilosa*.

**30. *Trichosanthes baviensis*** Gagnepain, Bull. Mus. Natl. Hist. Nat. 24: 379. 1918.

短序栝楼 duan xu gua lou

Stems slender, grooved, glabrous or pubescent. Petiole slender, 4–9 cm, striate, densely pubescent; leaf blade abaxially pale green, adaxially deep green, ovate, 5–20 × 5–13 cm, thinly membranous, unlobed, abaxially pubescent, adaxially puberulent, margin denticulate, apex acuminate. Male flowers in corymb, ca. 2 cm; pedicel 1–1.5 cm, pubescent; bracts absent; calyx tube dilated at apex, ca. 2 cm, pubescent; segments narrowly triangular, ca. 3 mm. Female flowers solitary; pedicel ca. 7 mm, pubescent; ovary oblong, 8–10 mm, densely pubescent. Fruit ovoid, 3.5–5 × ca. 3.5 cm, smooth, glabrous, beaked. Seeds unknown. Fl. Apr–May, fr. May–Sep.

• Evergreen broad-leaved forests or thickets; 600–1500 m. Guangxi, SW Guizhou, S and SE Yunnan.

One of us (Jeffrey) treats this taxon as a synonym of *Trichosanthes pilosa*.

**31. *Trichosanthes trichocarpa*** C. Y. Wu ex C. Y. Cheng & C. H. Yueh, *Acta Phytotax. Sin.* 18: 340. 1980.

杏籽栝楼 xing zi gua lou

Stems slender, grooved, puberulent. Petiole slender, 7–8 cm, striate, puberulent; leaf blade abaxially pale green, adaxially deep green, broadly cordate, 10–16 × 7–13 cm, papery, unlobed or irregularly shortly 3-lobed; lobes triangular, abaxially pubescent, adaxially sparsely hairy, margin entire or denticulate, apex acuminate to long acuminate. Flowers unknown. Fruiting peduncle 3–4 cm, striate, puberulent; fruit yellow or orange-red, ovoid-oblong or oblong, 7–9 × 7–8 cm, densely white villous, beaked. Seeds obovate-triangular, 1–1.1 × ca. 1 cm, 3-loculed with 2 lateral locules narrow. Fr. Oct–Nov.

• Forests on mountain slopes, roadsides; 2100–2400 m. S and SW Yunnan.

One of us (Jeffrey) treats this taxon as a synonym of *Trichosanthes pilosa*.

**32. *Trichosanthes cucumeroides*** (Seringe) Maximowicz in Franchet & Savatier, *Enum. Pl. Jap.* 1: 172. 1873.

王瓜 wang gua

Stems slender, branched, grooved, pubescent. Petiole 3–10 cm, striate, densely pubescent; leaf blade abaxially pale green, adaxially deep green, broadly ovate or orbicular, 5–13(–19) × 5–12(–18) cm, papery, usually shortly 3–5-lobed, sometimes unlobed; lobes triangular or ovate to obovate-oblong, abaxially densely shortly pubescent, adaxially tomentose, margin denticulate or serrate, apex obtuse or acuminate. Male peduncle 5–10 cm, striate, pubescent; bracts linear-lanceolate, 2–3 mm, pubescent, entire; calyx tube 6–7 cm, pubescent; segments linear-lanceolate, 3–6 × ca. 1.5 mm, entire, acuminate. Female flowers solitary; pedicel 0.5–1 cm; ovary oblong, densely pubescent. Fruiting peduncle 5–20 mm, pubescent; fruit orange-red, ovoid, ovoid-oblong, or globose, 6–7 × 4–5.5 cm, smooth, beaked. Seeds deep brown, oblong or triangular-ovate, 7–12 × 7–14 mm, 3-loculed; 2 lateral ones large, ca. 4.5 mm in diam. Fl. May–Aug, fr. Aug–Nov.

Dense forests along valleys, open forests on mountain slopes; (200–)600–1700 m. Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, SE Xizang, Zhejiang [India, Japan].

One of us (Jeffrey) treats this species and its varieties as synonyms of *Trichosanthes pilosa*.

- 1a. Fruit ovoid or ovoid-oblong.
  - 2a. Seeds oblong, middle ridge as broad as 2 lateral locules ..... 32a. var. *cucumeroides*
  - 2b. Seeds triangular, 2 lateral locules narrow ..... 32b. var. *hainanensis*
- 1b. Fruit globose or narrowly oblong.
  - 3a. Fruit narrowly oblong ..... 32c. var. *stenocarpa*
  - 3b. Fruit globose ..... 32d. var. *dicaelosperma*

**32a. *Trichosanthes cucumeroides* var. *cucumeroides***

王瓜(原变种) wang gua (yuan bian zhong)

*Bryonia cucumeroides* Seringe in Candolle, *Prodr.* 3: 308. 1828; *Trichosanthes cavaleriei* H. Léveillé; *T. chinensis* Seringe; *T. cucumeroides* var. *formosana* (Hayata) Kitamura; *T. formosana* Hayata; *T. ovigera* Blume subsp. *cucumeroides* (Seringe) C. Jeffrey.

Fruit ovoid or ovoid-oblong. Seeds oblong, middle ridge as broad as 2 lateral locules.

Guangdong, Guangxi, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan].

**32b. *Trichosanthes cucumeroides* var. *hainanensis*** (Hayata) S. K. Chen, *Bull. Bot. Res.*, Harbin 5(2): 117. 1985.

海南栝楼 hai nan gua lou

*Trichosanthes hainanensis* Hayata, *Icon. Pl. Formosan.* 10: 8. 1921.

Fruit ovoid or ovoid-oblong. Seeds triangular-ovate, with middle ridge broad; 2 lateral locules narrow, ca. 2.5 mm in diam.

• Guangdong, Guangxi, Hainan.

**32c. *Trichosanthes cucumeroides* var. *stenocarpa*** Honda, *Bot. Mag. (Tokyo)* 54: 223. 1941.

狭果草栝楼 xia guo cao gua lou

*Trichosanthes matsudae* Hayata.

Fruit narrowly oblong, 7–9 × 2.5–4 cm.

Taiwan [Japan].

**32d. *Trichosanthes cucumeroides* var. *dicaelosperma*** (C. B. Clarke) S. K. Chen, *Bull. Bot. Res.*, Harbin 5(2): 118. 1985 [“*dicoelosperma*”].

波叶栝楼 bo ye gua lou

*Trichosanthes dicaelosperma* C. B. Clarke in J. D. Hooker, *Fl. Brit. India* 2: 609. 1879; *T. ascendens* C. Y. Cheng & C. H. Yueh.

Fruit globose or oblong. Seeds compressed; 2 lateral locules suboblong.

Dense forests; 600–1200 m. Guangxi, SE Xizang [India].

**33. *Trichosanthes tetragonosperma*** C. Y. Cheng & C. H. Yueh, *Acta Phytotax. Sin.* 12: 425. 1974.

方籽栝楼 fang zi gua lou

Stems slender, grooved, puberulent. Petiole 2–4 cm, twisted, striate, puberulent; leaf blade adaxially green, narrowly ovate, 8.5–11.5 × 4–5 cm, papery, abaxially glabrous or puberulent on veins, adaxially glabrous, apex shortly acuminate. Flowers unknown. Fruiting peduncle slender, 3–4 cm, striate, glabrous; fruit orange-yellow or red, ovoid, 6.5–11 × 4–5.5 cm, smooth, glabrous, base rounded or obtuse, apex acute. Seeds deep brown, 4-angled, ca. 1 × 1–1.2 cm, with narrow middle ridge, base concave, apex triangular, 3-loculed; 2 lateral locules broad, turgid and empty. Fr. Nov–Jan of next year.

• Forests; 1300–1600 m. SE Yunnan.

## 22. CYCLANTHERA Schrader, Index Sem. Hort. Acad. Goett. 1831: 2. 1831.

小雀瓜属 xiao que gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, climbing, annual or perennial. Tendrils simple or 2- to many fid. Leaves undivided, divided, or pedately 5–7-foliolate. Plants monoecious. Male flowers in raceme or panicle; calyx tube cup-shaped or cupular; segments 5, subulate, sometimes almost obsolete; corolla rotate, 5-partite; segments broadly ovate-oblong, usually acute; stamen 1; filament very short; anther horizontal, 1-celled, circular. Female flowers solitary, binary, or 3-fasciculate; calyx and corolla as in male flowers; ovary ovoid, 1-locular; style very short; stigma large, orbicular. Fruit ovoid or reniform,  $\pm$  fleshy, setose or setiform, rarely glabrous. Seeds few to numerous, compressed, angled, 2-lobed at apex and base.

About 20 species: tropical America; one species (introduced) in China.

**1. Cyclanthera pedata** (Linnaeus) Schrader, Index Sem. Hort. Acad. Goett. 1831: 2. 1831.

小雀瓜 xiao que gua

*Momordica pedata* Linnaeus, Sp. Pl. 2: 1009. 1753.

Plants annual. Stem robust, multibranched, glabrous. Petiole 5–15 cm; leaf blade 5-pedatisect, leaflets elliptic or elliptic-lanceolate, median leaflet 7–16  $\times$  2–6 cm, base cuneate, margin dentate, apex acuminate; lateral leaflets 5–14  $\times$  2–4 cm. Tendrils 2-fid. Male flowers in a panicle; peduncle 10–23 cm, 20–50-flowered; pedicels filiform, 4–10 mm; calyx tube cupular,

ca. 2  $\times$  3–4 mm; segments linear, ca. 2 mm; corolla yellow; segments ovate-triangular, 1.5–2  $\times$  2–2.5 mm, puberulent; filaments connate; anthers circular, 1.5–2 mm. Female flowers: calyx and corolla as in male flowers; ovary 2–3 mm; style 0.5–0.7 mm. Fruit narrowly oblong to narrowly elliptic, 5–7  $\times$  2.5–3 cm, setose, apex acuminate, 8–10-seeded. Seeds black, suboblong, 10–12  $\times$  7–8 mm, margin dentate. Fl. and fr. May–Oct.

Cultivated. Xizang, Yunnan [cultivated in tropics of New and Old Worlds, not known wild].

The fruit is used as a vegetable.

## 23. SECHIUM P. Browne, Civ. Nat. Hist. Jamaica, 355. 1756, nom. cons.

佛手瓜属 fo shou gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Chayota* Jacquin; *Chocho* Adanson.

Herbs, scandent, perennial. Roots tuberous. Tendrils 3–5-fid. Leaf blade cordate, membranous. Plants monoecious; flowers white. Male flowers in a raceme; calyx tube semiglobose; segments 5; corolla rotate, 5-partite; segments ovate-lanceolate, apex acute; stamens 3, inserted on base of calyx tube; filaments connate; anthers free, one 1-celled, two 2-celled; anther cells flexuous; pistillode absent. Female flowers solitary or binary, usually in same axil as male flowers; calyx and corolla as in male flowers; ovary fusiform, 1-locular, setose; style short; stigma 5-lobed; lobes reflexed, with only 1 pendulous ovule. Fruit obovoid, fleshy, sulcate at apex. Seed 1, large, ovate, compressed, woody, cotyledons large.

About five species: Mexico and Central America; one species (introduced) in China.

**1. Sechium edule** (Jacquin) Swartz, Fl. Ind. Occid. 2: 1150. 1800.

佛手瓜 fo shou gua

*Sicyos edulis* Jacquin, Enum. Syst. Pl. 32. 1760.

Stem angular-sulcate. Petiole slender, 5–15 cm, glabrous; leaf blade suborbicular, membranous, abaxially puberulent, adaxially slightly scabrous, base cordate, margin dentate, apex acuminate. Male flowers 10–30 on 8–30 cm peduncle, pedicels 1–6 mm; calyx tube short; segments explanate, 5–7 mm; corolla

rotate, 12–17 mm; segments ovate-lanceolate. Female pedicel 1–1.5 cm; calyx and corolla as in male flowers; ovary obovoid, 5-angled; style 2–3 mm; stigma ca. 2 mm wide. Fruit pale green, obovoid, 8–15  $\times$  6–8 cm, 5-sulcate in upper part, slightly hispid. Seed ca. 10  $\times$  7 cm, compressed. Fl. Jul–Sep, fr. Aug–Oct.

Commonly cultivated in S China [native to Mexico; commonly cultivated in warm parts of the world].

The fruit is used as a vegetable.

## 24. MELOTHRIA Linnaeus, Sp. Pl. 1: 35. 1753.

美洲马陵儿属 mei zhou ma jiao er shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Landersia* Macfadyen.

Herbs, climbing or trailing, annual. Leaves petiolate, usually palmately lobed. Tendrils simple. Plants monoecious. Male flowers shortly racemose or subcorymbose; calyx campanulate to cylindrical, 5-lobed; corolla yellow, rotate; segments 5; stamens 3, inserted

above middle of tube; anthers two 2-celled, one 1-celled; anther cells straight or slightly curved; connective not produced; rudimentary ovary subglobose. Female flowers solitary, usually coaxillary with male flowers; calyx and corolla as in male flowers; ovary globose to fusiform, 3-locular; ovules numerous, horizontal; style surrounded at base by an annular disk; stigmas 3. Fruit globose to oblong. Seeds numerous, compressed, smooth.

About 12 species: Neotropics; one species (introduced) in China.

**1. *Melothria pendula*** Linnaeus, Sp. Pl. 1: 35. 1753.

美洲马陵儿 mei zhou ma jiao er

Stems slender, setulose to glabrous. Petiole slender, retrorsely hispid, 0.9–5 cm; leaf blade adaxially dark green, abaxially paler, ovate to pentagonal, membranous to herbaceous, abaxially shortly hispid or scabrid, adaxially hispid or scabrid-punctate, cordate, unlobed or shallowly to deeply 3–5-lobed, apex obtuse to acuminate, apiculate. Male flowers 3–12 in axillary fascicles, often with an accompanying solitary flower; peduncle slender, 0.5–3.5 cm; pedicels slender, 1.5–9 mm; ca-

lyx campanulate, 1.5–3.5 mm, shortly pubescent to glabrous; corolla yellow; segments spreading, obovate-oblong, 1.5–2.5 mm, emarginate, apiculate; stamens 3, two 2-celled, one 1-celled; filaments short, ca. 0.5 mm; anthers ellipsoid. Female flowers solitary, often coaxillary with male flowers; pedicel slender, 0.7–3.5 cm; calyx and corolla as in male flowers. Fruit black when ripe, subglobose to ellipsoid, 0.8–1.9 × 0.8–1.2 cm. Seeds pallid, ovate, compressed, minutely fimbriate, 4–5 × 2–2.8 mm, 0.6–0.9 mm thick. Fl. and fr. Jan–Dec.

Ruderal weeds; low elevations. Taiwan [native to the Americas (S United States to Argentina); introduced in SE Asia].

**25. *ZEHNERIA*** Endlicher, Prodr. Fl. Norfolk. 69. 1833.

马陵儿属 ma jiao er shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Neochamandra* W. J. de Wilde & Duyfjes; *Pilogyne* Ecklon ex Schrader.

Herbs, climbing or trailing, annual or perennial. Leaves petiolate, unlobed or 3–5-lobed or -partite. Tendrils slender, simple. Plants monoecious or dioecious. Male flowers axillary, solitary or few, long pedicellate, or in a raceme-cyme or subumbel; calyx campanulate, 5-lobed; corolla campanulate, white or yellow-white, often becoming cream colored with age; segments 5; stamens 3, inserted at bottom or on upper part of tube; filaments shorter to longer than anthers; anthers all 2-celled or sometimes two 2-celled and one 1-celled, oblong or ovoid-oblong; anther cells straight or slightly curved; connective produced or not produced; rudimentary ovary variable in form. Female flowers solitary or paired or a few in a cyme, often coaxillary with male flowers; calyx and corolla as in male flowers; ovary globose to ellipsoid-fusiform, 3-locular; ovules few to numerous, horizontal; style surrounded at base by an annular disk; stigmas 3. Fruit globose or ellipsoid to fusiform, indehiscent. Seeds few to numerous, ovate, compressed, not sculptured.

About 55 species: Old World tropics; four species in China.

1a. Stamens inserted at bottom of tube; filaments longer than anthers.

2a. Plants monoecious; fruit globose or ovoid, red ..... 1. *Z. bodinieri*

2b. Plants dioecious; fruit oblong, purplish black ..... 2. *Z. guamensis*

1b. Stamens inserted on upper part of tube; filaments not longer than anthers.

3a. Fruit globose or oblong, less than 1.8 cm ..... 3. *Z. japonica*

3b. Fruit fusiform, attenuate, 3–4 cm, 1–1.5 cm in diam. .... 4. *Z. wallichii*

**1. *Zehneria bodinieri*** (H. Léveillé) W. J. de Wilde & Duyfjes, Thai Forest Bull., Bot. 32: 17. 2004.

钮子瓜 niu zi gua

*Melothria bodinieri* H. Léveillé, Fl. Kouy-Tchéou, 122. 1914–1915; *M. perpusilla* Cogniaux var. *subtruncata* Cogniaux; *Pilogyne bodinieri* (H. Léveillé) W. J. de Wilde & Duyfjes.

Plants scandent. Stem and branches slender, sulcate-angular, glabrous or sparsely pubescent. Petiole slender, 2–5 cm, glabrous; leaf blade broadly ovate or rarely triangular-ovate, 4–12 × 3–10 cm, membranous, abaxially subglabrous, adaxially scabrous, basal sinus semicircular, rarely subtruncate, margin undulate-denticulate, undivided or sometimes shortly 3–5-lobed, apex acute or shortly acuminate. Tendrils filiform, simple, gla-

brous. Plants monoecious. Male flowers often 3–9 in a subcapitate or cymose inflorescence; peduncle slender, 1–4 cm, glabrous; pedicels 1–4 mm; calyx tube campanulate, 2–3 × 1–2 mm, glabrous or puberulent; segments narrowly triangular, ca. 0.5 mm; corolla white; segments ovate or ovate-oblong, 2–2.5 mm, abaxially puberulent, apex subacute; stamens two 2-celled, one 1-celled, sometimes all 2-celled, inserted at base of calyx tube; filaments ca. 2 mm, puberulent; anthers ovoid, 0.6–0.7 mm. Female flowers solitary, rarely a few in an umbel; ovary ovoid. Fruiting pedicel slender, 0.5–1 cm, glabrous; fruit red when ripe, baccate, globose, 1–1.4 cm in diam., smooth. Seeds ovate-oblong, compressed, smooth, ca. 5 × 3–3.5 mm, marginate. Fl. Apr–Aug, fr. Aug–Nov.

Forest margins or roadsides on mountain slopes; 500–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Yunnan [India, Indonesia, Laos, Myanmar, Sri Lanka, Thailand, Vietnam].

The Chinese record of *Zehneria maysorensis* (Wight & Arnott) Arnott (FRPS 73(1): 173. 1986) is based on a misidentification of *Z. bodinieri*.

**2. *Zehneria guamensis*** (Merrill) Fosberg, Smithsonian Contr. Bot. 45: 15. 1980.

台湾马陵儿 tai wan ma jiao er

*Melothria guamensis* Merrill, Philipp. J. Sci., C, 9: 151. 1914; *M. kelungensis* (Hayata) Hayata ex Makino & Nemoto; *M. liukiensis* Nakai; *Zehneria kelungensis* Hayata; *Z. liukiensis* (Nakai) E. H. Walker.

Plants scandent. Stems and branches slender, elongate, sulcate-angular, glabrous or rarely puberulent. Tendrils filiform, simple. Petiole slender, 1.5–5 cm; leaf blade abaxially pale green, adaxially deep green, broadly ovate, 4–8 × 4–8 cm, membranous, scabrous, basal sinus semicircular, rarely hastate, undivided or somewhat 3–5-lobed, margin irregularly denticulate or crenate-dentate, apex acute and shortly mucronate or shortly acuminate. Plants dioecious. Male peduncle slender, 1.5–5 cm, apex 10–30-flowered; pedicels spreading, 3–6 mm; calyx tube broadly campanulate, ca. 3 mm, base acute; segments subulate, ca. 0.5 mm; corolla pale yellow, puberulent; segments ovate, ca. 2.5 mm, 3-veined, acute; filaments short, ca. 1 mm, puberulent; anthers ovoid, 0.8–1 mm. Female flowers solitary or sometimes in few-flowered fascicle; pedicels 1–1.5 cm; ovary oblong. Fruit purplish black when ripe, baccate, ovate-oblong, 1–1.5(–3) cm × 7–10 mm, smooth, glabrous, both ends obtuse. Seeds gray-white, ovate-oblong, 2–3 × ca. 2 mm, base slightly attenuate, marginate. Fl. and fr. Mar–Dec.

Forests; 400–1400 m. Guangdong, Taiwan, Yunnan [Japan; Pacific islands (Guam)].

De Wilde and Duyfjes (Blumea 51: 75. 2006) recorded *Zehneria repanda* (Blume) C. Simmons (*Pilogyne repanda* (Blume) W. J. de Wilde & Duyfjes) from Taiwan, on the basis of a single collection (*van Steenis* 20752), which we have not seen. It differs from *Z. guamensis* in its smaller, 0.5–0.8(–1) cm in diam., globose fruit. It is said to be a montane species of forest margins and scrub, at 1400–2700 m.

**3. *Zehneria japonica*** (Thunberg) H. Y. Liu, Bull. Natl. Mus. Nat. Sci., Taichung 1: 40. 1989.

马陵儿 ma jiao er

*Bryonia japonica* Thunberg in Murray, Syst. Veg., ed. 14, 870. 1784; *Melothria argyi* H. Léveillé; *M. formosana* Hayata; *M. indica* Loureiro; *M. japonica* (Thunberg) Maximowicz ex Cogniaux; *M. leucocarpa* (Blume) Cogniaux var. *rubella* Gagnepain; *Neoachmandra indica* (Loureiro) W. J. de Wilde & Duyfjes; *N. japonica* (Thunberg) W. J. de Wilde & Duyfjes; *Zehneria indica* (Loureiro) Keraudren; *Z. omeiensis* Z. Y. Zhu.

Plants scandent. Stems and branches filiform, glabrous. Petiole slender, 2.5–3.5 cm, villous at first, glabrescent; leaf blade abaxially pale green, adaxially dark green, polymorphic,

triangular-ovate, ovate-cordate, or hastate, 3–5 × 2–4 cm, membranous, unlobed or 3–5-lobed, abaxially glabrous, adaxially scabrous, apex acute or rarely shortly acuminate. Plants monoecious. Male flowers solitary, or 2 or 3 in a raceme; peduncle slender, very short, glabrous; pedicels filiform, 3–5 mm, glabrous; calyx broadly campanulate, ca. 1.5 mm, base acute or obtuse; corolla pale yellow, puberulent; segments oblong or ovate-oblong, 2–2.5 × 1–1.5 mm; stamens 3, two 2-celled and one 1-celled, sometimes all 2-celled; filaments short, ca. 0.5 mm; anthers ovoid-oblong or oblong, ca. 1 mm, pubescent; anther cells curved, puberulent; connective broad, apex produced. Female flowers solitary or rarely paired in same axil as male flowers; pedicel filiform, 1–2 cm, glabrous; corolla broadly campanulate, ca. 2.5 mm in diam.; segments lanceolate, 2.5–5 × 1–1.5 mm, apex slightly obtuse; ovary narrowly ovoid, 3.5–4 × 1–2 mm; style short, ca. 1.5 mm; stigmas 3; staminodes glandular. Fruit orange or red, oblong or attenuately ovoid, 1–1.5 cm × 5–8(–10) mm, both ends obtuse. Seeds gray-white, ovate, 3–5 × 3–4 mm, base attenuate, margin obscure. Fl. Apr–Jul, fr. Jul–Oct.

Moist places in forests, roadsides, thickets; 500–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Nepal, Philippines, Vietnam].

**4. *Zehneria wallichii*** (C. B. Clarke) C. Jeffrey, Kew Bull. 34: 802. 1980.

锤果马陵儿 chui guo ma jiao er

*Melothria wallichii* C. B. Clarke in J. D. Hooker, Fl. Brit. India 2: 626. 1879; *Neoachmandra wallichii* (C. B. Clarke) W. J. de Wilde & Duyfjes.

Plants slender. Stems and branches glabrous. Tendrils filiform, glabrous, simple. Petiole slender, 3–4 cm, sparsely white hirsute; leaf blade ovate or triangular, 6–7 × 6–7 cm, membranous, abaxially more scabrous, white punctate, adaxially sparsely hirsute on veins, base truncate or with ca. 5 mm deep sinus, margin sparsely dentate, apex acute. Plants dioecious. Male flowers usually 7–10 in a raceme, or solitary; rachis filiform, 1–2 cm, puberulent; pedicels slender, 0.5–1 cm; calyx tube campanulate, 1–2 × ca. 2 mm, glabrous; segments subulate, ca. 0.5 mm; corolla yellow-white; segments explanate, ovate or oblong, apex acute or slightly obtuse; stamens 3, two 2-celled, one 1-celled, inserted on base of calyx tube; filaments short; anthers oblong, 1–1.2 mm, glabrous; anther cells erect; connective narrow, not produced. Female flowers solitary; pedicels slender, 1–1.5 cm, puberulent; ovary fusiform, ca. 1 × 0.2 cm, subglabrous, both ends attenuate. Fruiting pedicel 1–2 cm, sparsely hirsute; fruit fusiform, 3–4 × 1–1.5 cm, both ends attenuate. Seeds gray-white, oblong or ovate, compressed, 5–7 × 3–4 mm, smooth, marginate. Fl. Jun–Aug, fr. Aug–Nov.

Mountain slopes; 800–1000 m. Yunnan [India, Myanmar, Thailand].

## 26. CUCUMIS Linnaeus, Sp. Pl. 2: 1011. 1753.

黄瓜属 huang gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, scandent or creeping, annual. Stem and branches scabrous, hispid. Tendrils slender, simple. Leaf blade almost orbicular,

reniform, or cordate-ovate, undivided or palmately 3–7-lobed. Plants monoecious, rarely dioecious, or flowers hermaphroditic. Male flowers fascicled or solitary; calyx tube campanulate, 5-lobed; segments subulate; corolla rotate or subcampanulate, 5-lobed; segments oblong or ovate; stamens 3, free, inserted on corolla tube; anthers oblong, one 1-celled, two 2-celled; anther cells linear, reflexed or curved; connective produced; rudimentary ovary glandular. Female flowers solitary or fascicled; calyx and corolla as in male flowers; staminodes 3, subulate; ovary cylindric; ovules numerous, horizontal; style short; stigmas 3–5. Fruit polymorphic, fleshy, indehiscent, smooth or verrucose. Seeds numerous, compressed, emarginate.

About 32 species: tropical and temperate regions, most species in Africa; four species in China.

- 1a. Fruit smooth; ovary hairy ..... 1. *C. melo*
- 1b. Fruit and ovary muriculate or verrucose or sparsely tuberculate, not hairy.
  - 2a. Fruit oblong or cylindric, (5–)10–50 cm ..... 2. *C. sativus*
  - 2b. Fruit oblong, smaller than 5 cm.
    - 3a. Fruit oblong, at least twice as long as broad, muricate ..... 3. *C. hystrix*
    - 3b. Fruit obovoid, only slightly longer than broad, sparsely obscurely tuberculate ..... 4. *C. debilis*

# 1. *Cucumis melo* Linnaeus, Sp. Pl. 2: 1011. 1753.

甜瓜 tian gua

Plants creeping. Stems and branches scabrous, puberulent, or hispid. Tendrils filiform, puberulent. Petiole 7–12 cm, setose; leaf blade suborbicular or reniform, 6–15 × 6–15 cm, papery, abaxially hispid, adaxially scabrous, undivided or 3–7-lobed, dentate; sinus truncate or rounded. Plants monoecious or flowers bisexual. Male flowers 1 or 2 to several, fasciculate; pedicels filiform, 0.5–4 cm, pubescent; calyx tube narrowly campanulate, 3–8 mm, densely hispidulous to white villous; segments subulate or linear, 2–4 × 0.4–1.2 mm; corolla yellow; tube 1–2 mm; segments ovate-oblong to broadly ovate or obovate, 3–24 × 2.5–20 mm, obtuse; anther cells flexuous. Female flowers solitary; ovary ellipsoid or fusiform, 4–11 × 2–5 mm, densely white lanate, villous or puberulent; style 1–2 mm; stigmas 3, 2–2.5 mm. Fruit very variable in size, shape, color, odor, and taste. Seeds numerous, yellow-white, ovate-oblong, 4–8 × 2.4–4 mm, smooth, base rounded, apex acute, emarginate. Fl. and fr. May–Sep.

Farmlands, roadsides. Anhui, Jiangsu, Shandong, Xinjiang, C and E China; also cultivated throughout China [native to Old World tropics and subtropics; introduced in New World tropics; widely cultivated in tropical and temperate countries].

- 1a. Ovary densely villous or white lanate, with spreading hairs; (cultivated) fruit sweet ..... 1a. subsp. *melo*
- 1b. Ovary very shortly and densely puberulent, hairs appressed; (cultivated) fruit not sweet ..... 1b. subsp. *agrestis*

## 1a. *Cucumis melo* subsp. *melo*

甜瓜(原亚种) tian gua (yuan ya zhong)

*Cucumis bisexualis* A. M. Lu & G. C. Wang.

Ovary and young fruit pilose or lanate, with spreading hairs; fruit in cultivated forms fragrant and sweet.

Farmlands, roadsides. Anhui, Jiangsu, Shandong, Xinjiang; also cultivated throughout China [native to Old World tropics and subtropics; introduced in New World tropics; widely cultivated in tropical and temperate countries].

The fruit is used as a refreshing dessert in summer; the plants are used medicinally.

## 1b. *Cucumis melo* subsp. *agrestis* (Naudin) Pangalo in Zhukovskii, Zemledel'ch. Turtsiya, 534. 1933.

菜瓜 cai gua

*Cucumis melo* var. *agrestis* Naudin, Ann. Sci. Nat., Bot., sér. 4, 11: 73. 1859; *Bryonia callosa* Rottler; *C. acidus* Jacquin; *C. callosus* (Rottler) Cogniaux & Harms.

Ovary and young fruit sericeous with short appressed hairs; fruit in cultivated forms mostly not fragrant and not sweet.

Farmlands, roadsides. C and E China; commonly cultivated in China [throughout Old World tropics; introduced in New World tropics; also commonly cultivated in E and SE Asia, rarely cultivated elsewhere].

The fruit is used as a vegetable (菜瓜 cai gua).

The forms cultivated in China belong to the 'Conomon' cultivar group (*Cucumis conomon* Thunberg, Nova Acta Regiae Soc. Sci. Upsal. 3: 208. 1780; *C. melo* var. *conomon* (Thunberg) Makino, Bot. Mag. (Tokyo) 16: 16. 1902).

## 2. *Cucumis sativus* Linnaeus, Sp. Pl. 2: 1012. 1753.

黄瓜 huang gua

Plants scandent or creeping. Stem and branches angular, white hispid. Tendrils slender, simple. Petiole 10–16(–20) cm; leaf blade broadly ovate-cordate, 7–20 × 7–20 cm, membranous, margin 3–5-angular or -lobed; lobes triangular, dentate, apex acute or acuminate; sinus half-orbicular. Plants monoecious. Male flowers fasciculate; pedicel filiform, 5–15 mm, puberulent; calyx tube narrowly campanulate, 8–10 mm, densely white pubescent; segments subulate; corolla yellow-white, ca. 2 cm; segments oblong-lanceolate, acute; anthers 3–4 mm; connective ca. 1 mm. Female flowers solitary or fascicled; pedicels pubescent, 1–2 cm; ovary fusiform, muricate. Fruit yellow-green, oblong or cylindric, (5–)10–30(–50) cm, muricate, usually verrucose. Seeds white, small, narrowly ovate, 5–10 mm, emarginate, both ends acute. Fl. and fr. summer.

Forests, thickets, mountain slopes; 700–2000 m. Guangxi, Guizhou, Yunnan; also commonly cultivated in China [NE India, Myanmar, Nepal, Thailand; cultivated in all tropical and temperate countries].

- 1a. Fruit oblong or cylindric, 10–30(–50) cm, muricate, usually verrucose ..... 2a. var. *sativus*

- 1b. Fruit oblong or subglobose, 5–6 cm,  
smooth ..... 2b. var. *hardwickii*

**2a. *Cucumis sativus* var. *sativus***

黄瓜(原变种) huang gua (yuan bian zhong)

Fruit oblong or cylindric, 10–30(–50) cm, muricate, usually verrucose.

Commonly cultivated in China [cultivated in all tropical and temperate countries].

**2b. *Cucumis sativus* var. *hardwickii*** (Royle) Gabaev, Ogorstsy, 47. 1932.

西南野黄瓜 xi nan ye huang gua

*Cucumis hardwickii* Royle, Ill. Bot. Himal. Mts. 1: 220. 1835; *C. sativus* f. *hardwickii* (Royle) W. J. de Wilde & Duyfjes; *C. sativus* [unranked] *hardwickii* (Royle) Alefeld.

Fruit oblong or subglobose, 5–6 cm, smooth.

Forests, thickets, mountain slopes; 700–2000 m. Guangxi, Guizhou, Yunnan [NE India, Myanmar, Nepal, Thailand].

**3. *Cucumis hystrix*** Chakravarty, J. Bombay Nat. Hist. Soc. 50: 896. 1952.

野黄瓜 ye huang gua

*Cucumis muriculatus* Chakravarty.

Plants scandent. Stem and branches angular-sulcate, scabrous, white hirsute. Tendrils filiform, simple. Petiole 6–10 cm; leaf blade broadly ovate or triangular-ovate, 6–13 × 6–10(–12) cm, irregularly 3–5-lobed; lobes triangular, base cordate, mar-

gin dentate, apex acute. Plants monoecious. Male flowers solitary or subfasciculate; calyx tube narrowly campanulate, ca. 6 mm; segments linear, 1–2 mm; corolla yellow; segments ovate-oblong, 5–6 × 3–4 mm; filaments ca. 1 mm; anthers ca. 2 mm. Female flowers solitary; pedicels ca. 5 mm; calyx and corolla as in male flowers; corolla 8–10 mm; ovary oblong-ovoid, ca. 10 × 4 mm, densely yellow-brown hispid; style 2–3 mm; stigmas 3-lobed. Fruit oblong, 4–5 × 1.5–2.3 cm, muricate, verrucose. Seeds narrowly ovate, 3–4 mm, both surfaces smooth, emarginate. Fl. Jun–Aug, fr. Aug–Sep.

Forests, thickets; 800–1500 m. W Yunnan [NE India, Myanmar, Thailand].

**4. *Cucumis debilis*** W. J. de Wilde & Duyfjes, *Adansonia*, sér. 3, 29: 241. 2007.

滇黄瓜 dian huang gua

Plants slender, probably annual, scandent. Stems and branches sparsely to densely minutely aculeate-hispid. Tendrils simple, sparsely aculeate. Petiole 3–5 cm; leaf blade subcircular in outline, 4–7 × 4–7 cm, 3–5-angular or -lobed, margin coarsely serrate-dentate; lobes broadly triangular, base deeply cordate, apex acute. Plants monoecious. Male flowers solitary or paired; calyx tube turbinate-campanulate, 5.5–6 mm; segments linear, ca. 3 mm; corolla ?yellow; segments elliptic 4–6 × ca. 3 mm; filaments slender, ca. 0.5 mm; anthers 2.5–3 mm. Female flowers solitary, sometimes coaxillary with male flowers; pedicels 30–35 mm; calyx and corolla probably similar to male flowers, details unknown. Fruit green, obovoid, sparsely obscurely tuberculate. Seeds unknown. Fl. and fr. Sep.

Yunnan [N Vietnam (ca. 1400 m)].

## 27. *MUKIA* Arnott, Madras J. Lit. Sci. 12: 50. 1840.

帽儿瓜属 mao er gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, scandent, annual, slender, setose. Petiole very short, subglabrous; leaf blade usually 3–7-lobed, base cordate. Tendrils simple. Plants monoecious; flowers small, male flowers fascicled; female flowers usually solitary or in a few-flowered fascicle in same axil as male flowers. Male flowers: calyx campanulate; segments 5, subulate; corolla rotate; segments 5; stamens 3, free, inserted on calyx tube; filaments short; anthers oblong, two 2-celled, one 1-celled; anther cells erect; connective slightly produced; rudimentary ovary glandular. Female flowers: calyx and corolla as in male flowers; staminodes absent or very small; ovary ovoid, hispid; style terete; stigma 2- or 3-lobed, ovules few, horizontal. Berry oblong or globose, small, indehiscent. Seeds horizontal, ovate, compressed, both surfaces scabrous or smooth, marginate.

Three species: tropical and subtropical Africa, Asia, Australia; two species in China.

Renner et al. (BMC Evol. Biol. 7: 58. 2007; doi:10.1186/1471-2148-7-58) presented molecular evidence to show that *Mukia* is an ingroup of *Cucumis*.

- 1a. Fruit globose, fruit coat thickening; seed surfaces scrobiculate, indistinctly marginate ..... 1. *M. maderaspatana*  
1b. Fruit oblong, fruit coat not thickening; seed surfaces indistinctly scrobiculate, marginate ..... 2. *M. javanica*

**1. *Mukia maderaspatana*** (Linnaeus) M. Roemer, Fam. Nat. Syn. Monogr. 2: 47. 1846.

帽儿瓜 mao er gua

*Cucumis maderaspatanus* Linnaeus, Sp. Pl. 2: 1012. 1753; *Bryonia althaeoides* Seringe; *B. cordifolia* Linnaeus; *B. scab-*

*rella* Linnaeus f.; *Coccinia cordifolia* (Linnaeus) Cogniaux; *Melothria althaeoides* (Seringe) Nakai; *M. maderaspatana* (Linnaeus) Cogniaux; *Mukia althaeoides* (Seringe) M. Roemer; *M. scabrella* (Linnaeus f.) Arnott.

Plants scandent or prostrate, all parts densely yellow-brown hispid. Stems many branched, robust, sulcate. Leaf blade

somewhat rigid, ovate or ovate-cordate, 5–9 × 5–9 cm, usually 3–5-lobed, median lobe ovate-triangular, both surfaces scabrous, base cordate, margin irregularly denticulate, apex slightly obtuse. Tendrils moderately robust. Male flowers fascicled; pedicels short or absent; calyx tube campanulate, ca. 2 × 1.5 mm; segments reflexed, subulate, 1–1.5 × ca. 1 mm; corolla yellow; segments ovate-oblong, ca. 2 × 0.5 mm, apex obtuse; filaments short, ca. 0.5 mm, slightly pilose; anthers oblong, ca. 1 mm, ciliate; connective distinct; rudimentary ovary globose. Female flowers solitary or 3–5-fasciculate. Fruiting pedicels extremely short; fruit dark red, globose, ca. 1 cm in diam., smooth. Seeds ovate, ca. 4 × 2.5 mm, ca. 2.5 mm thick, both surfaces scrobiculate, indistinctly marginate. Fl. Apr–Aug, fr. Aug–Dec.

Rocky mountain slopes, thickets; 400–1700 m. Guangdong, Guangxi, Guizhou, Taiwan, Yunnan [tropical Africa and Asia, Australia].

**2. *Mukia javanica*** (Miquel) C. Jeffrey, Hooker's Icon. Pl. 37: t. 3661. 1969.

爪哇帽儿瓜 *zhua wa mao er gua*

*Karivia javanica* Miquel, Fl. Ned. Ind. 1(1): 661. 1856; *Cucumis javanicus* (Miquel) Ghebretinsae & Thulin; *Melothria*

*assamica* Chakravarty; *M. assamica* var. *scabra* Chakravarty; *M. javanica* (Miquel) Cogniaux.

Plants scandent. Stem and branches slender, hispid. Petiole shortly hispid; leaf blade ovate-cordate, 4–6 × 3–5(–7) cm, usually 3–5-lobed, median lobe ovate-triangular, both surfaces shortly hispid, margin dentate, apex acuminate. Tendrils slender, hispid. Male flowers 2 to several, fasciculate, in leaf axils; pedicel very short, 2–3 mm, shortly hispid; calyx tube cupular, 2–2.5 mm; segments erect, subulate, 1.5–2.5 mm; corolla yellow; segments ovate-oblong, 3–4 mm, apex obtuse; stamens inserted on calyx tube; filaments ca. 0.5 mm, puberulent; anthers 1.5–2 mm; connective produced. Female flowers fasciculate in same axil as male flowers; calyx tube cupular; segments triangular, ca. 0.5 × 0.3 mm; corolla segments ovate-oblong, ca. 2.5 × 1.5 mm, 3-veined; ovary ovoid, 3–4 × 1.5–2.5 mm, densely hispid; style ca. 1 mm, apex 3-lobed; staminodes glandular. Fruiting pedicel 2–4 mm, densely hispid; fruit red, oblong, 1–1.5 × ca. 1 cm. Seeds ovate, ca. 4 × 2.5 mm, margin prominent. Fl. Apr–Jul, fr. Jul–Oct.

Forests, grasslands on mountain slopes; 500–1200 m. Guangdong, Guangxi, Taiwan, Yunnan [India, Indonesia, Philippines, Thailand, Vietnam].

## 28. SCOPELLARIA W. J. de Wilde & Duyfjes, Blumea 51: 297. 2006.

云南马陵儿属 *yun nan ma jiao er shu*

Lu Anmin (路安民 *Lu An-ming*); Charles Jeffrey

*Scopella* W. J. de Wilde & Duyfjes, Blumea 51: 34. 2006, not Mains (1939) [Fungi].

Herbs, climbing, annual or perennial. Leaves petiolate, unlobed or lobed. Tendrils simple, hairy. Plants monoecious. Male flowers shortly racemose; calyx campanulate, 5-lobed; corolla yellow; segments 5; stamens 3, inserted on throat of tube; filaments longer than anthers; anthers all 2-celled, anther cells straight; connectives not produced; rudimentary ovary subglobose. Female flowers 1 or 2, often coaxillary with male flowers; calyx and corolla as in male flowers; ovary ellipsoid-globose, 3-locular; ovules numerous, horizontal; style surrounded at base by an annular disk; stigmas 3. Fruit globose to fusiform, indehiscent. Seeds numerous, ovoid-ellipsoid, somewhat compressed, faces scrobiculate.

Two species: SE Asia and W Malaysia; one species in China.

One of us (Lu) does not recognize “micro-genera” such as this; however, for the purposes of this Flora, the treatment by the co-author (Jeffrey) is followed.

**1. *Scopellaria marginata*** (Blume) W. J. de Wilde & Duyfjes, Blumea 51: 297. 2006.

云南马陵儿 *yun nan ma jiao er*

*Bryonia marginata* Blume, Bijdr. 924. 1826; *Melothria marginata* (Blume) Cogniaux; *Scopella marginata* (Blume) W. J. de Wilde & Duyfjes; *Zehneria marginata* (Blume) Keraudren.

Plants scandent, annual. Stem and branches glabrous, angular-sulcate. Petiole slender, 2–3.5 cm, white hirsute; leaf blade ovate-cordate or oblong-hastate, 6–10 × 4–10 cm, membranous, usually 3-lobed; median lobe larger, narrowly triangular or lanceolate-triangular, 5–7 × 1.5–2.5 cm, apex acute; lateral lobes smaller, triangular, 2.5–3.5 × 2–2.5 cm, scabrous on both surfaces, white setose, base truncate or slightly concave, mar-

gin callous-dentate, apex obtuse. Tendrils slender. Male flowers usually 5–15 in a 4–6 cm raceme; pedicels only 2–6 mm, puberulent; calyx tube narrowly campanulate, ca. 1 mm, hirsute; segments subulate, 0.3–0.5 mm; corolla yellow, pubescent; segments ovate-triangular, ca. 1 mm; anthers attenuate, glabrous; connective not produced; pistillodes glandular. Female flowers solitary in axils; pedicels filiform, 3–4 cm; calyx and corolla as in male flowers; ovary narrowly oblong, puberulent; styles short; stigmas enlarged. Fruiting pedicel slender, 3–4 cm, glabrous; fruit ovoid or subglobose, 1.5–1.8 cm × 5–12 mm, base slightly obtuse or attenuate. Seeds ovate, ca. 4 × 2.2 mm, ca. 1 mm thick, base obtuse-rounded, both surfaces scrobiculate, margin prominent.

Sparse forests or roadsides on mountain slopes; 600–800 m. Yunnan [Cambodia, Indonesia, Laos, Myanmar, Philippines, Thailand, Vietnam].

## 29. DIPLOCYCLOS (Endlicher) T. Post & Kuntze, Lex. Gen. Phan. 178. 1903 [*"Diplocyclus"*].

毒瓜属 du gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Bryonia* [unranked] *Diplocyclos* Endlicher, Prodr. Fl. Norfolk. 68. 1833.

Herbs, scandent. Tendrils 2-fid. Leaf blade palmately 5-lobed. Plants monoecious. Flowers small, fasciculate, often male and female flowers together in axils. Male flowers: calyx tube broadly campanulate; segments short; corolla broadly campanulate; segments ovate; stamens 3, free, inserted on calyx tube; filaments short; anthers ovoid, one 1-celled, other 2-celled; anther cells linear, slightly flexuous. Female flowers: calyx and corolla as in male flowers; staminodes 3; ovary globose or ovoid, with 3 placentas; ovules few, horizontal; style slender; stigmas 3, 2-lobed. Fruit baccate, globose or ovoid. Seeds strongly margined, surfaces slightly scrobiculate at middle.

Four species: tropical Africa, Asia, Australia; one species in China.

**1. *Diplocyclos palmatus*** (Linnaeus) C. Jeffrey, Kew Bull. 15: 352. 1962.

毒瓜 du gua

*Bryonia palmata* Linnaeus, Sp. Pl. 2: 1012. 1753; *B. affinis* Endlicher; *Bryonopsis affinis* (Endlicher) Cogniaux; *B. laciniosa* (Linnaeus) Naudin var. *erythrocarpa* Naudin; *B. laciniosa* var. *walkerii* Chakravarty; *Ilocania pedata* Merrill.

Root tuberous. Stems slender, glabrous. Tendrils glabrous. Petiole 4–6 cm, slightly puberulent; leaf blade broadly ovate, 8–12 × 8–12 cm, membranous, palmately 5-lobed; middle lobe oblong-lanceolate, 8–10 × 2–3.5 cm, apex acuminate or obtuse; lateral lobes short, lanceolate or oblong-lanceolate, both surfaces subglabrous, sinus rounded. Male and female flowers

usually fasciculate in same axil. Male flowers: pedicel slender, 5–15 mm; calyx tube ca. 2 × 5–6 mm; segments subulate, 0.5–1 mm; corolla green-yellow, ca. 7 mm in diam.; segments ovate, ca. 2 × 0.5–1 mm; stamens 3; filaments 1–1.5 mm; anthers ovoid, ca. 2 mm; anther cells reflexed. Female flowers: calyx and corolla as in male flowers; ovary ovoid, smooth. Fruit yellow-green to red, narrowly white striped, globose, indehiscent, 14–18 mm in diam., smooth. Seeds few, brown, ovate, ca. 5 × 3 mm. Fl. Mar–Aug, fr. Sep–Dec.

Forests, thickets; ca. 1000 m. Guangdong, Guangxi, Hainan, Taiwan [Bhutan, Cambodia, India, Japan (Ryukyu Islands), Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia].

The fruit and roots contain toxin.

## 30. COCCINIA Wight & Arnott, Prodr. Fl. Ind. Orient. 1: 347. 1834.

红瓜属 hong gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Cephalandra* Schrader.

Herbs, climbing. Roots tuberous. Branches glabrous or slightly scabrous. Tendrils simple, rarely 2-fid. Leaf blade angled or divided. Plants dioecious or rarely monoecious. Male flowers solitary or in a cyme or raceme; calyx tube short, campanulate or turbinate; segments 5; corolla campanulate; segments 5; stamens 3, inserted at base of calyx tube; filaments connate; anthers connivent, one 1-celled, two 2-celled; anther cells reflexed; connective not produced. Female flowers solitary; calyx and corolla as in male flowers; staminodes 3, oblong or subulate; ovary ovoid, oblong, or linear; placentas 3; ovules numerous, horizontal; style filiform; stigma 3-lobed. Fruit ovoid or oblong, baccate, indehiscent. Seeds numerous, compressed, marginate.

About 20 species: mainly distributed in tropical Africa; one species in China.

**1. *Coccinia grandis*** (Linnaeus) Voigt, Hort. Suburb. Calcutt. 59. 1845.

红瓜 hong gua

*Bryonia grandis* Linnaeus, Syst. Nat., ed. 12, 2: 640; Mant. Pl. 1: 126. 1767; *Cephalandra indica* Naudin, nom. illeg. superfl.; *Coccinia indica* Wight & Arnott, nom. illeg. superfl.

Roots robust. Stem slender, slightly woody, many branched, angular, glabrous. Tendrils filiform, glabrous, simple. Petiole slender, 2–5 cm; leaf blade broadly cordate, 5–10 × 5–10 cm, usually 5-angled or 5-lobed, base with several glands, apex obtuse. Plants dioecious; flowers solitary. Male pedicel

slender, 2–4 cm, glabrous; calyx tube broadly campanulate, 4–5 mm; segments linear-lanceolate, ca. 3 mm; corolla white or slightly yellow, 2.5–3.5 cm; segments ovate, outside glabrous, inside pubescent; filaments and anthers connate; filaments 2–3 mm; anthers subglobose, 6–7 mm. Female pedicel slender, 1–3 cm; staminodes 3, 1–3 mm, nearly subulate, villous at base; ovary fusiform, 12–15 mm; style 6–7 mm; stigmas 3, 5–6 mm. Fruit red when mature, fusiform, ca. 5 × 2.5 cm. Seeds yellow, oblong, 6–7 × 2.5–4 mm, ca. 1.5 mm thick, both surfaces densely punctate, apex rounded. Fl. and fr. summer.

Thickets on mountain slopes and in forests; 100–1100 m. Guangdong, Guangxi, Yunnan [tropical Africa and Asia].

### 31. *LAGENARIA* Seringe, Mém. Soc. Phys. Genève 3(1): 25, t. 2. 1825.

葫芦属 hu lu shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, scandent, softly pubescent. Tendrils 2-fid. Petiole apex 2-glandular; leaf blade ovate-cordate or reniform. Plants dioecious or monoecious; flowers solitary or male flowers in racemes, white. Male flowers: pedicels elongate; calyx tube narrowly campanulate or funnelform; segments 5; corolla segments 5, oblong-ovate, apex retuse; stamens 3; filaments free; anthers included, slightly coalescent or free, oblong, one 1-celled, others 2-celled; anther cells sigmoid-flexuous; connective not produced; pistillode glandular. Female flowers: pedicels short; calyx tube cupular; calyx and corolla as in male flowers; ovary ovoid or cylindric; ovules numerous, horizontal; placentas 3; styles short; stigmas 3, 2-lobed. Fruit polymorphic, indehiscent, fleshy, woody when mature. Seeds numerous, obovate, compressed, distinctly marginate.

Six species: mainly distributed in tropical Africa; one species (introduced) in China.

**1. *Lagenaria siceraria*** (Molina) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 3: 435. 1930.

葫芦 hu lu

*Cucurbita siceraria* Molina, Sag. Stor. Nat. Chili, 133. 1782; *Cucumis mairei* H. Léveillé; *Cucurbita lagenaria* Linnaeus; *C. leucantha* Duchesne, nom. illeg. superfl.; *Lagenaria leucantha* Rusby; *L. leucantha* var. *clavata* Makino; *L. leucantha* var. *depressa* (Seringe) Makino; *L. leucantha* var. *makinoides* Nakai; *L. leucantha* var. *microcarpa* (Naudin) Nakai; *L. microcarpa* Naudin; *L. siceraria* var. *depressa* (Seringe) H. Hara; *L. siceraria* var. *microcarpa* (Naudin) H. Hara; *L. vulgaris* Seringe; *L. vulgaris* subsp. *asiatica* Kobjakova; *L. vulgaris* var. *depressa* Seringe; *L. vulgaris* var. *microcarpa* Matsu-mura & Nakai.

Plants annual. Stem and branches sulcate-angular, pubes-

cent. Tendrils filiform, puberulent. Petiole 16–20 cm, with 2 glands at apex; leaf blade ovate-cordate or reniform-ovate, 10–35 × 10–35 cm, undivided or 3–5-lobed, both surfaces puberulent, palmately 5–7-veined, base cordate, margin irregularly dentate. Plants monoecious; flowers solitary. Male flowers: pedicels slender; calyx tube funnelform, ca. 2 cm; segments lanceolate, ca. 5 mm; corolla yellow; segments 3–4 × 2–3 cm; filaments 3–4 mm; anthers oblong, 8–10 mm. Female flowers: calyx segments and corolla as in male flowers; ovary densely pubescent; stigma enlarged, 2-lobed. Fruit various in size and shape, woody when mature. Seeds white, obovate or triangular, ca. 20 mm, apex truncate. Fl. summer, fr. autumn.

Commonly cultivated in China [cultivated in all warmer areas of the world].

The fruit is used as a vegetable when young; woody when mature, it is used as various vessels.

### 32. *CITRULLUS* Schrader ex Ecklon & Zeyher, Enum. Pl. Afric. Austral. 2: 279. 1836, nom. cons.

西瓜属 xi gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Anguria* Miller.

Herbs, climbing, annual or perennial. Stem and branches scabrous, robust. Tendrils 2- or 3-fid, rarely simple. Leaves orbicular or triangular-ovate, deeply 3–5-partite; segments lobulate or dissected. Plants monoecious; flowers solitary, rarely fasciculate. Male flowers: calyx tube broadly campanulate, 5-lobed; corolla rotate or broadly campanulate, deeply 5-partite; segments ovate-oblong; stamens 3, inserted on base of calyx tube; filaments free, short; anthers free or slightly coherent, one 1-celled, others 2-celled; anther cells linear, sigmoid-flexuous; connective dilated, not produced; rudimentary ovary glandlike. Female flowers: calyx and corolla as in male flowers; staminodes 3, setiform or ligulate; ovary ovoid, with 3 placentas; ovules numerous, horizontal; style short, columnar; stigmas 3, thick, reniform, nearly 3-lobed. Fruit globose or oblong, fleshy or dry, indehiscent, many seeded. Seeds oblong, compressed, smooth, marginate or emarginate.

Four species: tropical and S Africa, SW Asia, E Mediterranean region; one species (introduced) in China.

**1. *Citrullus lanatus*** (Thunberg) Matsumura & Nakai, Cat. Sem. Spor. Hort. Bot. Univ. Imp. Tokyo 30: no. 854. 1916.

西瓜 xi gua

*Momordica lanata* Thunberg, Prodr. Pl. Cap. 13. 1794; *Citrullus colocynthis* Schrader var. *lanatus* (Thunberg) Matsumura & Nakai; *C. edulis* Spach; *C. vulgaris* Schrader ex Ecklon & Zeyher; *Colocynthis citrullus* (Linnaeus) Kuntze; *Cucumis citrullus* (Linnaeus) Seringe; *Cucurbita citrullus* Linnaeus.

Plants annual. Stem and branches robust, sulcate-angular, villous. Tendrils puberulent, 2-fid. Petiole 3–12 cm, densely pubescent; leaf blade white-green, triangulate-ovate, 8–20 × 5–15 cm, both surfaces hispid, 3-partite; segments lobulate, base cordate, sinus semicircular, apex acute or acuminate. Flowers solitary. Male flowers: pedicel 3–4 cm, villous; calyx tube densely villous; segments narrowly lanceolate, 2–3 mm; corolla pale yellow, 2.5–3 cm in diam.; segments ovate-oblong, 1–1.5 × 0.5–0.8 cm; stamens nearly free. Female flowers: calyx and

corolla as in male flowers; ovary 5–8 mm, densely villous; stigmas 3, reniform. Fruit globose or oblong, smooth. Seeds numerous, color various, ovate, 1–1.5 × 0.5–0.8 cm. Fl. and fr. Apr–Oct.

Commonly cultivated in China [native to S Africa; cultivated in all warmer areas of the world].

The fruit are important “water fruit” in summer; the seeds contain edible oil; the fruit coat is used medicinally.

### 33. *SOLENA* Loureiro, Fl. Cochinch. 2: 477, 514. 1790.

茅瓜属 mao gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

Herbs, scandent, perennial. Roots tuberous. Stem and branches slender, subglabrous. Tendrils simple, glabrous. Petiole very short or almost obsolete; leaf blade polymorphic, very variable, base cordate or hastate. Plants dioecious or monoecious. Male flowers in umbelliform or cymose inflorescence; calyx tube campanulate; segments 5, ± subulate; corolla yellow or yellow-white; segments triangular; stamens 3, two 2-celled, one 1-celled; filaments short; anthers oblong; anther cells conduplicate or curved. Female flowers solitary; ovary oblong; ovules few, horizontal; staminodes 3. Fruit oblong or ovoid, indehiscent. Seeds few, globose.

Three species: S and SE Asia; one species in China.

#### 1. *Solena heterophylla* Loureiro, Fl. Cochinch. 2: 514. 1790.

茅瓜 mao gua

Roots fusiform, 1.5–2 cm in diam. Stem and branches glabrous. Petiole slender, 4–10 mm, puberulent at first, glabrescent; leaf blade very variable, ovate, oblong, ovate-triangular, or hastate, undivided or 3–5-lobed, leathery; lobes oblong-lanceolate, lanceolate, or triangular, 8–12 × 1–5 cm, abaxially densely setose or almost glabrous, adaxially densely setose or scabrous, base cordate, margin entire or dentate, apex obtuse or acuminate. Tendrils slender. Male flowers umbellate or subumbellate; peduncle very short, apically 10–20-flowered; pedicels 2–8 mm; calyx tube 3–5 mm, ca. 3 mm in diam.; segments subulate, 0.2–0.4 mm; corolla yellow or yellow-white; segments triangular, 1–1.5 mm, apex obtuse or acute; filaments filiform, ca. 3 mm; anther cells curved or conduplicate, puberulent. Female flowers usually solitary; pedicel 2–10 mm, puberulent; calyx and corolla as in male flowers; ovary ovoid, 2.5–3.5 × 2–3 mm; stigmas 3. Fruit red-brown, broadly ovoid, oblong, or subglobose, 2–6 × 2–5 cm. Seeds gray-white or gray-brown, suborbicular or obovate, 5–7 × 5–6.5 mm, smooth or slightly tuberculate. Fl. May–Aug, fr. Jun–Nov.

Mixed forests, thickets, grasslands, roadsides, mountain slopes; 600–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [NE Afghanistan, Bhutan, India, Indonesia (Java), Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

The roots are used medicinally.

- 1a. Plants dioecious; leaves polymorphic;  
anther cells curved ..... 1a. subsp. *heterophylla*

- 1b. Plants monoecious; leaves palmately  
5-lobed, segments lanceolate; anther  
cells conduplicate ..... 1b. subsp. *napaulensis*

#### 1a. *Solena heterophylla* subsp. *heterophylla*

茅瓜(原亚种) mao gua (yuan ya zhong)

*Bryonia hastata* Loureiro; *Melothria delavayi* Cogniaux;  
*Solena delavayi* (Cogniaux) C. Y. Wu.

Plants dioecious. Anther cells curved. Fruit oblong or subglobose, 2–6 × 2–5 cm. Fl. May–Aug, fr. Aug–Nov.

Mixed forests, thickets, grasslands, roadsides on mountain slopes; 600–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [NE Afghanistan, India, Indonesia (Java), Malaysia, Myanmar, Nepal, Thailand, Vietnam].

The roots are used medicinally.

- 1b. *Solena heterophylla* subsp. *napaulensis* (Seringe) W. J. de  
Wilde & Duyfjes, Blumea 49: 75. 2004.

西藏茅瓜 xi zang mao gua

*Bryonia napaulensis* Seringe in Candolle, Prodr. 3: 307.  
1828.

Plants monoecious. Anther cells conduplicate. Fruit broadly ovoid, 2.5–3 × ca. 2.5 cm, glabrous, apex and base obtuse. Fl. May–Jun, fr. Jun–Aug.

Mountain slopes, grasslands, thickets; 2000–2300 m. SE Xizang, Yunnan [N India, Myanmar, Nepal].

### 34. *BENINCASA* Savi, Bibliot. Ital. Giorn. Lett. 9: 158. 1818.

冬瓜属 dong gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Camolenga* Post & Kuntze.

Herbs, creeping, annual, all parts densely hispid. Leaves palmately 5-lobed; petiole eglandular. Tendrils 2- or 3-fid. Plants usually monoecious; flowers solitary. Male flowers: calyx tube broadly campanulate; segments reflexed, almost leaflike, dentate; corolla rotate, usually 5-lobed; segments obovate, entire; stamens 3, free, inserted on corolla tube; filaments short; anthers one 1-celled, two 2-celled; anther cells very sigmoid-flexuous; connective margined; pistillode glandlike. Female flowers: calyx and corolla as in male

flowers; staminodes 3; ovary ovoid; ovules numerous, horizontal; style inserted on disk; stigmas 3, expanded, 2-lobed. Fruit large, oblong, baccate, terete, hispid, glaucous, indehiscent. Seeds numerous, ovoid-oblong, compressed, margin tumid.

One species: cultivated in tropical and subtropical regions of the world, including China.

**1. *Benincasa hispida*** (Thunberg) Cogniaux in A. Candolle & C. Candolle, Monogr. Phan. 3: 513. 1881.

冬瓜 dong gua

*Cucurbita hispida* Thunberg, Nova Acta Regiae Soc. Sci. Upsal. 4: 38. 1783; *Benincasa cerifera* Savi; *B. hispida* var. *chieh-qua* F. C. How; *B. pruriens* (Solander ex Seemann) W. J. de Wilde & Duyfjes; *B. pruriens* f. *hispida* (Thunberg) W. J. de Wilde & Duyfjes; *C. pruriens* Solander ex Seemann; *Lagenaria leucantha* Rusby var. *hispida* (Thunberg) Nakai; *L. siceraria* (Molina) Standley var. *hispida* (Thunberg) H. Hara; *L. vulgaris* Seringe var. *hispida* (Thunberg) Nakai.

Plants creeping or scandent. Stem and branches yellow-brown hispid and villous, sulcate-angular. Petiole robust, 5–20 cm, yellow-brown hispid and villous; leaf blade reniform-orbicular, 15–30 cm wide, 5–7-lobed; lobes broadly triangular

or ovate, both surfaces scabrous, abaxially densely pubescent, adaxially puberulent, base deeply cordate, sinus almost rounded, margin dentate, apex acute. Male flowers: pedicel 5–15 cm, densely hispid and villous; bract ovate or broadly oblong, 6–10 mm, apex acute; calyx tube 12–15 mm in diam., densely hispid-villous; segments 8–12 mm; corolla yellow; segments 3–6 × 2.5–3.5 cm, both surfaces pubescent; filaments 2–3 mm, base expanded; anthers ca. 5 mm. Female flowers: pedicel less than 5 cm, densely yellow-brown hispid and villous; ovary ovoid or cylindric, 2–4 cm, densely hispid; style 2–3 mm; stigmas 12–15 mm. Fruit 50–60 × 10–25 cm. Seeds white or pale yellow, 10–11 × 5–7 mm, ca. 2 mm thick, marginate. Fl. Jun–Sep, fr. Jul–Nov.

Commonly cultivated in China [native origin uncertain; cultivated throughout the tropics, especially in Asia].

The fruit is eaten as a vegetable; the seeds are used medicinally.

### 35. CUCURBITA Linnaeus, Sp. Pl. 2: 1010. 1753.

南瓜属 nan gua shu

Lu Anmin (路安民 Lu An-ming); Charles Jeffrey

*Pepo* Miller.

Herbs, climbing or prostrate, annual. Stem and branches robust. Tendrils 2- to many fid. Leaf blade lobed, base cordate. Plants monoecious; flowers solitary, yellow. Male flowers: calyx tube campanulate, rarely elongate; segments 5, lanceolate or leaflike at apex; corolla campanulate, 5-lobed; stamens 3; filaments free; anthers connected into a head, one 1-celled, two 2-celled; anther cells linear, reflexed; connective not produced; pistillode absent. Female peduncle short; calyx and corolla as in male flowers; staminodes 3, broadly triangular; ovary oblong or globose, with 3–5-placentas; ovules numerous, horizontal; style short; stigmas 3–5-lobed or bifurcate. Fruit large, fleshy, indehiscent. Seeds numerous, compressed, smooth.

About 15 species: warm regions of the Americas, also cultivated in tropical, subtropical, and temperate regions; three species (all introduced) in China.

1a. Calyx segments linear, apex leaflike; fruiting pedicel conspicuously enlarged at apex; seed margin thickened ..... 3. *C. moschata*  
1b. Calyx segments linear or linear-lanceolate, apex not leaflike; fruiting pedicel not strongly enlarged at apex.

2a. Leaf blade triangular or ovate-triangular, irregularly 5–7-lobed; calyx segments linear-lanceolate; fruiting pedicel angular-sulcate, slightly thickened at apex; seed marginate and obtuse ..... 1. *C. pepo*

2b. Leaf blade reniform or orbicular, almost entire or dentate; calyx segments lanceolate; fruiting pedicel not angular-sulcate, not thickened at apex; seed margin obtuse or ± marginate ..... 2. *C. maxima*

**1. *Cucurbita pepo*** Linnaeus, Sp. Pl. 2: 1010. 1753.

西葫芦 xi hu lu

Plants climbing. Stem setose and scabrous-hairy. Petiole setose, 6–9 cm; leaf blade triangular or ovate-triangular, both surfaces scabrous-hairy, base cordate, margin irregularly dentate, apex acute. Tendrils many fid. Plants monoecious; flowers solitary; pedicel angular, 3–6 cm, yellow-brown setose; calyx tube 5-angled; segments linear-lanceolate; corolla campanulate, ca. 5 × 3 cm; segments erect, apex acute; stamens 3; filaments ca. 15 mm; anthers connivent, ca. 10 mm; ovary ovoid, 1-locular. Fruiting pedicel robust, conspicuously angular-sulcate, apex slightly thickened; fruit variable in shape and size. Seeds numerous, white, ovate, ca. 20 mm, marginate and obtuse. Fl. and fr. May–Nov.

Commonly cultivated throughout China [native to North America; cultivated in tropical and temperate regions].

The fruit is used as a vegetable.

**2. *Cucurbita maxima*** Duchesne, Essai Hist. Nat. Courges, 7, 12. 1786.

笋瓜 sun gua

*Cucurbita pepo* Linnaeus var. *maxima* (Duchesne) Delile.

Plants climbing. Stem robust, white setose. Petiole 15–20 cm, densely setose; leaf blade reniform or orbicular-reniform, 15–25 cm, both surfaces setose, base cordate, margin almost entire or dentate, apex obtuse. Tendrils usually many fid, slightly setose. Male pedicel 10–20 cm, puberulent; calyx tube campanulate; segments linear-lanceolate, 18–20 mm, densely

white setose; corolla tubular; segments reflexed, ovate-orbicular, 2–3 cm, margin rugose, apex obtuse; stamens 3; filaments connivent, 5–7 mm, almost glabrous or puberulent at base; anthers connivent. Ovary ovoid; style short; stigmas 2-lobed. Fruiting pedicel short, cylindric, not angular-sulcate, apex not enlarged; fruit variable in shape, size, and color. Seeds compressed, margin obtuse or marginate. Fl. and fr. Apr–Nov.

Commonly cultivated in China [native to South America; cultivated in tropical and temperate regions].

The fruit is used as a vegetable; the seeds contain oil.

**3. *Cucurbita moschata*** Duchesne, Essai Hist. Nat. Courges, 7, 15–16. 1786.

南瓜 nan gua

*Cucurbita pepo* Linnaeus var. *moschata* (Duchesne) Duchesne.

Plants prostrate. Stem to 2–5 m, densely white setose. Petiole robust, 8–19 cm, setose; leaf blade broadly ovate or ovate-orbicular, 12–25 × 20–30 cm, 5-angled or 5-lobed; lobes triangular, adaxially yellow-white setose and velvety. Male calyx tube campanulate, 5–6 mm; segments linear, 1–1.5 cm, pubescent, enlarged or leaflike at apex; corolla campanulate, ca. 8 × 6 cm; segments with revolute margin, rugose, apex acute; stamens 3; filaments 5–8 mm, glandular; anthers connivent, ca. 15 mm. Ovary 1-locular; style short; stigma enlarged, 2-lobed. Fruiting pedicel robust, 5–7 cm, angular-sulcate, strongly enlarged at apex; fruit variable in shape, size, and color. Seeds numerous, gray-white, ovate or oblong, 10–15 × 7–10 mm, margin thickened. Fl. and fr. Apr–Nov.

Commonly cultivated throughout China [native to Central America; cultivated worldwide].

The fruit is used as a vegetable; the seeds are edible.

## RUBIACEAE

茜草科 qian cao ke

Chen Tao (陈涛)<sup>1</sup>, Zhu Hua (朱华)<sup>2</sup>, Chen Jiarui (陈家瑞 Chen Chia-jui)<sup>3</sup>;  
Charlotte M. Taylor<sup>4</sup>, Friedrich Ehrendorfer<sup>5</sup>, Henrik Lantz<sup>6</sup>, A. Michele Funston<sup>4</sup>, Christian Puff<sup>5</sup>

Trees, shrubs, annual or perennial herbs, subshrubs, vines, or lianas, infrequently monocaulous or creeping and rooting at nodes, terrestrial or infrequently epiphytic, with bisexual flowers, infrequently dioecious, or rarely polygamo-dioecious (*Diplospora*, *Galium*, *Guettarda*, perhaps *Brachytome*) or monoecious (*Galium*), evergreen or sometimes deciduous (*Hymenodictyon*), sometimes armed with straight to curved spines (formed by modified stems or peduncles), infrequently with elongated principal stems bearing lateral short shoots (i.e., brachyblasts; *Benkara*, *Catunaregam*, *Ceriscoides*, *Himalrandia*, *Leptodermis*, *Serissa*), infrequently with lateral branches or short shoots spinescent (i.e., prolonged, sharp, and leafless at apex), infrequently with reduced internodes that give an appearance of verticillate leaf arrangement (*Brachytome*, *Damnacanthus*, *Duperrea*, *Rothmannia*, *Rubovietnamia*), infrequently with buds resinous (*Gardenia*) or mucilaginous (*Scyphiphora*), infrequently with tissues fetid when bruised, [rarely with swollen hollow stems or leaf bases housing ants (*Neonauclea*)]; branchlets terete to angled or quadrate, in latter two cases often becoming terete with age, or rarely flattened (*Wendlandia*) or winged (*Hedyotis*, *Rubia*), buds conical or rounded with stipules valvate or imbricate, or infrequently flattened with stipules erect and pressed together (*Cinchona*, *Haldina*, *Nauclea*, *Neonauclea*). Raphides present or absent. Leaves opposite, verticillate, or apparently verticillate (i.e., closely set due to reduced internodes), decussate or occasionally distichous, petiolate to sessile, infrequently somewhat to strongly anisophyllous, rarely punctate- or striate-glandular (*Galium*); margins flat to occasionally undulate or crisped, entire or rarely lobed (*Hymenodictyon*, *Morinda*) to denticulate or serrate (*Hymenodictyon*, *Leptomischus*, *Ophiorrhiza*, *Wendlandia*); secondary veins pinnate or rarely triplinerved or palmate (*Hedyotis*, *Rubia*), free (i.e., eucamptodromous) or uniting near margins (i.e., brochidodromous) in weak to well-developed or rarely substraight submarginal vein, sometimes with foveolate (i.e., pitted or cryptlike) and/or tufted (i.e., pubescent) domatia (i.e., structures that house mites) in abaxial axils, these rarely also present in axils of tertiary veins (*Morinda*), with presence of domatia often variable within a species; tertiary and/or quaternary venation rarely arranged in regular squares (*Guettarda*), regular rectangles (i.e., clathrate; *Urophyllum*), or lineolate (i.e., closely parallel within each areole; *Timonius*); petiole rarely articulate at base (*Ixora*); stipules persistent with leaves, deciduous before leaves, or quickly caducous, interpetiolar and infrequently fused to adjacent petioles or leaf bases, sometimes united around stem into a sheath, rarely completely united into a conical cap (i.e., calyptrate; *Gardenia*), with interpetiolar portion variously triangular in general shape to truncate, with apex entire or bilobed, multifid, lacerate, setose, or laterally appendaged, with apex, lobes, setae, and/or appendages sometimes glandular (*Chassalia*, *Hedyotis*, *Hymenodictyon*, *Knoxia*, *Mitchella*, *Mycetia*, *Neanotis*, *Ophiorrhiza*, *Pentas*, *Pseudopyxis*, *Psychotria*, *Trailiaedoxa*), internally (i.e., adaxially) with small to well-developed colleters (i.e., glandular trichomes), these infrequently persistent after stipules fall (*Psychotria*), or stipules rarely expanded into 1 to several leaflike segments and then apparently absent due to leaflike form that gives an appearance of verticillate leaves (*Argostemma*, *Asperula*, *Galium*, *Microphysa*, *Phuopsis*, *Rubia*). Inflorescences terminal, axillary (i.e., borne at both axils at a node), or pseudo-axillary (i.e., borne consistently in 1 axil per node; lateral), sometimes apparently leaf-opposed due to marked anisophylly, or rarely superaxillary (*Damnacanthus*, *Diplospora*) or cauline (*Mycetia*), variously cymose to thyriform, corymbiform, paniculiform, racemiform, spiciform, fasciculate, or capitate and few to many flowered or occasionally reduced to a solitary flower, pedunculate (peduncle here used for basalmost axis supporting inflorescence or solitary flower) to sessile, when sessile often with 3 principal axes (i.e., tripartite), bracteate or bracts sometimes reduced or apparently absent, with bracts (here usually including bracts borne on pedicels or next to flowers, i.e., bracteoles) generally triangular to linear or sometimes leaflike (i.e., similar to normal or somewhat reduced leaves) and rarely enlarged, petaloid, and resembling calycophylls (*Dunnia*, *Neohymenopogon*), infrequently fused and involucre, occasionally fused in pairs (i.e., forming a calyculus, or calyculate), infrequently thickened and spatulate to clavate or conical (genera of Naucleaceae), or infrequently stipuliform, rarely glandular (*Damnacanthus*, *Mycetia*), multifid to fimbriate (*Damnacanthus*, *Kelloggia*, *Spermacoce*) or spinescent (*Phuopsis*). Flowers sessile to pedicellate (pedicel here used for ultimate axis immediately supporting a single flower, except when this is a peduncle), bisexual and monomorphic, distylous, or rarely tristylous (*Chassalia*, *Pentas*), unisexual with 2 forms generally similar except for corolla size and hypanthium development, or rarely cleistogamous (*Ophiorrhiza*), actinomorphic or rarely zygomorphic (*Argostemma*), sometimes with ovaries of individual flowers partially to fully fused (*Mitchella*, *Morinda*, *Mouretia*, *Nauclea*), variously diurnal or nocturnal, usually sweetly fragrant, protandrous [or rarely protogynous], occasionally with secondary pollen presentation (e.g., *Ixora*, *Pavetta*, *Phuopsis*, *Scyphiphora*, genera of Naucleaceae). Calyx gamosepalous and fused to inferior ovary in hypanthium or ovary portion, this generally ellipsoid, turbinate, obconic, cylindrical, or occasionally subglobose to hemispherical, glabrous and smooth, pubescent, or rarely tuberculate (*Galium*) or with unusual flattened (*Dentella*) or hooked, sometimes glandular trichomes (*Galium*, *Kelloggia*), or rarely longitudinally ridged to winged (*Gardenia*,

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*Spiradiclis*), above this developed into a free limb portion, this limb variously tubular to cupular or infrequently reduced to obsolete (*Asperula*, *Coffea*, *Galium*, *Leptunis*, *Microphysa*, *Ophiorrhiza*, *Phuopsis*, *Rubia*), truncate to 4- or 5(–9)-denticulate (i.e., lobes reduced to tiny projections along a generally truncate margin) or shallowly to deeply 4- or 5(–9)-lobed, open in bud or rarely with lobes markedly imbricate (*Emmenopterys*, *Keenania*), [or rarely spathaceous (i.e., fused into a conical cap that splits irregularly)], inside variously near base and/or at sinuses between lobes with few to numerous small colleters, rarely densely or markedly veined (*Clarkella*, *Myrioneuron*, *Pseudopyxis*), rarely on margins with well-developed, sessile to stalked glands (*Mycetia*), lobes generally triangular to linear, occasionally obtuse to lanceolate or oblanceolate, or rarely prolonged into a slender shaft bearing a thickened apical portion (*Neonauclea*), occasionally slightly to markedly unequal on an individual flower with all lobes of different lengths or infrequently in unequal pairs of similar lengths (*Diodia*, *Mitracarpus*, *Spermacoce*), infrequently with 1(to 5, *Mussaenda*) lobe on some (or all, *Mussaenda*) flowers of an inflorescence enlarged into a calycophyll (i.e., a membranous to papery, petaloid, veined, white to colored blade borne on a generally well-developed stipe; *Emmenopterys*, *Morinda*, *Mussaenda*, *Schizomussaenda*). Corolla large and often showy to reduced, gamopetalous, white, yellow, orange, red, blue, purple, and/or pale green, when nocturnal often white at anthesis becoming yellow with age, variously funnelform, salverform (i.e., hypocrateriform), tubular, campanulate, or occasionally rotate to infrequently urceolate (i.e., swollen in basal part of tube; *Canthium*, *Lasianthus*) or inflated (i.e., markedly swollen in middle or upper part of tube; *Keenania*, *Leptomischus*), infrequently curved in tube and/or gibbous (i.e., asymmetrically swollen at very base of tube; *Chassalia*, *Guettarda*, *Mycetia*, *Ophiorrhiza*), infrequently differing in shape between long-styled and short-styled forms (*Antirhea*), infrequently markedly fleshy to leathery (*Caelospermum*, *Damnacanthus*, *Fosbergia*, *Rothmannia*, *Timonius*, *Urophyllum*), inside glabrous to variously pubescent with pubescence frequently confined to throat, outside infrequently ridged to winged (*Cinchona*, *Ophiorrhiza*), rarely fenestrate in tube (i.e., with longitudinal slits; *Damnacanthus*, *Paederia*), lobes (3 or)4 or 5(–11), shorter than or occasionally longer than tube, acute or less often obtuse to rounded at apex, generally spreading to somewhat reflexed at anthesis, infrequently with margins crisped to irregular, densely ciliate, and/or appendaged (*Cinchona*, *Luculia*, *Rondeletia*, *Saprosma*, *Serissa*), in bud imbricate (and usually quincuncial), valvate, valvate-induplicate, valvate-reduplicate, or convolute (i.e., contorted) to left or rarely to right (*Coptosapelta*, *Rothmannia*), usually with aestivation consistent within a genus, occasionally with wings, ridges, and/or rounded to hornlike thickenings or protuberances on back or at apex (*Lerchea*, *Ophiorrhiza*), rarely cucullate (*Lerchea*). Stamens adnate to corolla, free or rarely fused to stigma (*Acranthera*), alternate to corolla lobes and isomerous (i.e., equal in number to lobes) or rarely more numerous (*Gardenia*) [to rarely fewer], inserted variously in corolla throat, tube, or infrequently at base and sometimes appearing free (*Galium*), included to exerted, with point of insertion and position of anthers usually differing between long-styled and short-styled forms of distylous flowers, with staminodes of pistillate flowers generally similar to stamens but smaller; filaments well developed to reduced or obsolete, free or rarely coherent (*Argostemma*) or fused (*Acranthera*, *Argostemma*), variously glabrous to pubescent, occasionally markedly flattened (*Hymenodictyon*, *Kelloggia*); anthers free or rarely coherent or fused (*Argostemma*), 4-thecal or rarely 2-thecal (*Hymenodictyon*), 2-celled, in outline generally narrowly oblong, linear (i.e., narrowly fusiform), narrowly lanceolate, or narrowly elliptic, at base occasionally bifid (i.e., sagittate; *Caelospermum*, *Cephalanthus*, *Duperrea*, *Hamelia*, *Neohymenopogon*, *Scyphiphora*), dorsifixed (i.e., medifixed to dorsifixed near base) to occasionally basifixed, infrequently pubescent (*Hyptianthera*, *Lerchea*), with dehiscence introrse by longitudinal slits or rarely by apical pores (*Argostemma*), with connective infrequently prolonged into an apical and/or sometimes basal appendage (*Acranthera*, *Argostemma*, *Hyptianthera*, *Morinda*, *Rubovietnamia*, *Wendlandia*), appendages rarely fused into a cone (*Acranthera*); pollen variously 3- or 4(or 5)-colpate and generally subglobose or occasionally 3- or 4-porate, 5–25-colpate and disk-shaped or ellipsoidal, in tetrahedral tetrads and 3- or 4-porate, cylindrical with 2 pores, or inaperturate. Ovary inferior [or rarely secondarily superior], sometimes fused between flowers (*Mitchella*, *Morinda*, *Mouretia*), (1 or)2(–10)-celled (i.e., locular), with ovules 1 or 2 to numerous in each cell (i.e., locule) on basal, axile (i.e., inserted on septum), apical, or infrequently parietal (*Ceriscoides*, *Gardenia*) placentas, in staminate flowers usually with ovary reduced and pistillode composed of structures similar to but smaller than style and stigma, in distylous flowers usually with ovary similarly developed but style and stigma differing in size and position in flower and sometimes stigmas also differing in shape between long-styled and short-styled forms; style 1, terminal on ovary, developed or rarely reduced (*Galium*, *Microphysa*), variously glabrous to pubescent, surrounded at base by well-developed fleshy disk [or this rarely reduced], this disk variously annular, conical, 2-parted, or shallowly lobed, glabrous or rarely pubescent (*Clarkella*, *Mouretia*, *Timonius*); stigmas free or rarely fused to anther connectives (*Acranthera*), 1- or 2(–10)-lobed (i.e., these lobes often equivalent to “stigmas 1 or 2 to 10” of some authors), with whole stigma or lobes variously capitate, linear, spatulate, clavate, lobed, or infrequently mitriform (i.e., shaped like a drinking glass) to cylindrical with recessed attachment (*Canthium*, *Mitragnyna*, *Pyrostris*), glabrous or infrequently pubescent (*Clarkella*, *Hyptianthera*), variously included to exerted, with receptive surfaces introrse, apical, or internal. Infructescences generally similar to inflorescences but occasionally with part or all changing color, orientation, shape, and/or other characteristics as the fruit mature. Fruit simple or rarely multiple (i.e., a syncarp; *Mitchella*, *Morinda*, *Nauclea*), variously capsular with dehiscence loculicidal, septicidal, circumscissile (i.e., around equator or middle; *Mitracarpus*), or through an apical beak (i.e., prolonged disk portion, sometimes to give appearance of partially superior ovary; *Hedyotis*, *Neanotis*, *Neohymenopogon*, *Ophiorrhiza*, *Pentas*, *Spiradiclis*) or operculum (i.e., circular lid; *Argostemma*, *Leptodermis*, *Leptomischus*, *Mouretia*, *Pseudopyxis*); or fleshy, small to quite large, and baccate (i.e., with numerous seeds enclosed by fleshy to juicy pulp or endocarp and usually indehiscent); or drupaceous (i.e., with 1 to several seeds enclosed in pyrenes), fleshy to occasionally dry, and indehiscent or infrequently dehiscent releasing pyrenes (*Paederia*, *Serissa*); or schizocarpous (i.e., dry and separating into segments) with mericarps (i.e., segments, cocci, nutlets) indehiscent (e.g., *Asperula*, *Cephalanthus*, *Richardia*); calyx limb persistent or deciduous usually leaving a circular scar, sometimes with persistent carpophore or septum (*Adina*); pyrenes (i.e., seeds enclosed in and dispersing with endocarp layer) when present and

ovules all developed 1–10-locular and 1–10-seeded (i.e., fruit containing several pyrenes and each pyrene with 1 seed in 1 locule, or pyrenes solitary in each fruit and comprising entire ovary), ellipsoid to subglobose, plano-convex (i.e., hemispherical), concavo-convex, lenticular, or angled (i.e., narrow with 2 large inner faces and a small outer face), with outer wall hard to cartilaginous (*Caelospermum*) or infrequently papery (*Coffea*, *Pavetta*), smooth to ridged or sulcate on dorsal (i.e., abaxial) surface, without (*Psychotria*) or usually with evident preformed germination slits, pores, and/or opercula generally on ventral (i.e., adaxial) surface, rarely winged (*Paederia*) or pubescent (*Caelospermum*, *Paederia*); seeds 1 to numerous, small (0.1–1.9 mm), medium-sized (2–5 mm) to large (5.1–20 mm), variously ellipsoid, lenticular, flattened, oblanceoloid, angled, or plano-convex, smooth to variously winged, foveolate, tuberculate, papillose, and/or striate; endosperm (i.e., albumen) fleshy, oily, corneous (i.e., horny) and entire or infrequently ruminant (*Psychotria*), or rarely absent (*Antirhea*); embryo variously shaped.  $x = 6$ –17, most commonly 11, less frequently 9 or 12.

About 660 genera and 11,150 species: cosmopolitan family, with most genera and species in humid tropical regions; 97 genera (three endemic, ten introduced) and 701 species (352 endemic, 23 introduced, six of unconfirmed occurrence) in China.

This is one of the largest families of flowering plants and is represented nearly worldwide though it is most abundant in the tropical regions of both hemispheres. Important economic members of the family are coffee (*Coffea*), quinine (*Cinchona*), madder (*Rubia*), ipecac (*Carapichea* Aublet), and various horticultural plants, notably *Gardenia*, *Ixora*, *Mussaenda*, and *Pentas*. Several genera include pantropical weeds, notably *Mitracarpus*, *Richardia*, and *Spermacoce*, of neotropical origin, and *Oldenlandia* (*Hedyotis*) of African origin. A number of species are used for various medicinal purposes.

Genera, tribes, and subfamilies of Rubiaceae characteristically either have or lack raphides; this character is generally considered informative taxonomically in this family. Raphides are tiny, needle-shaped crystals that are produced in groups inside some cells of leaf, stem, flower, and fruit tissues. They apparently function to protect the plant from herbivores. Raphides are often visible with a hand lens on dried specimens, particularly in soft tissues such as petals, the calyx hypanthium, and the young leaves at the apex of the stem, but may be difficult to see especially in succulent plants.

Leaf domatia are common in Rubiaceae and are sometimes taxonomically informative at least for separation of species. These domatia provide protection for tiny mites that live on the leaves and that help protect the plant from herbivores and fungi by eating insect eggs, small insects, and spores. These domatia occasionally take the form of foveolae or crypts, but more often are formed by small groups or tufts of pubescence, which is sometimes different in form from pubescence found on other parts of the plant.

At least half of the species of Rubiaceae have distylous flowers: an individual species has two flower forms, the long-styled form (or pin) with the stigmas borne above the anthers and the short-styled form (or thrum) with the anthers borne above the stigmas. An individual plant bears only one flower form, and the flowers are incompatible with other flowers of similar form whether borne on the same or another plant. Heterostyly is unusual in the flowering plants and is found in several other plant families that mostly have three floral forms instead of two with the third form (the homostylous) with the stigmas and anthers borne at the same level. Tristyly has only been documented very rarely for Rubiaceae, although it was noted by FRPS for *Chassalia curviflora* in China.

A number of species of many genera of Rubiaceae have calyx lobes that are unequal in size on an individual flower, and in some species of several genera one or more of the calyx lobes are markedly different, much enlarged and also often petaloid. These structures are found on flowers, where they are typically brightly colored and apparently function to attract pollinators, and/or on the fruit, where they are dry and brown and apparently function in dispersal of the fruit or seeds. These structures have variously been called “petaloid calyx lobes,” a morphologically descriptive term; “semaphylls,” a term that refers to the assumed function in pollination; and “calycophylls,” the term used here that refers to the leaflike shape of the calyx lobe. These structures are sometimes mistaken for bracts; a few species of Rubiaceae do also have petaloid bracts (e.g., *Dumilia*), but those structures are inserted on the inflorescence axes or immediately below the ovary of the flower.

The woody Rubiaceae are better represented (i.e., more diverse) in moist temperate regions of China than in comparable habitats in North America, as detailed by Latham and Ricklefs (in Ricklefs & Schluter, Spec. Diversity Ecol. Communities, 294–314. 1993). They concluded that this pattern, which is also found in a number of other dicotyledonous families, is due largely to historical factors. The principal factors they identified are the extinction of woody Rubiaceae in these other regions, while the plants were able to persist in E Asia (e.g., *Emmenopterys*), and the long-term direct connection of the moist temperate and moist tropical zones in E Asia vs. the separation of these zones by deserts and large water bodies in other regions. They agreed with Wolfe (in Nelson & Rosen, Vicariance Biogeogr. 413–427. 1981) that the connections of plant ranges between E North America and E Asia were broken by the end of the Eocene, and thus that species of the several genera that are found in both regions (e.g., *Cephalanthus*) have had separate evolutionary histories for some time. Several SE Asian Rubiaceae genera, all found in China, appear to represent the most basal living lineages of the family, notably *Acranthera*, *Coptosapelta*, and *Luculia* (Bremer et al., Syst. Biol. 48: 413–435. 1999; Bremer & Manen, Pl. Syst. Evol. 225: 43–72. 2000; Rydin et al., Pl. Syst. Evol. 278: 101–123. 2009).

A number of species of Rubiaceae are cultivated as ornamentals; most of these are mentioned and some are keyed and described here.

Additional information on many of the cultivated Rubiaceae was presented by Puff and Chamchumroon (Thai Forest Bull., Bot. 31: 75–94. 2003).

Complete Rubiaceae floras for E Asia are very few. The Chinese Rubiaceae were treated comprehensively in 1999 by FRPS; the treatment here is based primarily on that work. The Fl. URSS was published in English in 2000, but this is an unedited, unmodified translation of the 1958 work. The Fl. Japan has been published in several editions but includes relatively few genera and is rather idiosyncratic. The genus overview within the Rubiaceae of Thailand: A Pictorial Guide to Indigenous and Cultivated Genera by Puff et al. (43–240. 2005) is a useful recent reference.

Some morphological features that are characteristic of the Rubiaceae have been described, measured, and named very differently by different authors, and the differing terminology has generated some confusion. In particular, the terminology and measurements used for the calyx and gynoecium have differed widely. The ovary of Rubiaceae flowers is typically inferior, and the calyx is gamosepalous with its free portion, or limb, arising from the top of the ovary portion; this limb varies from reduced (i.e., not developed) to developed, and truncate to deeply lobed. Most Rubiaceae authors have distinguished the inferior ovary portion of the flower from the free calyx limb; the ovary portion has sometimes been called

simply an ovary, but sometimes considered to include the fused calyx and corolla tissue covering it and called a hypanthium. However, several authors, including in FRPS, have treated as one structure the inferior ovary together with the unlobed lower portion of the calyx limb, when this is present, as the “calyx tube” and the lobed portion of the calyx as a separate structure, the calyx lobes. The “calyx tube” is often clearly delimited and measurable, but the inclusion of the ovary in this means that this measurement can sometimes include ovaries that have been fertilized and are developing into fruit, thus are larger than and not comparable to the ovaries at anthesis even though the corolla may be still attached to the flowers. Here the ovary or hypanthium portion of the flower is measured separately from the limb; the term “hypanthium” is used to link these measurements to those of FRPS. The limb is measured separately here because the length of the tubular portion of this often includes taxonomically useful information, and while the “calyx tube” measurement is lost when the fruit are developed, the length of the tubular portion of the free calyx limb is usually still evident on the fruit thus facilitating identification. Another portion of the gynoecium that has been regarded differently by different authors is the distinction between the stigma and style: the structures regarded as 2-lobed stigmas by some authors are regarded as a style with 2 separate stigmas by as many other authors. Morphological study of the androecium and gynoecium here during preparation of a flora treatment has not been detailed and no focused effort has been made here to systematize these morphological interpretations.

Inflorescence terminology is complicated in most flowering plant families. The terms “bract” and “bracteole” have been carefully and regularly applied by some Rubiaceae authors, with the term “bracteole” used only for the bracts that immediately subtend the flowers or in some cases that are found anywhere along the pedicels, and the term “bract” used for the remaining structures. However, other authors have not distinguished these structures, or have not distinguished them regularly or consistently. The term “floral bract” here refers to the structures found on the pedicels or that immediately subtend sessile flowers. Bracts and leaves are generally considered homologous structures, and in Rubiaceae these often vary continuously along the inflorescences. In particular, Rubiaceae commonly have somewhat reduced leaves subtending the inflorescences, and bracts that are somewhat enlarged and occasionally leaflike. These structures have been variously called “reduced leaves” or “foliose bracts” or “foliaceous bracts” (here called “leaflike bracts”). In particular, many species with branched inflorescences sometimes have rather large, leaflike bracts subtending the basalmost pair of secondary axes; these have been variously interpreted as enlarged bracts at the top of the peduncle, or vegetative leaves that are borne at the base of a sessile, tripartite inflorescence.

Significant measurements found on plants from outside China are noted in the discussions following the species descriptions and/or are included within brackets in the descriptions in accordance with *Flora of China* style. Authors in FRPS described the seeds and embryos of some Rubiaceae but not others; their descriptions are reported. In many cases no information is available about these features for Chinese Rubiaceae. Authors in FRPS also described the pollen of a few genera; these reports are not included here because a number of very detailed, extensively documented pollen descriptions are available elsewhere, which show that much variation is found in pollen morphology at the species level in Rubiaceae and as yet Rubiaceae genera are not well characterized in terms of pollen. Thus, the very limited information available only at the genus level here does not seem well integrated into this flora treatment. The counts presented here for leaf veins apply to the secondary veins, as done by the majority of Rubiaceae authors. Many species of Rubiaceae also frequently have rather well-developed though shorter intersecondary veins, which often vary widely in number and degree of development between populations or plants; these apparently were occasionally combined with the secondary veins in the measurements given by FRPS, but such measurements are subject to significant misinterpretation by authors working in other regions and the varied usage in that work adds yet more confusion.

Where data were missing from the descriptions in the first draft for the *Flora of China*, the terms “unknown,” “not known,” “not noted,” and “not seen” were retained (with “not known” consisted to “unknown”). Where these terms were used in the habitats and elevational ranges they were deleted in accordance with the style of previous *Flora of China* volumes. Where missing data were denoted with question marks, e.g., “shape?,” or with constructions such as “\_ × \_,” these were deleted because it was not apparent which of the above categories of missing data applied.

The genus *Khasiaclunea* Ridsdale (Blumea 24: 347. 1979) is known with certainty from India and Myanmar and provisionally from N Vietnam; this may also be present in China, but no confidently determined specimens have yet been seen. The single species, *K. oligocephala* (Haviland) Ridsdale (Blumea 24: 347. 1979; *Adina oligocephala* Haviland, J. Linn. Soc., Bot. 33: 46. 1897), was reported by Ridsdale (loc. cit.) as “probably” found in China; however, this genus is not treated here.

Lo Hsienshui, Ko Wancheung, Chen Weichiu, Hsue Hsianghao & Wu Hen. 1999. Rubiaceae (1). In: Chen Weichiu, ed., Fl. Reipubl. Popularis Sin. 71(1): i–xvii, 1–432; Lo Hsienshui, Ko Wancheung, Chen Weichiu & Ruan Yunzhen. 1999. Rubiaceae: Rubioideae. In: Chen Weichiu, ed., Fl. Reipubl. Popularis Sin. 71(2): i–xvi, 1–377; Wan Wenhao. 2000. Theligonaceae. In: Chen Chia-jui, ed., Fl. Reipubl. Popularis Sin. 52(2): 147–151.

## Key 1

- 1a. Leaves apparently whorled and estipulate, 4 to numerous at each node; herbs, twiners, and low shrubs; calyx limb reduced to a thin rim or absent ..... Key 2
- 1b. Leaves paired to whorled with stipules developed between each pair; calyx limb well developed to reduced or apparently absent.
  - 2a. Acaulescent to caulescent herbs, soft subshrubs, or herbaceous vines or clambering plants, if tall subshrubs then stems annual ..... Key 3
  - 2b. Low to tall woody shrubs, trees, or lianas with well-developed secondary growth and perennial stems ..... Key 4

## Key 2

- 1a. Flowers 5-merous and fruit fleshy, dispersing as 1 drupaceous structure, red to orange or black ..... 79. *Rubia*
- 1b. Flowers 4-merous or 5-merous, fruit dry though sometimes inflated, dispersing as 1 structure or splitting into 2 structures.
  - 2a. Fruit inflated, dispersing as 1 structure; flowers 4-merous ..... 50. *Microphysa*
  - 2b. Fruit not inflated, schizocarpous and dispersing as 2 partially to completely separated mericarps; flowers 4- or 5-merous.
    - 3a. Corollas rotate to campanulate or broadly funnelform ..... 28. *Galium*
    - 3b. Corollas tubular to salverform or funnelform.

- 4a. Corollas 5-merous ..... 70. *Phuopsis*  
 4b. Corollas 4-merous (in our species).  
     5a. Leaves narrowly elliptic to lanceolate, with developed blades; mericarps ellipsoid and generally straight ..... 7. *Asperula*  
     5b. Leaves linear, with blades hardly developed; mericarps obovoid and markedly curved ..... 46. *Leptunis*

### Key 3

- 1a. Flowers fused in pairs by their ovaries; fruit fused in pairs ..... 51. *Mitchella*  
 1b. Flowers and fruit free.  
     2a. Plants monoecious, with unisexual anemophilous flowers, staminate with 3 or 5 corolla lobes, 6–30 stamens, and no ovary, pistillate with 3 corolla lobes, reduced staminodes, and a 1-celled ovary; calyx limb reduced to absent ..... 91. *Theligonum*  
     2b. Plants with bisexual insect-pollinated flowers, with 4–6 corolla lobes, with 4–6 stamens, and 2–5-celled ovary both developed; calyx limb well developed to reduced or absent.  
       3a. Calyx limb reduced to a thin truncate rim or absent.  
         4a. Flowers 5-merous and fruit fleshy, orange to red or black ..... 79. *Rubia*  
         4b. Flowers 4- or 5-merous and fruit dry, schizocarpous or capsular, green to brown.  
           5a. Ovules numerous in each cell; fruit capsular, mitriform and laterally markedly flattened (this shape often evident in young developing fruit), with numerous small seeds ..... 65. *Ophiorrhiza*  
           5b. Ovules 1 per cell; fruit indehiscent or schizocarpous with 2 mericarps, ellipsoid to subglobose, sometimes flattened, with 2 seeds.  
             6a. Fruit inflated, dispersing as a single structure ..... 50. *Microphysa*  
             6b. Fruit not inflated, schizocarpous, dispersing as 2 partially to completely separated mericarps.  
               7a. Corolla salverform to tubular or funnelform ..... 7. *Asperula*  
               7b. Corolla rotate to campanulate or broadly funnelform ..... 28. *Galium*  
       3b. Calyx limb developed, with lobes sometimes reduced but still evident.  
         8a. Ovary and fruit densely covered by well-developed, unusual, flattened or curved and glandular trichomes or projections.  
           9a. Ovary and fruit covered with flattened trichomes, these sometimes with apical thickenings; flowers solitary, terminal or pseudoaxillary, sessile or subsessile ..... 21. *Dentella*  
           9b. Ovary and fruit covered with glandular curved trichomes; flowers several and pedicellate in terminal and pseudoaxillary, irregularly branched cymes ..... 41. *Kelloggia*  
         8b. Ovary and fruit smooth and glabrous to variously pubescent but trichomes neither regularly glandular nor markedly flattened.  
           10a. Plants extensively twining, climbing, or clambering, with stems slender and herbaceous or suffrutescent and flexuous.  
             11a. Plants climbing by adventitious roots (*P. serpens*); stipules deciduous after distalmost few nodes; fruit fleshy, drupaceous, red ..... 74. *Psychotria*  
             11b. Plants not climbing by adventitious roots, these sometimes scattered along stem but not principal supports; stipules persistent or deciduous; fruit dry, green or becoming brown or black.  
               12a. Plants not fetid when bruised; fruit capsular with several to numerous small angled seeds; corollas with 4 or 5 valvate lobes ..... 35. *Hedyotis*  
               12b. Plants usually with fetid odor when bruised; fruit schizocarpous, dry, inflated, with 2 flattened winged pyrenes; corollas with 4–6 valvate-induplicate lobes ..... 66. *Paederia*  
           10b. Plants weak to erect, creeping on ground, self-supporting or weakly shortly clambering.  
             13a. Cultivated plants; corolla white to pink or red, 20–25 mm; fruit usually not developing ..... 68. *Pentas*  
             13b. Wild plants; corolla white to red or purple, 1–55 mm; fruit usually developing.  
               14a. Stipules setose, lacinate, multifid, fimbriate, and/or dentate to markedly erose, if lobed then lobes 4 or more and entire or erose.  
               15a. Calyx and corolla lobes each 6; fruit schizocarpous with 3 mericarps ..... 76. *Richardia*  
               15b. Calyx and corolla lobes 3–5; fruit indehiscent, schizocarpous with 2 mericarps, or capsular.  
               16a. Flowers solitary and sessile, or several and sessile in sessile heads or glomerules.  
               17a. Fruit a circumscissile capsule; calyx lobes usually with hyaline margins; seeds 2 with cruciform attachment scar ..... 52. *Mitracarpus*  
               17b. Fruit indehiscent, schizocarpous, or capsular and splitting longitudinally or apically; calyx lobes with margins not hyaline; seeds 2 to numerous with simple rounded to linear attachment scar.  
               18a. Seeds 1 per cell, 2 per fruit, fruit indehiscent, schizocarpous splitting into mericarps, or capsular splitting longitudinally and deeply.  
               19a. Fruit indehiscent or splitting into 2 indehiscent mericarps ..... 22. *Diodia*

- 19b. Fruit capsular, splitting septicidally into 2 segments with 1 or both segments then splitting loculicidally ..... 86. *Spermacoce*
- 18b. Seeds 2 or more per cell, 4 or more per fruit, fruit indehiscent, schizocarpous splitting into mericarps, or capsular splitting primarily through apical beak or apical half.
- 20a. Plants without fetid odor when bruised, usually drying green or brownish green; seeds angled to lenticular ..... 35. *Hedyotis*
- 20b. Plants usually with fetid odor when bruised, usually drying black to gray; seeds peltate to plano-convex ..... 60. *Neanotis*
- 16b. Flowers solitary to numerous, sessile to pedicellate or pedunculate in fascicles or cymes, if flowers sessile then borne severally in cymes or in pedunculate heads or glomerules.
- 21a. Fruit schizocarpous, flattened, with 2 suborbicular indehiscent mericarps ..... 42. *Knoxia*
- 21b. Fruit capsular, subglobose to ovoid or mitriform, opening to release several to numerous seeds.
- 22a. Fruit mitriform and laterally markedly flattened (this shape often evident in young developing fruit) ..... 65. *Ophiorrhiza*
- 22b. Fruit subglobose to ovoid, angled to ridged but strongly flattened laterally.
- 23a. Fruit opening through apical lid that develops from disk ..... 73. *Pseudopyxis*
- 23b. Fruit dehiscent through linear openings across top and often extending down sides.
- 24a. Flowers 5-merous ..... 88. *Spiradiclis*
- 24b. Flowers 4- or 5-merous.
- 25a. Plants without fetid odor when bruised, usually drying green or brownish green; seeds angled to lenticular ..... 35. *Hedyotis*
- 25b. Plants usually with fetid odor when bruised, usually drying black to gray; seeds peltate to plano-convex ..... 60. *Neanotis*
- 14b. Stipules entire, 2-lobed, or 3-lobed, lobes entire.
- 26a. Fruit a fleshy drupe with 2–4 pyrenes; principal stems creeping, with short erect reproductive stems.
- 27a. Inflorescences several flowered, capitate, and pedunculate; leaves cordiform to ovate ..... 30. *Geophila*
- 27b. Flowers solitary, sessile or subsessile; leaves elliptic ..... 64. *Nertera*
- 26b. Fruit dry, or fleshy and baccate with several to numerous seeds; habit erect to creeping with or without short erect reproductive stems.
- 28a. Stipules densely covered with numerous, closely set, parallel or palmate fibers or veins ..... 58. *Myrioneuron*
- 28b. Stipules smooth, without evident veins or fibers or 1- or 2-costate.
- 29a. Fruit dry and indehiscent or schizocarpous.
- 30a. Fruit indehiscent, obconical, several seeded; small herbs with well-developed tubers ..... 17. *Clarkella*
- 30b. Fruit schizocarpous with 2 flattened, suborbicular mericarps; erect to rather tall herbs without tubers ..... 42. *Knoxia*
- 29b. Fruit dry and capsular, or fleshy and indehiscent.
- 31a. Fruit mitriform and laterally markedly flattened (this shape often evident in young developing fruit) ..... 65. *Ophiorrhiza*
- 31b. Fruit subglobose to ovoid, laterally not or only weakly flattened.
- 32a. Fruit an operculate capsule (dehiscence mode unknown in *Keenania*).
- 33a. Flowers 1 to several in cymes or fascicles, all of them generally well separated by each other on inflorescence axes and/or pedicels.
- 34a. Corolla rotate to campanulate; ovary and fruit 2-celled ..... 6. *Argostemma*
- 34b. Corolla tubular-funnelform to salverform; ovary and fruit 4- or 5-celled ..... 73. *Pseudopyxis*
- 33b. Flowers several to numerous in heads or congested cymes, many or all of them closely grouped together.
- 35a. Ovules and seeds borne on stipitate placentas near base of septum ..... 45. *Leptomischus*
- 35b. Ovules and seeds borne on peltate placentas near middle of septum.
- 36a. Plants apparently without raphides; disk apparently glabrous ..... 40. *Keenania*
- 36b. Raphides present; disk puberulent ..... 55. *Mouretia*
- 32b. Fruit a capsule dehiscent through linear openings, or fleshy and indehiscent.
- 37a. Ovary and fruit 5-celled; plants often with fetid odor when bruised ..... 87. *Spermadictyon*
- 37b. Ovary and fruit 1- or 2-celled; plants without or sometimes with fetid odor when bruised.
- 38a. Fruit baccate, fleshy to dry, indehiscent (unknown in *Keenania*).
- 39a. Flowers solitary on paired axillary short shoots (i.e., brachyblasts); corollas ca. 55 mm ..... 1. *Acranthera*
- 39b. Flowers 2 to numerous on axillary or terminal peduncles; corollas 3–10 mm.

- 40a. Corolla lobes convolute in bud; plants nearly to completely acaulescent ..... 32. *Guihaiothamnus*  
 40b. Corolla lobes valvate in bud; plants with stems (so far as known).  
     41a. Inflorescences cymose, branched; raphides present and evident ..... 47. *Lerchea*  
     41b. Inflorescences capitate or congested-cymose, not or sparingly branched;  
         plants perhaps with raphides but these not readily evident ..... 40. *Keenania*  
 38b. Fruit capsular, septicidal or loculicidal (unknown in *Keenania*).  
     42a. Flowers with 4 calyx and corolla lobes and stamens or some flowers occasionally  
         with 5.  
         43a. Plants without fetid odor when bruised, usually drying green or brownish green;  
             seeds angled to lenticular ..... 35. *Hedyotis*  
         43b. Plants usually with fetid odor when bruised, usually drying black to gray; seeds  
             peltate to plano-convex ..... 60. *Neanotis*  
     42b. Flowers with 5 calyx and corolla lobes and stamens.  
         44a. Inflorescences capitate or congested-cymose; ovary and fruit smooth ..... 40. *Keenania*  
         44b. Inflorescences branched, cymose; ovary and fruit ridged to winged ..... 88. *Spiradiclis*

#### Key 4

- 1a. Leaves with tertiary or quaternary venation finely, regularly lineolate (this visible best on abaxial surface);  
 inflorescences axillary; fruit a fleshy drupe.  
     2a. Fruit with 1 pyrene, this with 2–5 cells (and seeds); corollas 5–11 mm, with 4 or 5 lobes ..... 5. *Antirhea*  
     2b. Fruit with 50 or more pyrenes, each with 1 cell; corollas 10–15 mm, with 6 lobes ..... 92. *Timonius*  
 1b. Leaves with tertiary and higher order venation not visible or irregularly to somewhat regularly areolate;  
 inflorescences axillary, terminal, or in other positions; fruit dry to fleshy, drupaceous, baccate, capsular,  
 schizocarpous, or other form.  
     3a. Plants mangroves, growing along seashores in areas regularly inundated by saltwater, with succulent tissues,  
         usually with stilt roots, usually with young growth covered with mucilage or resin ..... 83. *Scyphiphora*  
     3b. Plants of terrestrial or freshwater riverine habitats, with succulent to very thin tissues, without stilt roots,  
         with young growth covered with resin or not.  
         4a. Flowers fused together by their ovaries, at least shortly at their bases; fruit multiple (i.e., formed from  
             more than 1 flower).  
             5a. Stipules twisted or imbricate in a hemispherical to conical bud; fruit drupaceous, each with 2 or 4 pyrenes,  
                 each pyrene with 1 seed ..... 54. *Morinda*  
             5b. Stipules held erect and pressed together in flattened bud; fruit baccate, each fruit with numerous seeds ..... 59. *Nauclea*  
         4b. Flowers free, sometimes tightly packed on a common supporting structure but not actually fused; fruit  
             free (i.e., each formed from only 1 flower).  
         6a. Flowers in 1 to several symmetrical, globose heads, heads sessile to pedunculate, terminal or axillary,  
             flowers sessile to pedicellate.  
             7a. Lianas with recurved spines ..... 94. *Uncaria*  
             7b. Shrubs or trees, unarmed.  
             8a. Some or all leaves truncate to cordate at base.  
                 9a. Inflorescences all axillary; stipules ovate to elliptic or spatulate, unlobed, held erect and pressed  
                     together in a flattened bud ..... 33. *Haldina*  
                 9b. Inflorescences terminal and sometimes also in uppermost leaf axils; stipules ovate in outline and  
                     deeply bilobed, imbricate in a conical bud ..... 85. *Sinoadina*  
         8b. Leaves obtuse to acute at base.  
             10a. Fruit indehiscent; large trees, frequently cultivated for lumber ..... 62. *Neolamarckia*  
             10b. Fruit schizocarpous splitting into 2 mericarps or capsular with septicidal then loculicidal  
                 dehiscence; shrubs and trees, perhaps occasionally cultivated.  
             11a. Fruit schizocarpous, splitting into 2 indehiscent mericarps; leaves opposite or whorled;  
                 shrubs ..... 13. *Cephalanthus*  
             11b. Fruit capsular, valves opening to release seeds; leaves opposite; shrubs and trees.  
                 12a. Stipules held erect and pressed together in a flattened bud.  
                     13a. Inflorescence heads sessile or subsessile with peduncles up to 0.5 cm; stigmas cylindrical  
                         with style attached in a recessed portion (i.e., upside-down mitriform) ..... 53. *Mitragyna*  
                     13b. Inflorescence heads pedunculate, peduncles 1–8 cm; stigmas globose to ovoid ..... 63. *Neonauclea*  
                 12b. Stipules imbricate or valvate in a conical to hemispherical bud.  
                     14a. Seeds subglobose to trigonous or ellipsoid, not winged ..... 49. *Metadina*  
                     14b. Seeds flattened to fusiform or angled, usually winged.  
                         15a. Calyx lobes ca. 0.5 mm; fruit 5–7 mm ..... 85. *Sinoadina*

- 15b. Calyx lobes 1–2 mm; fruit 1.5–5 mm.
  - 16a. Stipules deeply bilobed for more than 1/2 their length ..... 2. *Adina*
  - 16b. Stipules triangular and entire to shortly bilobed for 1/4 or less their length ..... 69. *Pertusadina*
- 6b. Flowers variously arranged in heads, cymes, panicles, or other types of groups, these groups sometimes umbelliform but heads then not symmetrically globose, terminal, axillary, pseudoaxillary, or in other positions.
  - 17a. Fruit capsular, opening through an apical operculum and later sometimes splitting into 5 valves, with each seed individually enclosed in a fibrous, netlike aril ..... 44. *Leptodermis*
  - 17b. Fruit indehiscent, baccate, drupaceous, or capsular but then not operculate and with fewer than 5 valves, seeds without aril or with aril continuous, fleshy.
  - 18a. Inflorescences not borne at stem apex but regularly axillary (i.e., borne in both axils at a node), superaxillary, and/or apparently axillary due to regularly produced axillary or lateral short shoots (i.e., brachyblasts).
  - 19a. Stems and abaxial surface of leaf densely sericeous, hirsute, or strigose with remarkably long silky trichomes ..... 97. *Xanthophytum*
  - 19b. Stems and abaxial surface of leaf variously glabrous to pubescent with trichomes of various types, but not densely and consistently long and silky.
  - 20a. Inflorescence borne on regular paired axillary short shoots (i.e., brachyblasts), each short shoot with several stipulate nodes; fruit fleshy and drupaceous or baccate, or dry and indehiscent or schizocarpous.
    - 21a. Stipules with 1–8 stiffly spiniform bristles ..... 84. *Serissa*
    - 21b. Stipules entire or with several to numerous bristles or projections but these not spiny.
      - 22a. Bracts multifid with segments glandular.
        - 23a. Corolla lobes valvate in bud; fruit a fleshy drupe ..... 20. *Damnacanthus*
        - 23b. Corolla lobes convolute in bud; fruit a dry schizocarp ..... 93. *Trailliaedoxa*
      - 22b. Bracts absent or entire and not glandular.
        - 24a. Stipules bilobed ..... 72. *Prismatomeris*
        - 24b. Stipules triangular.
          - 25a. Flowers with 4 calyx lobes, corolla lobes, and stamens.
            - 26a. Petioles and inflorescence axes articulate at their bases; stigmas fusiform ..... 39. *Ixora*
            - 26b. Petioles and inflorescence axes not articulate; stipules lobed.
              - 27a. Plants without fetid odor; corolla salverform, with lobes convolute in bud ..... 67. *Pavetta*
              - 27b. Plants with or without fetid odor when bruised; corolla campanulate, tubular, or funnelform, with lobes valvate or valvate-induplicate in bud ..... 81. *Saprosma*
      - 25b. Flowers with 5 calyx lobes, corolla lobes, and stamens.
        - 28a. Calyx lobes 5–8 mm ..... 12. *Catunaregam*
        - 28b. Calyx lobes 0.5–4 mm.
          - 29a. Ovules and seeds 1–4 in each cell; plants without spines; flowers sessile and solitary ..... 36. *Himalrandia*
          - 29b. Ovules and seeds more than 4 in each cell; plants with or without spines; flowers sessile to pedicellate, solitary to several in fascicles.
            - 30a. Plants with bisexual flowers; ovary with ovules and seeds attached to septum (i.e., axile) ..... 8. *Benkara*
            - 30b. Plants dioecious; ovary with ovules and seeds attached to outer wall (i.e., parietal); nodes of stems mostly reduced ..... 14. *Ceriscoides*
  - 20b. Inflorescences borne on peduncles directly from main stems, these with no more than 1 reduced basal node.
    - 31a. Inflorescences racemiform or spiciform, with well-developed primary axes directly bearing numerous pedicels ..... 37. *Hymenodictyon*
    - 31b. Inflorescences capitate to cymose, without well-developed primary axes or with axes of several orders developed, with higher order axes or all axes bearing few to numerous pedicels.
      - 32a. Woody twiners or climbers; fruit a woody capsule, subglobose, with winged seeds ..... 19. *Coptosapelta*
      - 32b. Erect shrubs and trees; fruit fleshy and indehiscent or capsular, papery to cartilaginous, flattened, with unwinged seeds.
        - 33a. Fruit capsular, papery to cartilaginous, mitriform and laterally markedly flattened (this shape often evident in young developing fruit) ..... 65. *Ophiorrhiza*
        - 33b. Fruit indehiscent and fleshy.

- 34a. Corolla lobes imbricate in bud; fruit a drupe with a single, 4–9-celled subglobose pyrene, this 2–3 cm in diam.; plants of coastal thickets ..... 31. *Guetarda*
- 34b. Corolla lobes convolute or valvate in bud or imbricate in some species of *Lasianthus*; fruit baccate with numerous seeds or drupaceous with 1-celled pyrenes 2 to numerous; plants of interior habitats.
- 35a. Cultivated plants; corolla lobes convolute in bud; fruit drupaceous with 2 plano-convex pyrenes with papery walls; bracts fused in calyculate pairs ..... 18. *Coffea*
- 35b. Native plants; corolla lobes convolute, valvate, or imbricate in bud; fruit baccate or drupaceous with 2 to numerous plano-convex to angled, ellipsoid-oblong, ellipsoid, or flattened, hard-walled pyrenes; bracts free or fused in calyculate pairs.
- 36a. Fruit a berry with several to numerous seeds.
- 37a. Seeds numerous; corolla lobes valvate in bud ..... 95. *Urophyllum*
- 37b. Seeds 3–8; corolla lobes convolute in bud.
- 38a. Ovules and seeds 1–3 per cell; stigmas papillose; calyx lobes minute or up to 0.5 mm ..... 23. *Diplospora*
- 38b. Ovules and seeds 3–6 per cell; stigmas pubescent; calyx lobes 1–2 mm ..... 38. *Hyptianthera*
- 36b. Fruit a drupe, with 2 to numerous pyrenes, each containing 1 seed.
- 39a. Flower buds acute to rounded at apex; pyrenes flattened to triangular; plants often with fetid odor when bruised ..... 43. *Lasianthus*
- 39b. Flower buds sharply acute to acuminate at apex; pyrenes plano-convex to ellipsoid-oblong or ellipsoid; plants without fetid odor.
- 40a. Plants without or sometimes with spines; stipules pilose to sericeous inside (i.e., adaxially) ..... 11. *Canthium*
- 40b. Plants without spines; stipules glabrous inside ..... 75. *Psydrax*
- 18b. Inflorescences terminal, pseudoaxillary (i.e., regularly borne in only 1 axil at a node), or apparently pseudoaxillary or lateral due to anisophylly or an undeveloped internode.
- 41a. Stipules with 1–8 sharp spines or spiny bristles ..... 84. *Serissa*
- 41b. Stipules entire to lobed or multifid, sometimes aristate or caudate but not spiny.
- 42a. Stipules with several well-developed, fibrous, closely set veins, these parallel to palmate ..... 58. *Myrioneuron*
- 42b. Stipules smooth, 1–3-costate but not densely veined.
- 43a. Calyx limb with developed truncate tube; flowers several to numerous, all pedicellate, borne in umbelliform cymules ..... 10. *Caelospermum*
- 43b. Calyx limb reduced to developed and at least shortly lobed or denticulate; flowers variously arranged but not uniformly pedicellate in umbelliform cymules.
- 44a. Corolla lobes convolute in bud and fruit a berry with fleshy to leathery outer wall.
- 45a. Fruit and usually ovary portion of calyx 5–8-ridged or -winged, ridges continuous with midrib of each calyx lobe ..... 29. *Gardenia*
- 45b. Fruit and ovary portion of calyx smooth to tuberculate.
- 46a. Some or all inflorescences regularly borne in pseudoaxillary, leaf-opposed, and/or lateral position with only 1 inflorescence per node (i.e., not paired, borne on only one side of stem), this arrangement due to anisophylly or a reduced internode producing apparently alternate leaves or a 3-leaved node.
- 47a. Inflorescences all apparently leaf-opposed or borne at leafless nodes (due to extreme anisophylly), stems with paired or apparently alternate leaves ..... 3. *Aidia*
- 47b. Inflorescences mostly borne on apparently 3-leaved nodes, stems with some 3-leaved nodes.
- 48a. Flowers 12 or more per inflorescence ..... 25. *Duperrea*
- 48b. Flowers 1–10 per inflorescence.
- 49a. Some or all leaf apices with short filamentous arista or projection ..... 80. *Rubovietnamia*
- 49b. Leaf apices without filamentous projections.
- 50a. Plants dioecious, with unisexual flowers; fruit 5–15 mm in diam.; corollas (so far as known) 5–8 mm ..... 9. *Brachytome*
- 50b. Plants with bisexual flowers; fruit ca. 35 mm in diam.; corollas 68–75 mm ..... 78. *Rothmannia*
- 46b. Inflorescence borne at stem apices and sometimes in adjacent uppermost leaf axils, sometimes displaced to pseudoaxillary by subsequent overtopping stem growth, produced at stems generally with number and arrangement of leaves similar at all nodes.
- 51a. Low shrubs, up to 0.5 m tall, with many internodes reduced and relatively small leaves.

- 52a. Flowers solitary ..... 36. *Himalrandia*
- 52b. Flowers in cymes of 6–12 ..... 93. *Trailliaedoxa*
- 51b. Shrubs, low (ca. 0.3 m tall) to tall, or trees.
- 53a. Corolla densely sericeous (i.e., with long, silky, appressed trichomes) on outside .... 71. *Porterandia*
- 53b. Corolla glabrous to puberulent, spreading pubescent, or strigillose (i.e., with short appressed trichomes) on outside.
- 54a. Inflorescences with 1–7 flowers; fruit 4–11 cm ..... 27. *Fosbergia*
- 54b. Inflorescences with 5 to numerous flowers; fruit 2 cm or shorter.
- 55a. Petioles and inflorescence axes articulate; ovules and seeds 1 per cell, 2 per ovary or fruit; stigmas unlobed ..... 39. *Ixora*
- 55b. Petioles and inflorescence axes not articulate; ovules and seeds 1 to numerous per cell, 2 to numerous per ovary or fruit; stigmas lobed.
- 56a. Bark of older stems becoming coppery red and circumferentially wrinkled to peeling ..... 90. *Tarennoidea*
- 56b. Bark of older stems smooth, persistent, green to gray or brown, sometimes becoming longitudinally striate or fissured with age.
- 57a. Ovules 1 per cell and 2 per ovary; fruit drupaceous with 2 plano-convex pyrenes ..... 67. *Pavetta*
- 57b. Ovules 2 or more per cell and 4 or more per ovary; fruit baccate with seeds 2 or more, ellipsoid, obovoid, or compressed globose.
- 58a. Seeds 2–6 per fruit, 4–5 mm in diam., compressed globose, fruit yellowish white; plants without spines ..... 4. *Alleizettella*
- 58b. Seeds 4 to numerous per fruit, 3–5 mm in diam., compressed globose to ellipsoid or obovoid, fruit purplish black, black, or sometimes white; plants with or without spines.
- 59a. Plants without or usually with spines; calyx limb persistent or deciduous on fruit ..... 8. *Benkara*
- 59b. Plants without spines; calyx limb deciduous on fruit ..... 89. *Tarenna*
- 44b. Corolla lobes valvate, valvate-induplicate, imbricate, or convolute in bud and fruit a drupe, berry, capsule, or schizocarp, if corolla lobes convolute then fruit not a berry.
- 60a. Stigmas, cells of ovary, and cells of fruit 4 or 5.
- 61a. Corollas tubular with relatively short lobes, these 10% or less of total corolla length; plants cultivated oramentals ..... 34. *Hamelia*
- 61b. Corollas funnelform, tubular-funnelform, or salverform with lobes developed, 15% or more of total corolla length; plants native or cultivated.
- 62a. Fruit dry, schizocarpous or capsular, leathery; plants often with fetid odor when bruised ..... 87. *Spermadictyon*
- 62b. Fruit fleshy and drupaceous or baccate, or capsular and thinly textured; plants without fetid odor.
- 63a. Plants not particularly succulent, sometimes with spines, usually with some internodes not expanded; calyx without stalked glands ..... 20. *Damnacanthus*
- 63b. Plants sometimes succulent, without spines, with all internodes expanded; calyx sometimes with stalked glands ..... 57. *Mycetia*
- 60b. Stigmas 1 or 2 and cells of ovary and fruit 2, or sometimes any of these 3 on some but not all flowers in an inflorescence.
- 64a. Cultivated ornamental plants; herbs and low shrubs to small trees; corollas red, orange, or yellow.
- 65a. Stigmas unlobed; corolla lobes convolute in bud; petioles and inflorescence axes articulate ..... 39. *Ixora*
- 65b. Stigmas 2- or 3-lobed; corolla lobes valvate, valvate-induplicate, or imbricate in bud; petioles and inflorescence axes not articulate.
- 66a. Plants often with petaloid calycophylls; corolla lobes valvate-induplicate in bud ..... 56. *Mussaenda*
- 66b. Plants without petaloid calycophylls; corolla lobes valvate or imbricate in bud.
- 67a. Herbs and low shrubs; corolla with white pubescence in throat, lobes obtuse to acute, with margins flat ..... 68. *Pentas*
- 67b. Shrubs; corolla with yellow pubescence in throat, lobes broadly obtuse to rounded, with margins flat to crisped ..... 77. *Rondeletia*
- 64b. Native plants; low shrubs to large trees; corollas white, pink, purple, yellow, or red.

- 68a. Fruit indehiscent, drupaceous, or baccate, fleshy or leathery; corolla lobes convolute, imbricate, or valvate in bud; ovules and seeds 1 to numerous per cell, 2 to numerous per fruit.
- 69a. Stigmas unlobed; petioles and inflorescence axes articulate at base ..... 39. *Ixora*
- 69b. Stigmas 2- or 3-lobed; petioles and inflorescence axes not articulate.
- 70a. Fruit baccate, with numerous seeds in each cell, these enclosed in soft tissues.
- 71a. Corolla lobes valvate-reduplicate; calyx sometimes with calycophylls, without stalked glands; seeds flattened; plants not succulent ..... 56. *Mussaenda*
- 71b. Corolla lobes valvate-induplicate; calyx without calycophylls, sometimes with stalked glands; seeds angled; plants often succulent ..... 57. *Mycetia*
- 70b. Fruit indehiscent or drupaceous, with 1 seed in each cell, this enclosed in a pyrene.
- 72a. Stipules caducous or rather quickly deciduous, often exposing a ring of persistent trichomes that usually dry red-brown (use magnification) ..... 74. *Psychotria*
- 72b. Stipules persistent to caducous, not enclosing persistent trichomes or these reduced and/or drying white.
- 73a. Corolla lobes convolute in bud.
- 74a. Fruit drupaceous, with pyrenes flattened to concavo-convex ..... 67. *Pavetta*
- 74b. Fruit schizocarpous with segments or valves oblanceoloid ..... 93. *Trailliaedoxa*
- 73b. Corolla lobes valvate in bud.
- 75a. Corolla tubular-funnelform with base usually gibbous and tube usually curved ..... 15. *Chassalia*
- 75b. Corolla tubular-funnelform or salverform, generally straight at base and in tube.
- 76a. Stipules persistent and becoming hardened and yellowed with age, often fragmenting when older ..... 74. *Psychotria*
- 76b. Stipules caducous, or persistent but then not becoming hardened, yellowed, or fragmented.
- 77a. Plants often with fetid odor when bruised; corolla lobes mostly 4, or on a few flowers of some plants 5 or 6 ..... 81. *Saprosma*
- 77b. Plants without fetid odor; corolla lobes regularly 5, on a few flowers of some plants 4.
- 78a. Bracts glandular-multifid ..... 20. *Damnacanthus*
- 78b. Bracts entire, not glandular ..... 72. *Prismatomeris*
- 68b. Fruit dry and capsular (i.e., dehiscent), indehiscent, or schizocarpous (i.e., splitting into sections); corolla lobes valvate, valvate-induplicate, or imbricate in bud; ovules and seeds several to numerous in each cell and fruit, or 1 per cell and 2 per fruit in *Trailliaedoxa*.
- 79a. Inflorescences racemiform or spiciform, with 1 or a few well-developed main axes bearing pedicels ..... 37. *Hymenodictyon*
- 79b. Inflorescences subcapitate to cymose, with axes of various orders developed to different degrees and flowers usually borne from axes of various orders.
- 80a. Fruit mitriform and laterally markedly flattened (this shape often evident in young developing fruit) ..... 65. *Ophiorrhiza*
- 80b. Fruit ellipsoid to subglobose.
- 81a. Fruit capsular, septicidal, 8–50 mm with at least some fruit 10 mm or longer; seeds flattened and often winged; corollas 5–70 mm.
- 82a. Stipules persistent; shrubs, often epiphytic ..... 61. *Neohymenopogon*
- 82b. Stipules caducous; terrestrial shrubs or trees.
- 83a. Corolla lobes valvate in bud, acute; cultivated trees, without petaloid calycophylls ..... 16. *Cinchona*
- 83b. Corolla lobes imbricate in bud, obtuse to rounded; native trees perhaps sometimes cultivated, sometimes with petaloid calycophylls.
- 84a. Calyx lobes 2–2.5 mm; corolla lobes ca. 7 mm; plants sometimes with calycophylls ..... 26. *Emmenopterys*
- 84b. Calyx lobes 8–20 mm; corolla lobes 11–18 mm; plants without calycophylls ..... 48. *Luculia*
- 81b. Fruit indehiscent, schizocarpous, or capsular, septicidal or loculicidal, 1–8 mm; seeds flattened and sometimes winged to angled and unwinged; corollas 2–20 mm.

- 85a. Corolla lobes imbricate in bud; fruit capsular, loculicidal, subglobose, woody ..... 96. *Wendlandia*
- 85b. Corolla lobes valvate, valvate-induplicate, or convolute in bud; fruit indehiscent, schizocarpous, or capsular and septicidal or loculicidal, subglobose to ellipsoid, papery to woody, if loculicidal then corolla lobes valvate.
- 86a. Corolla lobes convolute in bud; low shrubs; ovules and seeds 1 per cell .... 93. *Trailliaedoxa*
- 86b. Corolla lobes valvate or valvate-induplicate in bud; low to large shrubs; ovules and seeds several to numerous in each cell.
- 87a. Corolla lobes valvate-induplicate in bud; plants often with petaloid calycophylls ..... 82. *Schizomussaenda*
- 87b. Corolla lobes [simple-]valvate in bud; plants with or without petaloid calycophylls.
- 88a. Inflorescences usually with 1 or several petaloid bracts and/or calycophylls; corolla yellow; capsules septicidal; stipules interpetiolar, persistent ..... 24. *Dunni*
- 88b. Inflorescences without petaloid bracts or calycophylls; corolla white, pink, blue, purple, or yellow; capsules septicidal or loculicidal or fruit indehiscent; stipules interpetiolar or fused to petiole bases, persistent or caducous.
- 89a. Fruit dehiscent through apical part or splitting into 2 indehiscent valves ..... 35. *Hedyotis*
- 89b. Fruit deeply dehiscent into 2 or 4 separate valves ..... 88. *Spiradiclis*

# 1. ACRANTHERA Arnott ex Meisner, Pl. Vasc. Gen. 1: 162; 2: 115. 1838, nom. cons.

尖药花属 jian yao hua shu

Chen Tao (陈涛); Charlotte M. Taylor, Christian Puff

Herbs or subshrubs, unbranched or little branched, unarmed. Raphides absent. Leaves opposite and often clustered at ends of stems, without domatia; stipules persistent or deciduous, interpetiolar, triangular to oblong. Inflorescences terminal or sometimes displaced to pseudoaxillary, borne on principal stems or sometimes short shoots at stem apex or in 1 or both leaf axils, 1-flowered [or cymose to fasciculate and several flowered], bracteate [or bracts reduced]. Flowers pedicellate or sessile, bisexual, apparently monomorphic. Calyx with ovary portion usually relatively prolonged; limb lobed essentially to base; lobes 4 or 5, often with 1 well-developed colleter in each sinus. Corolla pale green or white to blue or purple, funnelform to campanulate, glabrous inside; lobes 4 or 5, valvate or reduplicate-valvate in bud. Stamens 5, inserted near base of corolla tube, included or exserted; filaments short to well developed, glabrous, free or fused in basal portion; anthers linear, at apex with sharply acute or spurred appendage, these connate into a tube surrounding stigma and united with it at tops of both structures. Ovary 1-celled, ovules many per cell on 2 T-shaped parietal placentas; stigma 1, clavate, relatively large, 10-ridged, sometimes fused at top to anther appendages. Fruit baccate or perhaps occasionally tardily capsular with irregular dehiscence, fleshy, ovoid to cylindrical or turbinate, color not reported, with calyx limb persistent; seeds numerous, reddish brown or nearly black, small, compressed or lenticular; endosperm fleshy; embryo small, straight.

About 40 species: China, India, Indonesia, Malaysia, Sri Lanka, Thailand, Vietnam, with most species apparently in Borneo; one species (endemic) in China.

This genus was monographed by Bremekamp (J. Arnold Arbor. 28: 261–308. 1947), who named a number of subgenera and series. C. Y. Wu's new species did not fit into Bremekamp's classification; consequently, he described a new monotypic subgenus for it, *Acranthera* subg. *Sinacranthera*. C. Y. Wu, distinguished from *A. subg. Acranthera* and *A. subg. Androtropis* Bremekamp by its funnelform corollas, inflorescences borne on opposite brachyblasts bearing two rudimentary leaves, and red to purple corolla color (vs. basal part of corolla cylindrical, inflorescences borne at stem apices, and blue corollas in *A. subg. Acranthera* and inflorescences borne at stem apices and pale green corollas in *A. subg. Androtropis*) and from the other subgenera by its well-developed, subglobose disk (vs. inconspicuous and presumably flattened). *Acranthera* is considered based on recent molecular and some morphological data to be a rather isolated basal lineage in Rubiaceae: its closest relative is probably *Coptosapelta*, and these two genera are probably most closely related to *Luculia* (Alejandro et al., Amer. J. Bot. 92: 544–557. 2005; Rydin et al., Pl. Syst. Evol. 278: 101–123. 2009).

Puff et al. (Ann. Missouri Bot. Gard. 82: 357–382. 1995) concluded that the flowers have an “anther-style and stigma complex” that is unique in Rubiaceae and suggested that at least some *Acranthera* species may be buzz-pollinated. Bremekamp described the ovaries as 2-celled with laminar axile placentas, but Puff et al. showed that the ovaries are actually 1-celled, with parietally inserted placentas that are T-shaped and meet closely enough in the middle to appear superficially to be borne on a median septum, though there is none.

1. *Acranthera sinensis* C. Y. Wu, Acta Phytotax. Sin. 6: 295. 1957.

中华尖药花 zhong hua jian yao hua

Herbs or subshrubs, 40(–100) cm tall, with tissues often turning black when dry; branches generally quadrangular, densely hirsute to strigose and strigillose becoming glabrescent with age. Petiole 1–7 cm, strigose to strigillose; leaf blade thinly papery to membranous, elliptic or obovate, 8–22 × 4.5–9 cm, adaxially sparsely to moderately hirsute to hispid, abaxially strigillose to strigose or hispid with pubescence denser along principal veins, base acute or cuneate, margins ciliolate, apex acuminate or acute; secondary veins 9–11 pairs; stipules persistent, broadly ovate to triangular, 1–3 mm, glabrescent, cuspidate or 2- or 3-dentate. Inflorescences terminal, pseudoaxillary, and/or axillary on short shoots, 1-flowered, short shoot reduced to developed (appearing as base of articulate pedun-

cle), to 2 mm; peduncle (i.e., directly subtending flower) 3–4 cm; bracts lanceolate, 2–3 mm, acute. Calyx strigillose to strigose or pilose; ovary portion cylindrical to obconical, 3–4 cm; lobes linear-lanceolate, 2.7–4 cm. Corolla purple outside and pink inside, funnelform, outside hirtellous to tomentulose; tube ca. 45 mm; lobes ovate, ca. 10 mm, obtuse then abruptly acuminate with tip ca. 1.5 mm. Filaments free; anthers 6–8 mm, with connective spurred at apex. Berry compressed cylindrical, 40–45 × ca. 5 mm, bisulcate; seeds with testa reticulate. Fl. Apr–Jun, fr. Jun–Oct.

• Forests on mountain slopes; 1000–1500 m. SE Yunnan.

Wu in the protologue explicitly designated two syntypes, *H. T. Tsai* 55229 collected on 19 May 1934 as the “typus florifer” and *H. T. Tsai* 60568 collected on 29 Jun 1934 as the “typus fructifer”; his species was published in 1957, so this name is validly published in spite of the lack of a single holotype.

## 2. *ADINA* Salisbury, Parad. Lond. t. 115 [“116”]. 1808.

水团花属 shui tuan hua shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, unarmed, often deciduous; buds conical. Raphides absent. Leaves opposite, distichous or decussate, usually with domatia; stipules persistent or deciduous, interpetiolar, bifid, nodes with a ring of persistent trichomes exposed after stipules fall. Inflorescences terminal and/or in axils of uppermost leaves, capitate with 1[to several] globose heads, pedunculate with peduncles usually articulate in basal half and bearing stipuliform bracts at middle, many flowered, bracteate; bracteoles linear to linear-spatulate. Flowers sessile, bisexual, monomorphic. Calyx limb 5-lobed. Corolla white, salverform to slenderly funnelform, glabrous inside; lobes 5, valvate in bud. Stamens 5, inserted in upper part of corolla tube, partially to fully exserted; filaments short, glabrous; anthers basifixed. Ovary 2-celled, ovules many in each cell, pendulous on axile placentas attached to upper 1/3 of septum; stigma globose to obovoid, exserted. Fruiting heads globose, at maturity shattering easily. Fruit capsular, obconic, septically then loculicidally dehiscent into 4 valves separating from base to apex from each other and from septum, cartilaginous to papery, with septum persistent or tardily deciduous, with calyx limb persistent on septum; seeds numerous, small, fusiform to oblanceoloid, flattened to rounded, with embryo portion obovoid, ellipsoid, oblong, or trigonous, sometimes with short wing at one or both ends.

Four species: China, Japan, Korea, Thailand, Vietnam; three species in China.

- 1a. Deciduous low shrubs; leaves distichous, subsessile to shortly petiolate, petioles to 2 mm, leaf blade 2.5–4 × 0.8–1.2 cm; flowering heads borne separately on axillary or sometimes apically paired peduncles ..... 3. *A. rubella*
- 1b. Evergreen shrubs or small trees; leaves decussate, petiolate, petioles 2–12 mm, leaf blade 4–18 × 1.5–6 cm; flowering heads borne separately on axillary or sometimes apically paired peduncles and/or infrequently or often in cymes of 3 or 5.
  - 2a. Leaf blade 4–12 × 1.5–3 cm, abaxially glabrous or sparsely puberulent on costa, petioles 2–6 mm; stipules persistent to caducous, 3–8 mm, puberulent to glabrous, lobes lanceolate to ovate; flowering heads infrequently in cymes of 3 ..... 1. *A. pilulifera*
  - 2b. Leaf blade 6–18 × 2.3–6 cm, abaxially sparsely to densely puberulent on veins to throughout, petioles 3–12 mm; stipules caducous, 4–5 mm, glabrous, lobes narrowly triangular; flowering heads often in cymes of 3 or 5 ..... 2. *A. pubicostata*

1. *Adina pilulifera* (Lamarck) Franchet ex Drake, J. Bot. (Morot) 9: 207. 1895.

水团花 shui tuan hua

*Cephalanthus pilulifer* Lamarck, Encycl. 1: 679. 1785; *Adina globiflora* Salisbury; *A. globiflora* var. *tonkinensis* Pitard; *A. pilulifera* var. *tonkinensis* (Pitard) Merrill ex H. L. Li.

Shrubs or small trees, evergreen, 1–5(–10) m tall; branches angled to terete, puberulent to glabrescent, often lenticellate, with bark usually gray. Leaves decussate; petiole 2–6 mm, gla-

brous or puberulent; blade drying papery to stiffly papery, narrowly elliptic, elliptic-lanceolate, obovate-oblong, oblanceolate, or obovate-oblanceolate, 4–12 × 1.5–3 cm, adaxially glabrous, abaxially glabrous or sparsely puberulent on costa, base acute to cuneate or obtuse, apex acute to acuminate with tip usually ultimately blunt; secondary veins 6–12 pairs, usually with foveolate and/or pilosulous domatia; stipules persistent to caducous, in outline ovate, 3–8 mm, puberulent to glabrous, deeply bifid, lobes lanceolate to ovate, acute to acuminate, erect to spreading. Inflorescences puberulent to glabrous; peduncles 2–5 cm, with bracts ca. 2 mm; flowering heads borne separately on

axillary or sometimes apically paired peduncles and/or infrequently in cymes of 3, 4–6 mm in diam. across calyces, 8–12 mm in diam. across corollas; bracteoles linear to linear-clavate, 1.3–1.8 mm. Calyx puberulent to glabrescent; ovary portion obconic, 0.5–1 mm, surrounded at base by a strigose ring; limb deeply lobed, lobes linear-oblong or spatulate, 1–1.8 mm, with apex thickened. Corolla white, narrowly funnelform, outside puberulent or hirtellous to glabrous; tube 2–3.5 mm; lobes ovate-oblong, 0.5–1 mm, obtuse. Stigma globose to obovoid, ca. 0.2 mm, exserted for 3–5 mm. Fruiting heads 7–11 mm in diam. Capsules obcuneate, 2–5 mm, puberulent to glabrescent; seeds ca. 2 mm. Fl. Jun–Sep, fr. Jul–Dec.

Thickets or sparse forests at streambanks, at roadsides, or in valleys; 200–400 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Jiangxi, Yunnan, Zhejiang [Japan, Vietnam].

H. L. Li (J. Arnold Arbor. 25: 317. 1944) recognized *Adina pilulifera* var. *tonkinensis* for Chinese plants from Guangxi, Hainan, and Yunnan but did not there explain their separation from the typical variety; no subsequent authors, including H. H. Hsue & H. Wu (in FRPS 71(1): 274–275. 1999), have recognized infraspecific taxa within this widespread species.

## 2. *Adina pubicostata* Merrill, J. Arnold Arbor. 21: 385. 1940.

毛脉水团花 mao mai shui tuan hua

Shrubs or small trees, evergreen, 1–8 m tall; branches angled to terete, puberulent to glabrescent, often lenticellate, with bark usually grayish to reddish brown. Leaves decussate; petiole 3–12 mm, glabrous to densely puberulent; blade drying papery to stiffly papery, narrowly elliptic, elliptic-oblong, lanceolate, or oblanceolate, 6–18 × 2.3–6 cm, adaxially glabrous, abaxially sparsely to densely puberulent on veins to throughout, base acute to cuneate or obtuse, apex acute to acuminate with tip usually ultimately blunt; secondary veins 6–12 pairs, usually with foveolate and/or pilosulous domatia; stipules caducous, in outline ovate, 4–5 mm, glabrous, deeply bifid, lobes narrowly triangular, acute, erect to spreading. Inflorescences densely puberulent; peduncles 2–5 cm, with bracts ca. 2 mm; flowering heads borne separately on axillary or sometimes apically paired peduncles and/or often in cymes of 3 or 5, 6.5–7 mm in diam. across calyces, 10–11 mm in diam. across corollas; bracteoles linear to linear-clavate, 1–2 mm. Calyx puberulent to glabrescent; ovary portion obconic, 0.5–1 mm, surrounded at base by a pilosulous ring; limb deeply lobed; lobes narrowly spatulate, ca. 1 mm, with apex cucullate to thickened. Corolla white, narrowly funnelform, outside puberulent to glabrous; tube 2–3 mm; lobes ovate, 1–1.5 mm, subacute. Stigma globose to obovoid, ca. 0.2 mm, exserted for 3–5 mm. Fruiting heads 8–9 mm in diam. Capsules obcuneate, 2–2.5 mm, pilosulous at apex to

glabrescent in lower portions, with persistent calyx lobes (on persistent septum) 1.2–2 mm; seeds 1.2–2 mm. Fl. Jun, fr. Jul–Nov or rarely into Jan.

Forests; 400–1200 m. Guangxi, Hunan [Vietnam].

This species has previously been included in *Adina pilulifera* (Ridsdale, Blumea 24: 357–358. 1979; H. H. Hsue & H. Wu, FRPS 71(1): 275. 1999); however, with more material now available it can be clearly distinguished from that species.

## 3. *Adina rubella* Hance, J. Bot. 6: 114. 1868.

细叶水团花 xi ye shui tuan hua

Low shrubs, deciduous, 1–3(–6) m tall; branches angled to terete, puberulent to tomentulose or glabrescent, sometimes lenticellate, with bark usually reddish brown. Leaves distichous, subsessile to shortly petiolate; petiole to 2 mm; blade drying papery, lanceolate, ovate-lanceolate, lanceolate-elliptic, or ovate-oblong, 2.5–4 × 0.8–1.2 cm, adaxially puberulent to glabrous, abaxially glabrescent to puberulent or sparsely pilosulous at least along veins, base obtuse to rounded, apex acute or acuminate; secondary veins 5–7 pairs, with pilosulous domatia; stipules persistent to deciduous, ligulate to ovate in outline, 2–5 mm, puberulent to glabrous, deeply bilobed, lobes narrowly triangular, acute to acuminate, erect to reflexed. Inflorescences densely puberulent or strigillose to glabrescent; peduncles 1–5 cm, with bracts 2–4 mm; flowering heads borne separately on axillary or sometimes apically paired peduncles, 4–7 mm in diam. across calyces, 10–12 mm in diam. across corollas; bracteoles linear or linear-clavate, 1–2 mm. Calyx puberulent to glabrescent; ovary portion obconic, 0.8–1 mm; limb deeply lobed, lobes spatulate or spatulate-clavate, 1–2 mm, at apex thickened, rounded, papillose. Corolla white or flushed with pink or purple on lobes, slenderly funnelform, outside glabrescent, puberulent, or hirtellous with trichomes often purple-red; tube 2–3 mm; lobes deltoid to ligulate, 0.5–1 mm, acute to obtuse. Stigma obovoid, 0.2–0.3 mm, exserted for 3–4 mm. Fruiting heads 8–12 mm in diam. Capsules oblong-obcuneate, 3–4 mm, puberulent, hirtellous, or glabrescent; seeds ca. 1.5 mm. Fl. and fr. May–Dec.

Wet sites at streambanks, riversides, and sand beaches; below 100–600 m. Fujian, Guangdong, Guangxi, Hunan, Jiangsu, Jiangxi, Shaanxi, Zhejiang [Korea].

This is a widespread and frequently collected species. The stipules are sometimes completely split, with the lobes falling separately, and can be confused with triangular entire stipules if care is not taken. How (Sunyatsenia 6: 249. 1946) noted that this species is effective for stabilization of slopes.

## 3. *AIDIA* Loureiro, Fl. Cochinch. 1: 143. 1790.

茜树属 qian shu shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees [or rarely vines], unarmed. Raphides absent. Leaves opposite, isophyllous or at nodes with inflorescences often markedly anisophyllous with smaller leaf reduced to a scale and/or deciduous to give an appearance of alternate leaf arrangement, usually with domatia; stipules persistent or usually caducous, interpetiolar or shortly united around stem, triangular. Inflorescences pseudoaxillary, usually produced at nodes with markedly anisophyllous leaves thus appearing “leaf-opposed,” fasciculate to usually

cymose, few to many flowered, sessile to pedunculate, bracteate. Flowers sessile or pedicellate, bisexual, monomorphic. Calyx limb cupular or campanulate, 4- or 5-lobed or -denticulate. Corolla white, yellow, or green sometimes flushed with pink or red, salverform, pilosulous to villosulous in throat; lobes 4 or 5, convolute in bud, usually strongly reflexed at anthesis. Stamens 4 or 5, inserted in corolla throat, exserted; filaments very short; anthers dorsifixed, exserted. Ovary 2(or 3)-celled, ovules several to many in each cell on axile placentas; stigma clavate, fusiform, or 2-lobed with lobes sometimes coherent or free. Fruit red to orange, baccate, fleshy, globose and smooth or ridged, with calyx limb deciduous; seeds several to numerous, medium-sized, angled to compressed, embedded in pulp.

About 50 species: tropical Africa, S and SE Asia, Oceania; eight species (one endemic) in China.

The Asian and Malesian portion of this genus was reviewed in detail by Ridsdale (Blumea 41: 135–179. 1996), who recognized five sections; all of our species fall in his *Aidia* sect. *Aidia*. An additional species, *A. shweliensis*, was included in *Aidia* by W. C. Chen (in FRPS 71(1): 350. 1999) but is here treated as *Fosbergia shweliensis*. The morphology of *Aidia* was studied in some detail by Tirvengadam and Sastre (Bull. Mus. Natl. Hist. Nat., B, Adansonia 8: 257–296. 1986), who also provided an overview of the taxonomy. Ridsdale (Reinwardtia 12: 289. 2008) treated *A. canthioides* in the genus *Benkara*, but it seems anomalous in that genus and is here retained in *Aidia*. The species circumscriptions of Ridsdale differ from those of W. C. Chen (loc. cit.: 348–356); neither author is completely followed here. Following Ridsdale, here plants with 4-merous flowers are distinguished from those with 5-merous flowers, which results in the separation of *A. racemosa* and *A. cochinchinensis*, both 5-merous representatives of primarily Malesian and Vietnamese species, from the 4-merous, primarily Chinese species *A. henryi*. Following W. C. Chen, *A. henryi* and *A. merrillii* are here considered conspecific. Following Ridsdale, *A. densiflora* (Wallich) Masamune is not treated here as a species found in China, and the names Merrill (Lingnan Sci. J. 14: 61. 1935) considered synonyms of that species (*Randia densiflora* (Wallich) Benth., *R. oppositifolia* Koorders, and *Webera oppositifolia* Roxburgh) are here considered misapplied names that do not correspond to any species in the Chinese flora.

- 1a. Young branches, leaf blade abaxially, and inflorescences densely hirtellous, pilosulous, or tomentulose, with trichomes spreading ..... 5. *A. pycnantha*
- 1b. Young branches, leaf blade abaxially, and inflorescences glabrous, puberulent, or strigillose, with trichomes mostly appressed or leaves sometimes pilose below on principal veins in *A. salicifolia*.
- 2a. Inflorescences fasciculate, or subsessile and congested-cymose with axes short and often monochasial, with bracts nearly as long as internodes of axes, and with pedicels much longer than axes (i.e., at first glance appearing fasciculate or fungoid).
- 3a. Pedicels 5–17 mm; calyx limb 3–5 mm; corolla with tube 8–9 mm, lobes 4–7 mm and shorter than tube ..... 1. *A. canthioides*
- 3b. Pedicels 1–4 mm; calyx limb 1–2.5 mm (unknown in *A. salicifolia*); corolla with tube ca. 3 mm, lobes 4–5 mm and longer than tube (corolla unknown in *A. salicifolia*).
- 4a. Leaf blade narrowly lanceolate to narrowly elliptic, 8.5–23 × 0.5–3 cm, with secondary veins 9–12 pairs; Guangxi ..... 7. *A. salicifolia*
- 4b. Leaf blade elliptic-lanceolate or oblong-lanceolate, 6.2–17.5 × 2.7–6.5 cm, with secondary veins 7–10 pairs; Yunnan ..... 8. *A. yunnanensis*
- 2b. Inflorescences cymose, subsessile to pedunculate, branched to several orders with axes sometimes dichasial or monochasial, with internodes of axes exceeding bracts, with pedicels absent or shorter than peduncle plus branched portion of inflorescence.
- 5a. Calyx limb 5–5.5 mm (including lobes); corolla lobes 9–10 mm ..... 4. *A. oxyodonta*
- 5b. Calyx limb 1–2.5 mm; corolla lobes 5–8 mm.
- 6a. Calyx lobes 4; corolla lobes 4; stipules 6–10 mm; widespread in China ..... 3. *A. henryi*
- 6b. Calyx lobes 5; corolla lobes 5; stipules 3–5 mm; Hainan (*A. cochinchinensis* also in Yunnan).
- 7a. Inflorescence axes dichasial ..... 2. *A. cochinchinensis*
- 7b. Inflorescence axes with branching dichasial at basal nodes but markedly monochasial at distal nodes ..... 6. *A. racemosa*

**1. *Aidia canthioides*** (Champion ex Benth.) Masamune, Trans. Nat. Hist. Soc. Formosa 28: 118. 1938.

香楠 xiang nan

*Randia canthioides* Champion ex Benth., Hooker's J. Bot. Kew Gard. Misc. 4: 194. 1852; *Aidia canthioides* var. *lanceolata* Masamune; *Benkara canthioides* (Champion ex Benth.) Ridsdale; *Fagerlindia canthioides* (Champion ex Benth.) Ridsdale.

Shrubs or trees, 1–12 m tall; branches flattened to subterete, glabrous. Petiole 5–18 mm, glabrous; leaf blade drying papery or thinly leathery, oblong-elliptic, oblong-lanceolate, or lanceolate, 4.5–18.5 × 2–8 cm, both surfaces glabrous, base

cuneate to obtuse or shortly rounded, sometimes inequilateral, apex acute to acuminate; secondary veins 3–7 pairs, in abaxial axils usually with foveolate and/or pilosulous domatia; stipules deciduous or sometimes persistent on distalmost nodes, broadly triangular, 3–8 mm, glabrous, apex acute or acuminate. Inflorescences fasciculate or shortly congested-monochasial and subsessile, 2–3 × 3–5 cm, several flowered, glabrescent; bracts ovate, often fused in pairs, 0.5–1 mm, acute to obtuse; pedicels 5–17 mm. Calyx densely to sparsely strigillose; ovary portion obconic, 1–1.5 mm; limb with basal tubular portion 3–5 mm; lobes 5, triangular to deltoid, 0.5–2 mm, acute. Corolla white or yellowish white, glabrous outside; tube 8–9 mm; lobes 5, narrowly spatulate-oblong, 4–7 mm, acute. Berry 5–8 mm in diam.,

sparsely strigillose or glabrous; seeds 6 or 7, flattened, angled, 2–3 mm. Fl. Apr–Jun, fr. May–Feb.

Thickets or forests on hills, on mountain slopes, or at streamsides in valleys; below 100–1500 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Japan, Vietnam].

This species was excluded from *Aidia* and treated as *Fagerlindia canthioides* by Ridsdale (Blumea 41: 176. 1996), then as *Benkara canthioides* by Ridsdale (Reinwardtia 12: 289. 2008). This species is here included in *Aidia* because of its apparent lack of lateral short shoots or spines, inflorescences not terminal on developed stems, and apparently bisexual flowers.

**2. *Aidia cochinchinensis*** Loureiro, Fl. Cochinch. 1: 143. 1790.

茜树 qian shu

*Randia cochinchinensis* (Loureiro) Merrill.

Shrubs or trees, 2–15 m tall; branches somewhat flattened to terete, glabrous. Petiole 5–10 mm, glabrous; leaf blade drying leathery or papery, elliptic to lanceolate, 9–15 × 3–5 cm, both surfaces glabrous, base acute to obtuse, apex acute to acuminate; secondary veins 5–7 pairs, in abaxial axils usually with pilosulous and/or foveolate domatia; stipules deciduous after distalmost 2 or 3 nodes, lanceolate to narrowly triangular, 3–5 mm, glabrous, apex acuminate. Inflorescences cymose, 2–6 cm, with axes usually regularly dichasial, glabrous to strigillose; peduncle ca. 0.5 cm; bracts lanceolate, 1–2 mm; pedicels 1–2 mm. Calyx glabrous; ovary portion obconic, ca. 2 mm; limb ca. 2 mm, shallowly toothed; lobes 5. Corolla white, glabrous outside; tube 3–4 mm; lobes 5, narrowly spatulate-oblong, 5–6 mm, obtuse. Berry 4–6 mm in diam. Fl. Apr.

Open mountain slopes; 500–1300 m. Hainan, Yunnan [Vietnam].

**3. *Aidia henryi*** (E. Pritzl) T. Yamazaki, J. Jap. Bot. 45: 338. 1970.

亨氏香楠 heng shi xiang nan

*Randia henryi* E. Pritzl, Bot. Jahrb. Syst. 29: 581. 1901; *Aidia merrillii* (Chun) Tirvengadam; *R. acutidens* Hemsley & E. H. Wilson; *R. caudatifolia* Merrill (1923), not Pitard (1923); *R. merrillii* Chun.

Shrubs or trees, 2–15 m tall; branches somewhat flattened to subterete, glabrous. Petiole 5–18 mm, glabrous; leaf blade drying leathery or papery, elliptic-oblong, oblong-lanceolate, or narrowly elliptic, 9–21.5 × 1.5–8 cm, both surfaces glabrous, base cuneate to obtuse, apex acute to acuminate; secondary veins 5–10 pairs, in abaxial axils usually with foveolate and/or pilosulous domatia; stipules caducous or sometimes persisting on distalmost nodes, lanceolate to narrowly triangular, 6–10 mm, glabrous, apex long acuminate. Inflorescences cymose, 1–7 × 1–10 cm, puberulent, strigillose, or glabrous, with axes dichasial or sometimes congested; peduncle 2–10 mm; bracts lanceolate to triangular or ovate, 0.5–2 mm, obtuse to acute; pedicels 0.5–7 mm. Calyx glabrous to strigillose; ovary portion obconic to cylindrical or narrowly ellipsoid, 1–1.5 mm; limb with tubular portion 1–2.5 mm; lobes 4, triangular to narrowly triangular or lanceolate, 0.5–1.5 mm. Corolla yellow, white, or sometimes red, glabrous outside; tube 3–4 mm; lobes 4, narrowly spatulate-oblong, 5–8 mm, acute to obtuse or rounded. Berry 5–6 mm in diam.; seeds ca. 2 mm. Fl. Mar–Jun, fr. May–Feb.

Thickets or forests at streamsides, on hills, or on mountain slopes; below 100–2400 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Thailand, Vietnam].

As noted above, this species is here circumscribed to generally comprise the plants treated by W. C. Chen (in FRPS 71(1): 354. 1999) as *Aidia cochinchinensis*. The reports of *A. cochinchinensis* (as *Randia cochinchinensis*) from Zhejiang by Qiu and Zhong (Fl. Zhejiang 6: 103. 1986) and from Fujian (Fl. Fujian. 5: 165. 1993) are here treated as reports of *A. henryi*.

**4. *Aidia oxyodonta*** (Drake) T. Yamazaki, J. Jap. Bot. 45: 339. 1970.

尖萼茜树 jian e qian shu

*Randia oxyodonta* Drake, J. Bot. (Morot) 9: 218. 1895.

Shrubs or trees, 2–12 m tall; branches somewhat flattened to subterete, puberulent to glabrous. Petiole 8–13 mm, glabrous; leaf blade drying leathery and often pale yellow adaxially and reddish brown abaxially, elliptic-oblong, lanceolate, or elliptic, 8–19 × 2.3–7.5 cm, glabrous on both surfaces, base obtuse to acute, apex acuminate or acute; secondary veins 7–10 pairs, in abaxial axils often with foveolate and/or pilosulous domatia; stipules generally persistent, ovate to narrowly triangular, 5–15 mm, glabrous, apex long acuminate to aristate. Inflorescences cymose with axes dichasial or often becoming monochasial distally, 4–5 cm, glabrous; peduncle 0.8–1 cm; bracts ovate to subulate, 2–3 mm, acute to acuminate; pedicels 2–5 mm. Calyx glabrous; ovary portion obconic, ca. 1.5 mm; limb with tubular portion campanulate, 5–5.5 mm; lobes 5, subulate or linear-lanceolate, 2–4.5 mm, ciliate to glabrous. Corolla yellowish white, outside glabrous; tube 4–5 mm; lobes oblong-spatulate, 9–10 × 3–5 mm, acuminate. Berry 7–13 mm in diam., glabrous; seeds flattened, ca. 2.5 mm. Fl. Apr–Nov, fr. May–Oct.

Thickets or forests on hills or mountains; 100–1000 m. SW Guangdong, SE Guangxi, Hainan [Vietnam].

The Vietnam checklist (Checkl. Pl. Spec. Vietnam 3: 85. 2005) recognized *Aidia oxyodonta* var. *microdonta* (Pitard) P. H. Hô (Ill. Fl. Vietnam 3: 189. 1993), which is based on *Randia oxyodonta* var. *microdonta* Pitard; presumably if this variety is recognized the Chinese plants fall under *A. oxyodonta* var. *oxyodonta*, but so far Chinese literature has not mentioned these varieties.

**5. *Aidia pycnantha*** (Drake) Tirvengadam, Nordic J. Bot. 3: 455. 1983.

多毛茜草树 duo mao qian cao shu

*Randia pycnantha* Drake, J. Bot. (Morot) 9: 218. 1895; *Aidia acuminatissima* (Merrill) Masamune; *R. acuminatissima* Merrill.

Shrubs or trees, 2–12 m tall; branches terete to flattened, densely tomentulose, pilosulous, or hirtellous with pubescence drying ferruginous, sometimes becoming glabrescent with age. Petiole 5–15 mm, densely hirtellous or pilosulous; leaf blade drying thinly leathery or papery, often reddish brown, elliptic-oblong, oblong-lanceolate, or oblong-oblong-lanceolate, 8–27.5 × 2–10 cm, adaxially glabrous and slightly shiny, abaxially hirtellous or pilosulous with pubescence usually denser on principal

veins, base cuneate to obtuse and sometimes slightly inequilateral, apex acuminate to caudate-acuminate with tip to 2.5 cm and sometimes falcate curved; secondary veins 10–14 pairs, in abaxial axils sometimes with weakly developed pilosulous domatia; stipules deciduous or sometimes persisting on apical 2 or 3 nodes, interpetiolar, lanceolate to narrowly triangular, 8–12 mm, densely strigillose to hirtellous or tomentulose, apex acute to acuminate. Inflorescences cymose with axes markedly dichasial, many flowered, 4–6 × 5–12 cm, branched to several orders, densely hirtellous to pilosulous or tomentulose; peduncle 0.5–1.5 cm; bracts linear-lanceolate, 2–4 mm, acute; pedicels 1–4 mm. Calyx densely hirtellous to strigillose; ovary portion 1–1.5 mm; limb with tubular portion 2–3 mm; lobes 5, narrowly triangular, 1–2 mm, acute to acuminate. Corolla white or pale yellow, outside glabrous; tube ca. 4 mm, densely villous in throat; lobes 5, oblong-oblancoate or spatulate, 6–9 × 2–2.5 mm, obtuse to rounded. Berry 6–8 mm in diam., sparsely strigillose to hirtellous or subglabrous; seeds ca. 2 mm. Fl. Mar–Sep, fr. Apr–Dec.

Thickets or forests at streamsides, in fields or valleys, or on hills or mountain slopes; near sea level to 1000 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

**6. *Aidia racemosa*** (Cavanilles) Tirvengadam, *Nordic J. Bot.* 3: 455. 1983.

总状茜草树 *zong zhuang qian-cao shu*

*Stylocoryna racemosa* Cavanilles, *Icon.* 4: 46. 1798; *Randia racemosa* (Cavanilles) Fernández-Villar (1880), not Roxburgh (1824); *R. suishaensis* Hayata.

Trees to 25 m tall; branches somewhat flattened becoming subterete, glabrous. Petiole 5–6 mm, glabrous; leaf blade drying thinly leathery, lanceolate to elliptic-oblong, 7–12 × 2–4 cm, glabrous on both surfaces, base acute to cuneate, apex acute; secondary veins 4 or 5 pairs, in abaxial axils usually with foveolate and/or pilosulous domatia; stipules caducous, shortly united around stem, narrowly triangular, 3–5 mm, glabrous, apex acuminate. Inflorescences cymose, ca. 3 × 4–6 cm, glabrescent, with axes becoming monochasial distally; peduncle ca. 0.5 cm; bracts triangular, 1–1.5 mm, acute; pedicels 1–3 mm. Calyx glabrous; ovary portion ellipsoid, ca. 1 mm; limb ca. 1.5 mm, shortly dentate to denticulate; teeth 5. Corolla white, outside glabrous; tube ca. 4 mm; lobes 5, narrowly spatulate-oblong, 5–5.5 mm, adaxially strigillose, obtuse to rounded. Berry 4–8 mm in diam., glabrous.

Forests; elevation in China not noted on specimens [ca. 200 m to probably higher]. Hainan [Indonesia, Malaysia, New Guinea, Philippines, Thailand; Australia, Pacific islands].

**7. *Aidia salicifolia*** (H. L. Li) T. Yamazaki, *J. Jap. Bot.* 45: 339. 1970.

柳叶香楠 *liu ye xiang nan*

*Randia salicifolia* H. L. Li, *J. Arnold Arbor.* 24: 456. 1943.

Shrubs, ca. 1 m tall; branches slender, terete, glabrous. Petiole 2–8 mm, glabrous; leaf blade drying papery, dark olive-green adaxially, paler abaxially, narrowly lanceolate to narrowly elliptic, 8–23 × 0.5–3 cm, both surfaces glabrous or sometimes pilose abaxially along principal veins, base cuneate or acute, apex long acuminate; secondary veins 9–12 pairs, in abaxial axils with foveolate domatia; stipules caducous, lanceolate to triangular, 3–10 mm, glabrous, apex long acute to acicular. Inflorescences not seen. Infructescences congested-cymose, subsessile, 0.5–1.5 cm; bracts not described; pedicels in fruit ca. 4 mm. Berry 6–8 mm in diam. Fr. Nov.

• Forests on mountains; 600–1000 m. Guangxi.

Ridsdale (*Blumea* 41: 135–179. 1996) noted that this species is only reliably known from the type collection, though the additional, more broad-leaved collections *Steward et al.* 544 and *Steward et al.* 806 (no herbarium given by him) from “Kweichow” might be conspecific.

**8. *Aidia yunnanensis*** (Hutchinson) T. Yamazaki, *J. Jap. Bot.* 45: 339. 1970.

滇茜树 *dian qian shu*

*Randia yunnanensis* Hutchinson in Sargent, *Pl. Wilson.* 3: 400. 1916.

Shrubs or trees, 2–7 m tall; branches somewhat flattened to subterete, glabrous. Leaves subsessile to petiolate; petiole to 6 mm, strigillose to glabrous; blade drying papery or thinly leathery and sometimes reddish brown, elliptic-lanceolate or oblong-lanceolate, 6.2–17.5 × 2.7–6.5 cm, adaxially glabrous, abaxially glabrous or sometimes strigose or strigillose along principal veins, base cuneate to shortly rounded, sometimes slightly inequilateral, apex acuminate to caudate-acuminate; secondary veins 7–10 pairs, in abaxial axils sometimes with small foveolate and/or pilosulous domatia; stipules caducous, interpetiolar or shortly united around stem, lanceolate to narrowly triangular, 4–7 mm, strigillose to glabrous, smooth to keeled, apex acute to acuminate. Inflorescences fasciculate, several flowered, strigillose to hirtellous or strigose sometimes becoming glabrescent with age; bracts triangular, 0.5–1 mm, acute; pedicels 2–4 mm. Calyx strigillose; ovary portion obconic to ellipsoid, ca. 1 mm; limb 1–2.5 mm including lobes, shallowly lobed; lobes 4, triangular to broadly triangular, 0.5–0.7 mm, acute. Corolla white, outside glabrous; tube ca. 3 mm, villous in throat; lobes 4, narrowly oblong-spatulate, 4–5 × ca. 2 mm, obtuse to rounded. Berry red, 5–8 mm in diam., strigillose or glabrous. Fl. Mar–May, fr. May–Jan.

Thickets or forests on hills or mountains; 500–1700 m. S Yunnan [Thailand (*Maxwell* 97-144, MO!)].

#### 4. *ALLEIZETTELLA* Pitard in Lecomte, *Fl. Indo-Chine* 3: 278. 1923.

白香楠属 *bai xiang nan shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs, sometimes scandent, perhaps sometimes dioecious, unarmed. Raphides absent. Leaves opposite, sometimes anisophyllous, usually with domatia; stipules caducous or persistent, interpetiolar or shortly united around stem, generally triangular. In-

florescences terminal on principal stems and/or pseudoaxillary on reduced lateral branches, shortly cymose, several flowered, sessile to pedunculate, bracteate. Flowers sessile to pedicellate, bisexual and monomorphic or perhaps sometimes unisexual. Calyx limb 5-lobed. Corolla white, salverform to funnelform, inside pubescent in throat and upper part of tube; lobes 5, convolute in bud. Stamens 5, inserted at upper part of corolla or at throat, included and positioned near base of corolla tube; filaments short; anthers dorsifixed. Ovary 2-celled, ovules 2 or 3 in each cell, on axile placentas; stigma 2-lobed with lobes linear, exserted. Fruit yellowish white, baccate, subglobose to oblate, fleshy, smooth, with calyx limb persistent or tardily deciduous; seeds few to several, medium-sized, ellipsoid to ovoid, embedded in pulp.

Two species: China, Vietnam; one species in China.

Most authors have described *Alleizettella* as having bisexual flowers, but Robbrecht and Puff (Bot. Jahrb. Syst. 108: 122–123, table 7. 1986) suggested it is sometimes dioecious and thus with unisexual flowers.

**1. *Alleizettella leucocarpa*** (Champion ex Benth) Tirvengadam, Nordic J. Bot. 3: 455. 1983.

白果香楠 bai guo xiang nan

*Randia leucocarpa* Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 4: 194. 1852; *Aidia leucocarpa* (Champion ex Benth) T. Yamazaki.

Shrubs, perhaps sometimes scandent, 1–3 m tall; branches compressed to subterete or subangled, strigose to strigillose or pilosulous often becoming glabrescent. Leaves equal to somewhat unequal; petiole 4–12 mm, strigose to strigillose; blade drying papery or thinly leathery, abaxially sometimes paler and/or brownish black speckled, oblong-obovate, elliptic-oblong, narrowly elliptic, or lanceolate, 4.5–17 × 1.5–6 cm, adaxially glabrous or sometimes strigillose to hirtellous along principal veins, abaxially glabrous to usually puberulent or hirtellous on blade and strigose to hirtellous along principal veins, base acute to cuneate, apex subacuminate to acuminate; secondary

veins 4–7 pairs, in abaxial axils usually with pilosulous and usually also foveolate domatia; stipules persistent, shortly united around stem, broadly triangular, 4–7 mm, strigose to strigillose, long acuminate. Inflorescences 1–2 cm, densely strigose, strigillose, or hirtellous; bracts triangular to lanceolate, 0.5–2 mm, acute to acuminate; pedicels 2–3.5 mm. Calyx sparsely to densely strigose to strigillose; ovary portion obconic, 1–1.5 mm; limb campanulate, basal tubular portion 1.5–2 mm; lobes triangular to linear, 0.5–1 mm, acute. Corolla funnelform; tube 3–4 mm, outside strigose in upper part, inside villous at throat; lobes subovate to ligulate, 1.5–2 mm, outside puberulent to glabrous, obtuse to acute. Infructescences usually displaced to pseudoaxillary by subsequent stem growth. Fruit subglobose to somewhat oblate, 8–13 mm in diam., strigillose, pilosulous, or glabrous; seeds 2–4, compressed globose, 4–5 mm in diam. Fl. Apr–Jun, fr. Jun–Feb.

Forests or thickets at streamsides in valleys or on mountain slopes; 200–1000 m. Fujian, Guangdong, Guangxi, Hainan [Vietnam].

## 5. *ANTIRHEA* Commerson ex Jussieu, Gen. Pl. 204. 1789.

毛茶属 mao cha shu

Chen Tao (陈涛); Charlotte M. Taylor

*Guettardella* Champion ex Benth.

Trees or shrubs, dioecious, unarmed. Raphides absent. Leaves opposite [or sometimes whorled], often with domatia; quaternary venation lineolate [or sometimes regularly areolate]; stipules caducous or persistent, interpetiolar, generally triangular to oblong. Inflorescences axillary, cymose with axes dichotomous or often markedly scorpioid, few flowered with flowers often fewer on pistillate plants, pedunculate, bracteate or bracts reduced. Flowers sessile, unisexual. Calyx sericeous outside; limb truncate or 4[or 5]-lobed; lobes often unequal. Corolla white or yellow, salverform in staminate flowers, funnelform in pistillate flowers, with tube often prolonged and slender, inside glabrous or pubescent in throat; lobes 4[or 5], obtuse, imbricate in bud. Stamens 4[or 5], inserted in corolla throat, partially exserted; filaments short or reduced; anthers dorsifixed. Ovary 2–8-celled, ovule 1 in each cell, apical and pendulous, with funicle thickened; stigma capitate or 2- or 3-lobed, included. Fruit dark purple, drupaceous, thinly fleshy, ellipsoid to subglobose and smooth, with calyx limb and subtending bracts persistent; pyrene 1, 2–8-celled with 1 seed in each cell, ellipsoid, woody or bony; seeds cylindrical, medium-sized, without endosperm; cotyledons compressed and minute; radicle clavate and ascending.

Thirty-six species: tropical Asia, Australia, Madagascar, Mascarene Islands, Pacific islands; one species (endemic) in China.

*Antirhea* has traditionally included both paleotropical and neotropical species, but the bisexual and polygamous neotropical plants are now included in other genera; even so, some authors still incorrectly give a pantropical range for this genus.

Chaw and Darwin (Tulane Stud. Zool. & Bot. 28: 50, 59, 69. 1992) recognized three subgenera of *Antirhea*. *Antirhea chinensis* is the type of *A.* subg. *Guettardella* (Champion ex Benth) Chaw, the largest subgenus.

**1. *Antirhea chinensis*** (Champion ex Benth) Benth & J. D. Hooker ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 23: 384. 1888.

毛茶 mao cha

*Guettardella chinensis* Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 4: 197. 1852.

Shrubs, erect, 1–2(–4) m tall; branches subterete to somewhat flattened, moderately to densely strigose, strigillose, or to

mentulose, often with trichomes of 2 lengths, occasionally becoming glabrescent, often markedly sylleptic from nodes below leaves with markedly elongated lowermost internode. Petiole 4–10 mm, densely strigose to tomentulose; leaf blade drying papery, elliptic-oblong, oblong-lanceolate, oblanceolate, elliptic, or narrowly elliptic, 3–7(–9) × 1–2.5(–3) cm, adaxially glabrous or sparsely strigillose, abaxially densely sericeous to strigillose, base cuneate to acute, margin flat to thinly revolute, apex acuminate; secondary veins 4–6 pairs, usually with well-developed pilosulous domatia; stipules usually persisting with leaves, triangular to narrowly triangular, 2.5–6 mm, abaxially strigose or strigillose to glabrescent, adaxially densely sericeous, acuminate. Inflorescences cymose, dichotomous or with

higher order axes often scorpioid, staminate several flowered, pistillate few to several flowered, sericeous to strigillose; peduncles 1–3 cm; branched portion 1–3 × 1–3 cm; bracts linear to subulate, 1.5–4 mm. Calyx densely sericeous; ovary portion ellipsoid to obconic, 0.5–1 mm; limb deeply lobed, tubular part 0.3–0.5 mm; lobes linear or lanceolate, 0.5–1.5 mm, often unequal. Corolla yellow, outside, densely sericeous; staminate tube 6–9 mm, pistillate 3–6 mm, inside glabrous or sparsely sericeous in lower portion; lobes ovate, 1–2 mm, obtuse. Drupe ellipsoid-oblong or ellipsoid, 5–7 × 3–4 mm, sparsely strigose; pyrene 2–5-celled, angled to ridged. Fl. Apr–Jun, fr. Oct–Nov.

• Forests, thickets; 100–1700 m. Fujian, Guangdong, Hainan.

## 6. ARGOSTEMMA Wallich in Roxburgh, Fl. Ind. 2: 324. 1824.

雪花属 xue hua shu

Chen Tao (陈涛); Charlotte M. Taylor

Herbs, unarmed, often reduced and/or monocaulous, often rhizomatous or tuberous, usually notably fleshy; stems flattened to subterete. Raphides present. Leaves opposite, apparently verticillate due to closely set stem nodes and/or leaflike stipules, or slightly to markedly anisophyllous and apparently alternate, decussate or distichous, without domatia; stipules persistent or deciduous, interpetiolar, entire or bilobed, sometimes leaflike and thus apparently absent. Inflorescences terminal or sometimes pseudoaxillary, fasciculate, cymose-corymbiform, or umbelliform, several flowered, few flowered, or reduced to 1 flower, sessile to pedunculate, bracteate with bracts sometimes fused into an involucre or sometimes with bracts very reduced. Flowers pedicellate or sessile, bisexual or monomorphic, sometimes somewhat zygomorphic, usually nodding. Calyx limb deeply 4- or 5-lobed. Corolla white, broadly rotate (i.e., “*Solanum*-like”) to campanulate (i.e., bell-shaped), glabrous inside; lobes 4 or 5, valvate in bud. Stamens 4 or 5, inserted near base of corolla tube, partially to fully exserted; filaments reduced or developed and free, coherent, or fused in middle portions into a tube; anthers free or usually coherent into a tube, with longitudinal slits or terminal pores, sometimes with connective prolonged at apex. Ovary 2-celled, ovules numerous in each cell on axile placentas attached near top of septum; stigma capitate or 2-lobed, included or exserted. Fruiting pedicels usually becoming thickened and erect. Fruit capsular, subglobose to obovoid, dehiscent through apical operculum formed from disk portion, leathery or membranous, often becoming black, with calyx limb persistent, with endocarp and septum becoming notably fibrous; seeds numerous, small, flattened to angled, with testa reticulate; endosperm fleshy.

At least 106 species: Bhutan, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; two species endemic to W Africa; six species (four endemic) in China.

The morphology and anatomy of the androecium of *Argostemma* were detailed by Puff et al. (Ann. Missouri Bot. Gard. 82: 358–366. 1995), who noted an absence of nectaries and probable buzz-pollination of flowers with both linear and poricidal anther dehiscence. Bremer (Ann. Missouri Bot. Gard. 76: 7–49. 1989) reported that the inner layers of the fruit become fibrous and trap seeds inside, with some of them sprouting while still in the capsule in an unusual form of vivipary. *Argostemma* was studied in Thailand by Sridith (Thai Forest Bull., Bot. 27: 86–137. 1999) and Sridith and Puff (Thai Forest Bull., Bot. 28: 123–137. 2000). *Argostemma* species apparently vary widely in size of individual plants and vegetative organs probably in relation to environmental factors.

- 1a. Leaves subsessile, most of them apparently in whorls of 4 at tops of stems, slightly to markedly unequal; anthers free, opening by apical pores ..... 5. *A. verticillatum*
- 1b. Leaves equal or unequal in pairs or sometimes apparently alternate due to marked reduction of 1 leaf of a pair, at least larger leaf of a pair clearly petiolate; anthers coherent in a cone, opening by longitudinal slits.
  - 2a. Calyx and fruit pilosulous, strigillose, villosulous, villous, or hirsute.
    - 3a. Calyx and fruit pilosulous or strigillose with generally straight hairs; larger leaf of a pair 1–4 cm ..... 1. *A. discolor*
    - 3b. Calyx and fruit densely villous, villosulous, or hirsute with usually crisped hairs; larger leaf of a pair 2.5–10 cm ..... 4. *A. solaniflorum*
  - 2b. Calyx and fruit glabrous or puberulent.
    - 4a. Corolla lobes ovate, ca. 5 mm ..... 3. *A. saxatile*
    - 4b. Corolla lobes lanceolate, 8.5–11 mm.
      - 5a. Leaf blade brownish yellow abaxially when dry, with secondary veins not visible; larger leaf of a pair 1–4 × 0.6–1.5 cm ..... 2. *A. hainanicum*
      - 5b. Leaf blade pale abaxially when dry, with secondary veins visible; larger leaf of a pair 2–6 × 1.5–2.5 cm ..... 6. *A. yunnanense*

**1. *Argostemma discolor*** Merrill, Philipp. J. Sci. 23: 265. 1923.异色雪花 *yi se xue hua*

Herbs, 7–15 cm tall, little branched; stems prostrate and rooting or with apices ascending, densely strigose to villosulous. Leaves opposite, markedly anisophyllous, in larger leaf of a pair petiole 3–8 mm, villosulous; blade drying papery and pale abaxially, elliptic, elliptic-oblong, or broadly ovate, 10–40 × 7–20 mm, adaxially sparsely strigose to hispid along midrib and near margins, abaxially glabrous on lamina and densely strigose to hispid along veins, base cuneate to obtuse, margin serrate-ciliate, apex acute to obtuse; secondary veins 4–6 pairs; smaller leaf of a pair subsessile, suborbicular or broadly ovate, 5–10 mm; stipules persistent, ovate, suborbicular, or obovate, 2–6 mm, glabrescent, ciliate. Inflorescences 2- or 3-flowered, strigose to hispid; peduncles 5–20 mm; bracts triangular to linear, 1–3 mm; pedicels 10–25 mm. Calyx pilosulous or strigillose; hypanthium portion obconic, 1–1.5 mm; lobes 5, triangular to lanceolate, 1.5–2 mm. Corolla white, rotate, glabrous; tube ca. 2 mm; lobes 5, lanceolate, 6–7 mm, ciliate. Stamens 5; anthers coherent, dehiscent by longitudinal slits, with connective prolonged. Capsules subglobose or obovoid, ca. 3 mm in diam. Fl. Mar–May, fr. Sep–Oct.

- Dense forests; 500–1500 m. Hainan.

**2. *Argostemma hainanicum*** H. S. Lo, Bull. Bot. Res., Harbin 6(4): 46. 1986.海南雪花 *hai nan xue hua*

Herbs, 10–20 cm tall; stems grayish black when dry, suberect or creeping, densely strigose-villous becoming glabrescent. Leaves opposite, anisophyllous; blade drying black adaxially, dark brown abaxially, oblong-lanceolate or oblong-ovate, 10–40 × 6–12(–15) mm, both surfaces strigose on midrib and sometimes near margins, base obtuse, margin entire or erose to ciliate, apex acute or shortly acuminate; secondary veins not visible; smaller leaf of a pair subovate, 2–8(–10) mm. Inflorescence 1- or 2-flowered, villous to glabrescent; peduncles 1–2 cm; bracts lanceolate, 1.5–2 mm. Calyx puberulent or subglabrous; lobes 5. Corolla white, rotate, glabrous; lobes 5, lanceolate, ca. 1 cm. Stamens 5; anthers coherent, dehiscent by longitudinal slits, with connective prolonged. Capsules slightly cordate, ?maybe didymous, ca. 5 × 7–8 mm, glabrous. Fl. May.

- Valleys or watersides in dense forests. Hainan (Ledong).

**3. *Argostemma saxatile*** Chun & F. C. How ex W. C. Ko, Fl. Hainan. 3: 578. 1974.岩雪花 *yan xue hua*

Herbs, 5–15 cm tall, unbranched or sometimes few branched; stems prostrate and rooting near base, ascending at apex, villous. Leaves opposite, markedly anisophyllous, in larger of a pair petiole 3–5 mm, pilose; blade drying thinly papery and pale abaxially, oblong-elliptic or ovate, 15–55 × 8–18 mm, adaxially sparsely strigose at least along midrib and margin, abaxially strigose at least along veins, base cuneate to obtuse, apex acute or rarely acuminate; secondary veins 5–7 pairs; smaller leaf of a pair subsessile, ovate, ca. 5 mm; stipules

persistent, subovate, ca. 1 mm, glabrescent. Inflorescences umbelliform or racemiform, 2–4-flowered, glabrous; peduncles 1 or 2, 1–3 cm; bracts ovate, 2–4 mm; pedicels 1–3 cm. Calyx glabrous; hypanthium portion obconic, 2–2.5 mm; lobes 5, broadly triangular, 1.5–2 mm. Corolla white, apparently rotate, glabrous or subglabrous; tube 1.5–2 mm; lobes 5, ovate, ca. 5 mm. Stamens 5; anthers coherent, dehiscent by longitudinal slits, with prolonged connective. Capsules not seen. Fl. Mar.

- Wet sites in dense forests; ca. 600 m. SW Guangxi.

**4. *Argostemma solaniflorum*** Elmer, Leaf. Philipp. Bot. 1: 2. 1906.水冠草 *shui guan cao*

*Argostemma iriomotense* Masamune; *A. taiwanense* S. S. Ying.

Herbs, to 30 cm tall, sometimes branched; stems erect, puberulent or villosulous to glabrescent. Leaves opposite, slightly to markedly anisophyllous, in larger leaf of a pair petiole 0.5–3 cm, villosulous to glabrescent; blade drying membranous, ovate, lanceolate, or elliptic-oblong, 25–100 × 12–30 mm, adaxially glabrous or sparsely hirsute or pilose, abaxially pilosulous or villosulous along principal veins and glabrous on lamina, base cuneate to obtuse, margin entire and glabrous, apex acute to weakly acuminate; secondary veins 7 or 8 pairs; stipules persistent, oblong-elliptic or ovate, 3–7 mm, glabrescent, obtuse. Inflorescences cymose, 1–6-flowered, strigillose or villosulous to glabrescent; peduncles 1–2.5 cm; bracts triangular and 1–3 mm or resembling reduced leaves and stipules; pedicels 5–20 mm. Calyx villous, villosulous, or hirsute; hypanthium portion subglobose, ca. 1.5 mm; lobes 5, triangular, ca. 1.5 mm. Corolla white, rotate, glabrous; tube ca. 1.5 mm; lobes 5, narrowly lanceolate, ca. 7 mm, marginally densely ciliate. Stamens 5; anthers coherent, 5.5–7 mm, dehiscent by linear slits. Capsules cupuliform, 2–3 mm, leathery, densely hirsute or villosulous, with persistent calyx limb to 3 mm. Fl. Mar–Apr, fr. Jul.

Shady and moist streamsides; below 100–500 m. Taiwan [Japan (Ryukyu Islands), Philippines].

This species appears to vary widely in size of the plants, leaf size, and pubescence; it has sometimes been characterized (e.g., FRPS 71(1): 180–182. 1999) based only on larger plants, as described in the protologue. The two synonymous names listed here were not included in FRPS but were cited in Fl. Taiwan (ed. 2, 4: 247. 1998).

**5. *Argostemma verticillatum*** Wallich in Roxburgh, Fl. Ind. 2: 325. 1824.小雪花 *xiao xue hua*

Dwarf herbs, 2–7 cm tall, unbranched, borne from subglobose tubers; stems erect, puberulent to glabrous. Leaves clustered at stem apex and usually apparently 4-verticillate, anisophyllous, subsessile; blade drying membranous to thinly papery, ovate, elliptic, elliptic-oblong, or obovate, 10–70 × 7–25 mm, both surfaces glabrous [or sometimes sparsely villosulous to villous], base obtuse to acute, apex acute to obtuse or shortly acuminate; secondary veins 4–7 pairs; stipules deciduous, elliptic to orbicular, 2–3 mm, obtuse to rounded. Inflorescences

cymose to umbelliform, 2- to several flowered, glabrous; peduncles 1–3, 0.7–2 cm; bracts ligulate to ovate, 1–2 mm; pedicels 5–10 mm. Calyx glabrous; hypanthium portion broadly campanulate to obconic, ca. 1 mm; lobes 5, subtriangular, ca. 1 mm. Corolla white, rotate, glabrous; tube ca. 1 mm; lobes 5, oblong-lanceolate to triangular, 3–5 mm. Stamens 5; anthers free, 2–3 mm, poricidal. Capsules obovoid, ca. 2 mm, with persistent calyx limb to 2 mm. Fl. Jun.

Streamsides in forests; ca. 1500 m. S Yunnan [Bhutan, NE India, Myanmar, Nepal, Vietnam].

This species was reported from Thailand by Sridith (Thai Forest Bull., Bot. 27: 118. 1999) and as having filaments fused at their middles into a tube, but according to the Chinese specimens studied and descriptions of this species in other regions (e.g., Fl. Bhutan 2(2): 756. 1999) the filaments are free. The Thai distribution is provisionally excluded here pending further study of the delimitation of this species.

**6. *Argostemma yunnanense*** F. C. How ex H. S. Lo, Bull. Bot. Res., Harbin 6(4): 45. 1986.

滇雪花 dian xue hua

Herbs, 6–20 cm tall; stems procumbent and rooting with apices ascending, densely crisped pubescent. Leaves opposite, anisophyllous, in larger leaf of pair petiole to 1 cm; blade drying pale abaxially, oblong-obovate, 20–60 × 15–25 mm, adaxially sparsely pilose to subglabrous, abaxially pubescent with pubescence denser on midrib and secondary veins, base obtuse, apex acute; secondary veins 7–10 pairs; smaller leaf of a pair subsessile, ovate to suborbicular, 4–6(–10) mm; stipules ovate, 5–7 mm. Inflorescences umbelliform, 2- or 3-flowered; peduncles 2–2.5 cm; bracts lanceolate, 3–5 mm; pedicels 1–1.5 cm. Calyx glabrous; hypanthium ca. 2 mm; lobes 5, broadly triangular, 1–1.2 mm. Corolla white, rotate; tube ca. 2.5 mm; lobes 5, lanceolate, 8.5–11 mm, margins glabrous. Stamens 5; anthers coherent, 4–4.5 mm, dehiscent by longitudinal slits, with prolonged connective ca. 3 mm. Capsules not seen. Fl. May.

• Dense forests; ca. 900 m. Yunnan.

## 7. *ASPERULA* Linnaeus, Sp. Pl. 1: 103. 1753, nom. cons.

车叶草属 che ye cao shu

Chen Tao (陈涛); Friedrich Ehrendorfer

*Asperula* sect. *Chlorostemma* Lange; *Chlorostemma* (Lange) Fourreau.

Subshrubs, perennial, or annual herbs. Raphides present. Leaves opposite, usually with leaflike stipules in whorls of 4–14, sessile to shortly petiolate, without domatia; leaflike stipules rarely reduced. Inflorescences thyrsoid, paniculiform to capitate, with terminal and often also axillary pedunculate to sessile cymes, bracteate with bracts often fused and sometimes involucrel. Flowers pedicellate to sessile, with prophylls, bisexual, monomorphic. Calyx limb reduced, practically absent. Corolla blue, pink, purple, or yellow to greenish or white, salverform, funnelform, campanulate, or sometimes rotate, glabrous inside; lobes 4 or 5, valvate in bud. Stamens 4 or 5, inserted in corolla tube, exserted (or sometimes included); filaments developed to short; anthers dorsifixed. Ovary inferior (hypanthium), 2-celled, ovules 1 in each cell, erect and axile; stigma globose to clavate, often 2-lobed, included or exserted. Fruit schizocarpous, generally didymous, dry; mericarps 2, indehiscent, with 1 seed, subglobose, ellipsoid-oblong, or reniform, smooth to tuberculate, glabrous to pubescent (but never with uncinat hairs); seeds small, with membranous testa; endosperm corneous; embryo curved; cotyledons leaflike; radicle terete, hypogynous.

About 200 species: widespread throughout N Africa, C and SW Asia, and Europe, extending into Australia and New Zealand, greatest species diversity in the dry regions of SW Asia and the E Mediterranean; two species (one introduced) in China.

The circumscription and relationships of *Asperula* were discussed most recently by Ehrendorfer et al. (Fl. Iranica 176: 105–161. 2005). Short references to the position of the genus within the Rubiaceae-Rubiinae are found in the introduction to the genus *Galium* of the present volume and its Chinese species are keyed out there.

Originally, the Linnaean genera *Asperula* and *Galium* were separated from each other on the basis of their salverform to campanulate vs. rotate corollas only. Sixty years of critical morphological and later DNA-analytical studies (see Natali et al., Opera Bot. Belg. 7: 193–203. 1996; Soza & Olmstead, Taxon 59: 755–771. 2010) have shown that this differentiation often does not reflect true phylogenetic relationships. In some obvious cases (e.g., *A. odorata* Linnaeus to *G. odoratum* (Linnaeus) Scopoli in *G. sect. Hylaea* (Grisebach) Ehrendorfer or *G. purpureum* Linnaeus to *A. purpurea* (Linnaeus) Ehrendorfer in *A. sect. Thliphthisa* Grisebach), the problem could be solved by a simple nomenclatorial transfer, but in several other cases the problems persist. Even after an effort to redefine the two genera with the help of the presence of prophylls (bracteoles) at the pedicels in *Asperula* vs. their absence in *Galium* (Ehrendorfer et al., Fl. Europaea 4: 3–38. 1976) the two genera are still phylogenetically interdigitated and heterogeneous. Thus, one is still left with a partly provisional classification of *Asperula* as proposed by Ehrendorfer et al. (loc. cit. 2005). Here, we follow FRPS (71(2): 213. 1999) and do not combine the genus *Leptunis* with *Asperula* (as in loc. cit. 2005).

As in *Galium*, the sectional classification of *Asperula* by Ehrendorfer et al. (loc. cit. 2005) does not fully agree with that of Pobedimova et al. (Fl. URSS 23: 205–285. 1958), which was followed by FRPS. In particular, Ehrendorfer et al. (loc. cit. 2005: 131–142, 157–158) placed *A. oppositifolia* in *A. sect. Oppositifoliae* Schischkin ex Schönbeck-Temesy and *A. orientalis* in *A. sect. Asperula* (*A. sect. Sherardianae* Candolle). The two species are keyed out below but are also included in the key to all taxa of Chinese Rubiaceae found in the present volume under *Galium*.

1a. Perennials, with stems originating from a woody rootstock; leaves at all nodes opposite, 3–6(–15) ×

0.5–1.5(–3) mm, glabrous, stipules reduced; flowers pink to purple ..... 1. *A. oppositifolia*

- 1b. Herbaceous annuals, with stems from fibrous roots; leaves and leaflike stipules at upper nodes in whorls of 4–8, 1.2–2.5 × 0.2–0.5 cm, glabrous to sparsely hispidulous on lamina and densely antrorsely aculeolate on veins and margins; flowers pale to clear purplish blue ..... 2. *A. orientalis*

**1. *Asperula oppositifolia*** Regel & Schmalhausen in Regel, Descr. Pl. Nov. Rar. 42. 1882.

对叶车叶草 dui ye che ye cao

Subshrubs, perennial, originating from a woody rootstock. Stems often ± woody at base, up to 40 cm tall, erect, weakly 4-angled, glabrous to puberulent. Leaves opposite, subsessile; blade drying stiffly papery, linear to linear-lanceolate, 3–6(–15) × 0.5–1.5(–3) mm, glabrous throughout or ± hairy, base and apex acute; secondary veins not evident; stipules 2–4 per leaf pair, reduced and never more than 0.3 mm. Inflorescences terminal and axillary, dichasial, branched to 1–4 orders, glabrous to puberulent; peduncles 1–10(–30) mm; bracts linear to narrowly elliptic (i.e., leaflike), 1–4 mm; pedicels 0–3 mm. Corolla pink to purple, funnellform, glabrous to sparsely pilose outside; tube ca. 2 mm; lobes 4, ovate-oblong, ca. 1.5 mm. Ovary subglobose to narrowly ellipsoid, 0.5–1 mm, glabrous to densely pilosulous. Mericarps ovoid, 1.5–2.5 mm, glabrous to densely pilosulous. Fl. Jun–Jul, fr. Jul–Aug.

Gravel on mountain slopes; ca. 3700 m. Xizang (Zanda) [Afghanistan, Pakistan, Tajikistan].

*Asperula oppositifolia* is a polymorphic species with several subspecies and belongs to the very variable *A. sect. Oppositifoliae* (Ehrendorfer et al., Fl. Iranica 176: 131–142. 2005). As we have not seen material from China, the data presented here are mostly taken from FRPS (71(2): 214. 1999) and do not allow an exact determination. Outside of China, populations of *A. oppositifolia* are found at elevations down to 1350 m. Their leaves are narrow and short relative to the internodes and sometimes deciduous. Thus, the plants appear to consist only of photosynthetic stems with small terminal groups of flowers.

**2. *Asperula orientalis*** Boissier & Hohenacker in Boissier, Diagn. Pl. Orient., ser. 1, 3: 30. 1843.

藍花車葉草 lan hua che ye cao

*Asperula arvensis* Linnaeus subsp. *orientalis* (Boissier & Hohenacker) Thiébaud; *A. azurea* Jaubert & Spach.

Herbs, annual, from fibrous roots. Stems few or solitary, to 30(–40) cm tall, 4-angled, erect, often regularly divaricately branched, glabrous to scaberulous or hispidulous. Leaves and leaflike stipules at middle stem regions in whorls of 4–8, subsessile; blade drying papery, lanceolate, linear-lanceolate, or spatulate, (7–)12–25(–30) × (1.5–)2–5(–10) mm, glabrous to sparsely hispidulous on lamina and densely scaberulous to antrorsely aculeolate on veins and margins, base acute, apex obtuse to rounded; secondary veins not evident. Inflorescences terminal, capitate to subcapitate; peduncles 1.5–4 cm; involucral bracts leaflike, 1–12 mm, white ciliate at margins. Flowers sessile. Corolla pale to clear purplish blue, salverform, outside densely papillose; tube 8–10 mm, dilated in throat around anthers; lobes 4, elliptic to ovate, 2–3 mm, obtuse. Ovary ovoid, ca. 1 mm, glabrescent. Mericarps 1–1.8 mm, glabrous. Fl. Jun–Jul, fr. Aug–Sep.

Cultivated ornamental in Anhui, Jiangsu (Nanjing), and Shaanxi (Xi'an) [native to SW Asia (Georgia, Iraq, Lebanon, Syria, Turkey)].

*Asperula orientalis* is a butterfly-pollinated SW Asiatic member of *A. sect. Asperula*. Pobedimova et al. (Fl. URSS 23: 283. 1958) erroneously gave the name *A. azurea* priority over *A. orientalis*. The other closely related taxa of *A. sect. Asperula* are the smaller-flowered and widespread *A. arvensis* Linnaeus (the conserved type of the genus) and *A. setosa* Jaubert & Spach. The latter has very small flowers, is obviously autogamous, and grows at higher elevations (1200–3200 m) from SW Asia to the Tian Shan and Pamir-Alai. It could be found in the mountains of W China.

## 8. BENKARA Adanson, Fam. Pl. 2: 85, 525. 1763.

箭筈屬 le qian shu

Chen Tao (陈涛); Charlotte M. Taylor

*Fagerlindia* Tirvengadam; *Griffithia* Wight & Arnott.

Shrubs or small trees, erect to clambering or perhaps scandent, usually armed with paired, ascending, straight to slightly curved, axillary thorns, often with short shoots. Raphides absent. Leaves opposite or sometimes congested to apparently fascicled on lateral short shoots, usually with domatia; stipules caducous, interpetiolar or shortly united around stem, generally triangular, acute to cuspidate. Inflorescences terminal on lateral branches and/or short shoots, 1-flowered or 2- to several flowered and fasciculate to cymose, sessile to pedunculate, bracteate or bracts reduced. Flowers pedicellate, bisexual, monomorphic. Calyx limb 5-lobed, usually with well-developed basal tubular portion. Corolla white to yellow, salverform, usually pubescent in throat; lobes 5, convolute in bud, usually spreading to reflexed. Stamens 5, inserted in corolla throat, partially to fully exserted; filaments short; anthers dorsifixed. Ovary 2-celled, ovules several to many in each cell on axile placentas; stigma clavate to fusiform or 2-lobed with lobes coherent, included to partially exserted. Fruiting pedicels sometimes elongating. Fruit purplish black, baccate, fleshy to leathery or infrequently woody, globose to ellipsoid, smooth, with calyx limb tardily deciduous; seeds several to numerous, medium-sized, angled or ellipsoid, embedded in pulp; testa weakly areolate.

About 19 species: China, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Thailand, Vietnam; seven species (four endemic) in China.

Ridsdale (Reinwardtia 12: 289–300. 2008) recently reviewed *Oxyceros* and *Fagerlindia* and concluded by re-circumscribing *Oxyceros* Loureiro (Fl. Cochinch. 1: 150. 1790) and synonymizing *Fagerlindia* with *Benkara*. In this new circumscription, *Oxyceros* comprises species distinguished by markedly recurved thorns (or spines), notably *O. horridus* Loureiro, and is not represented (as far as now known) in the Chinese flora. Ridsdale (loc.

cit.) transferred all the Chinese species previously included in *Oxyceros* to *Benkara*, with straight or only slightly curved spines or thorns. One Chinese species included by Ridsdale in *Fagerlindia* and later *Benkara* is here instead treated as *Aidia canthioides*.

*Benkara griffithii* (J. D. Hooker) Ridsdale (Reinwardtia 12: 298. 2008; *Randia griffithii* J. D. Hooker, Fl. Brit. India 3: 112. 1880; *Oxyceros griffithii* (J. D. Hooker) W. C. Chen) is not treated here. See the discussion under *B. forrestii* below.

- 1a. Flowers subsessile to very shortly pedicellate, on pedicels 0.5–1.5 mm ..... 7. *B. sinensis*
- 1b. Flowers pedicellate or pedunculate, on pedicels or peduncles 1–15 mm with at least some of them more than 2 mm.
  - 2a. Branchlets and calyx glabrous; corolla white, with tube 14–22 mm and lobes 5–12 mm.
    - 3a. Secondary leaf veins 4–6 pairs; calyx lobes 0.5–1.2 mm; plants drying with characteristic yellowed color ..... 5. *B. rectispina*
    - 3b. Secondary leaf veins 2 or 3 pairs; calyx lobes 1.5–2 mm; plants drying greenish to grayish ..... 6. *B. scandens*
  - 2b. Branchlets and calyx glabrous to puberulent, pilosulous, strigillose, or hirtellous; corolla white or yellow, with tube 3–7 mm and lobes 5–8 mm.
    - 4a. Calyx limb with tubular portion 3.5–4 mm; corolla white ..... 1. *B. depauperata*
    - 4b. Calyx limb with tubular portion 1–3 mm; corolla white to yellow.
      - 5a. Flowers 1 or 2 in fascicles, these sometimes congested and appearing as a cyme; leaves obtuse to rounded and sometimes shortly mucronate at apex ..... 2. *B. evenosa*
      - 5b. Flowers 3 to several in cymes branched to 2 or more orders; leaves acute to acuminate at apex with tips sharp to slightly blunt.
        - 6a. Corolla with tube 5–6 mm and lobes ca. 5 mm; leaves 1.5–5 cm wide, usually at least some leaves wider than 3 cm ..... 3. *B. forrestii*
        - 6b. Corolla with tube ca. 7 mm and lobes ca. 8 mm; leaves 1.5–3 cm wide ..... 4. *B. hainanensis*

**1. *Benkara depauperata*** (Drake) Ridsdale, Reinwardtia 12: 298. 2008.

多刺筋茜 duo ci le qian

*Randia depauperata* Drake, J. Bot. (Morot) 9: 217. 1895; *Canthium spinosissimum* Merrill; *Fagerlindia depauperata* (Drake) Tirvengadam.

Shrubs, 1–3 m tall; branches compressed to terete, puberulent to hirtellous or strigillose, with thorns 4–15 mm. Petiole 2–6 mm, puberulent to hirtellous or strigillose; leaf blade drying thinly papery, ovate, ovate-orbicular, lanceolate, or ovate-lanceolate, 1–8.2 × 0.8–3 cm, adaxially glabrous, abaxially glabrous or strigillose to hirtellous at least on principal veins, base rounded to obtuse or broadly cuneate, apex acute to caudate-acuminate; secondary veins 2–4 pairs, in abaxial axils usually with pilosulous domatia; stipules triangular to narrowly triangular, 3–4 mm, strigillose to puberulent, acuminate to aristate. Inflorescences 1-flowered or cymose and 2- or 3-flowered, puberulent or strigillose to glabrescent; peduncles 3–10 mm, articulate when flowers solitary; bracts lanceolate, 2–3 mm; pedicels 6–10 mm. Calyx limb hirtellous to strigillose; ovary portion obconic, 1–1.5 mm; limb with tube 3.5–4 mm; lobes triangular to linear, 1–2 mm, apex acute. Corolla white, glabrous outside; tube 3–4.5 mm; lobes elliptic-oblong to ligulate, 5–5.5 mm, ciliolate, acute. Fruiting pedicels 5–15 mm. Berry globose, 5–6 mm in diam., pilosulous or strigillose to glabrescent; seeds ellipsoid to angled, ca. 3 mm. Fl. Apr, fr. May–Jan.

Forests or thickets on hills; below 100–300 m. Fujian, Guangxi, Hainan [Vietnam].

**2. *Benkara evenosa*** (Hutchinson) Ridsdale, Reinwardtia 12: 298. 2008.

无脉筋茜 wu mai le qian

*Randia evenosa* Hutchinson in Sargent, Pl. Wilson. 3: 400. 1916; *Oxyceros evenosus* (Hutchinson) T. Yamazaki.

Shrubs, ca. 3 m tall; branches compressed to terete, puberulent to glabrous, with thorns 2–14 mm. Petiole 3–5 mm, puberulent to glabrous; leaf blade drying thinly leathery to stiffly papery and dark brown, obovate or elliptic, 2–6 × 1.5–3 cm, both surfaces glabrous, base cuneate to obtuse, apex obtuse to rounded and sometimes shortly mucronate; secondary veins 3–5 pairs, in abaxial axils with foveolate and/or pilosulous domatia; stipules triangular to ovate, 2.5–3 mm, glabrous, acute. Inflorescences 1- or 2-flowered, fasciculate, sometimes clustered on shortened internodes and appearing cymose, puberulent to glabrous; peduncles 5–10 mm, sometimes articulate near base; bracts triangular, ca. 1 mm, ciliate, acute. Calyx glabrous; ovary portion ellipsoid to obconic, 1.5–2 mm; limb with tube 2–3 mm; lobes triangular to linear, 0.5–1 mm. Corolla yellow, glabrous outside; tube 3–5 mm; lobes oblong-elliptic, ca. 6 × 3–3.5 mm, obtuse. Fruiting pedicels 10–17 mm. Berry globose, 5–7 mm in diam., glabrous. Fr. Sep–Oct.

• Forests on mountains; 1300–1600 m. Yunnan.

**3. *Benkara forrestii*** (J. Anthony) Ridsdale, Reinwardtia 12: 299. 2008.

滇筋茜 dian le qian

*Randia forrestii* J. Anthony, Notes Roy. Bot. Gard. Edinburgh 18: 204. 1934.

Shrubs or trees, 2–5 m tall; branches hirtellous or pilosulous to glabrescent, compressed to angled or subterete, with thorns 3–10 mm. Petiole 2.5–10 mm, hirtellous or pilosulous to glabrous; leaf blade drying papery to stiffly papery, brownish green, oblong-ovate, elliptic-lanceolate, or ovate, 3.5–7 × 1.5–5 cm, adaxially glabrous and shiny, abaxially glabrous or sparsely strigillose on principal veins, base cuneate to obtuse or sub-

rounded, apex acute to acuminate; secondary veins 4–6 pairs, in abaxial axils with foveolate and/or pilosulous domatia; stipules lanceolate to triangular, 2–5 mm, strigillose to glabrous, acuminate. Inflorescences cymose, 2.5–3 × 3–4 cm, 5- to several flowered, branched to several orders, pilosulous or hirtellous to glabrous; peduncle 4–10 mm; bracts and bracteoles lanceolate or triangular, 2–4 mm, acute; pedicels 1–3 mm. Calyx puberulent or strigillose to glabrous; ovary portion obconic, ca. 1 mm; limb 2–3 mm, partially lobed; lobes triangular, 1–1.5 mm, acute. Corolla white to greenish white or perhaps yellow, glabrous outside; tube 5–6 mm; lobes spatulate, ca. 5 mm, obtuse. Fruiting pedicels ca. 6 mm. Berry globose, 5–8 mm in diam., glabrous. Fl. Apr–Jun, fr. May–Dec.

• Forests or thickets at streamsides, on hills, or on mountain slopes; 1000–2400 m. Yunnan.

Ridsdale (loc. cit.: 298–299) treated *Benkara griffithii* and *B. forrestii* as two different species, without commentary or a key, and synonymized *Randia hainanensis* under *B. forrestii*. W. C. Chen (in FRPS 71(1): 346. 1999) treated these names as synonyms of *Oxyceros griffithii*. However, *B. forrestii* and *R. hainanensis* were recognized as separate species by Tirvengadam (in herb.), and these appear morphologically distinct as outlined in the key to species above and thus are separated here. These are provisionally treated as endemic pending further study of this genus and specimens from surrounding countries.

#### 4. *Benkara hainanensis* (Merrill) C. M. Taylor, **comb. nov.**

海南筋茜 hai nan le qian

Basionym: *Randia hainanensis* Merrill, Lingnan Sci. J. 11: 58. 1932.

Shrubs, 0.5–2.5 m tall; branches slender, compressed to subterete, glabrous, with thorns 4–7 mm. Petiole 2.5–13 mm, pilosulous to glabrous; leaf blade drying papery, brownish green to dark brown, oblong-ovate, elliptic-lanceolate, or lanceolate, 3–8 × 1.5–3 cm, both surfaces glabrous, base cuneate or obtuse to sometimes subrounded, apex acute to acuminate; secondary veins 3–6 pairs, in abaxial axils with foveolate and/or pilosulous domatia; stipules lanceolate to triangular, 2–4 mm, glabrous, acuminate. Inflorescences cymose, 2.5–3 × 3–4 cm, 3- to several flowered, branched to several orders, glabrous; peduncle 4–7 mm; bracts and bracteoles lanceolate to triangular, 2–6 mm, acute; pedicels 2–3 mm. Calyx glabrous; ovary portion obconic, ca. 1 mm; limb 1–3 mm, partially lobed; lobes triangular, 1–1.5 mm, acute. Corolla white or yellow, glabrous outside; tube ca. 7 mm; lobes spatulate, ca. 8 mm, obtuse and often mucronulate. Fruiting pedicels to 9 mm. Berry globose, 5–8 mm in diam., glabrous. Fl. Apr–Jun, fr. May–Dec.

• Forests or thickets at streamsides, on hills, or on mountain slopes; 200–600 m. Hainan.

W. C. Chen (in FRPS 71(1): 346. 1999) treated this species as a synonym of *Benkara griffithii* (as *Oxyceros griffithii*), and Ridsdale (Reinwardtia 12: 299. 2008) treated it as a synonym of *B. forrestii*; see comments above under *B. forrestii* regarding its separation here.

#### 5. *Benkara rectispina* (Merrill) Ridsdale, Reinwardtia 12: 299. 2008.

直刺筋茜 zhi ci le qian

*Randia rectispina* Merrill, Lingnan Sci. J. 14: 60. 1935;  
*Oxyceros rectispinus* (Merrill) T. Yamazaki.

Shrubs, 2–4 m tall, sometimes scandent; branches weakly compressed to subterete, glabrous, rather stout, often yellowish white, with thorns 6–14 mm. Petiole 3–6 mm, glabrous; leaf blade drying leathery and usually straw- to brownish yellow, ovate, elliptic-ovate, or elliptic, 1.5–6.5 × 1–3 cm, both surfaces glabrous and rather shiny, base cuneate, obtuse, or subrounded, apex obtuse or slightly rounded or rarely acute; secondary veins 4–6 pairs, in abaxial axils usually with foveolate and/or pilosulous domatia; stipules lanceolate to triangular, ca. 2 mm, acute to caudate or aristate. Inflorescences 1- or less often 2-flowered, glabrescent; peduncles 2–8 mm; bracteoles absent or 2, broadly ovate-triangular, 1.5–2 mm, acute, after falling leaving a persistent pilose ring; pedicels 5–8 mm. Calyx limb glabrous; ovary portion subglobose, ca. 2 mm; limb campanulate, ca. 4.5 × 3 mm, shallowly lobed; lobes triangular, 0.5–1.2 mm, cuspidate. Corolla white, outside glabrous; tube 18–22 mm; lobes elliptic-ovate, 5–6 mm, obtuse. Fruiting pedicels 5–12 mm. Berry globose, 6–10 mm in diam., glabrous; seeds 3–4 mm. Fl. Apr–Jul, fr. Sep–Jan.

• Forests or thickets at seashores or on hills; near sea level to 300 m. Hainan.

#### 6. *Benkara scandens* (Thunberg) Ridsdale, Reinwardtia 12: 300. 2008.

浓子茉莉 nong zi mo li

*Gardenia scandens* Thunberg, Gardenia, 17. 1780; *Fagerlindia scandens* (Thunberg) Tirvengadam; *Plectronia levinei* Merrill; *Randia accedens* Hance; *R. scandens* (Thunberg) Lamarck.

Shrubs, 1–3 m tall; branches terete to flattened, glabrous, with thorns 6–12 mm. Petiole 2–5 mm, glabrous; leaf blade drying papery or thinly leathery, ovate, lanceolate, broadly elliptic, or elliptic-oblong, 0.6–5.5 × 0.4–2.5 cm, both surfaces glabrous, base cuneate, margins sometimes thinly revolute, apex obtuse or acute; secondary veins 2 or 3 pairs, in abaxial axils usually with foveolate and/or pilosulous domatia; stipules triangular to ovate, 1.5–2 mm, glabrous, acuminate to cuspidate. Inflorescences 1-flowered or cymose and 2- or 3-flowered, glabrescent; peduncles 2–10 mm, articulate when flowers solitary; bracts lanceolate, 1.5–2.5 mm; pedicels 3–10 mm. Calyx glabrous; ovary portion obconic, 1.2–1.5 mm; limb with tube somewhat campanulate, 3.5–4 mm; lobes narrowly triangular, 1.5–2 mm, acute to acuminate. Corolla white, outside puberulent to usually glabrous; tube 14–20 mm; lobes lanceolate, 6–12 mm, acute. Fruiting pedicels 3–12 mm. Berry globose, 5–7 mm in diam., glabrous; seeds ellipsoid to angled, 2–3 mm. Fl. Mar–May, fr. May–Dec.

Thickets in fields or on hills at low elevations. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

#### 7. *Benkara sinensis* (Loureiro) Ridsdale, Reinwardtia 12: 300. 2008.

筋茜 le qian

*Oxyceros sinensis* Loureiro, Fl. Cochinch. 1: 151. 1790; *Aidia sinensis* (Loureiro) Masamune; *Fagerlindia sinensis* (Loureiro) Tirvengadam; *Randia sinensis* (Loureiro) Schultes.

Shrubs or small trees, sometimes scandent, many branched, 1–7 m tall; branches compressed to terete, rather stout, yellowish brown hirtellous or -pilosulous, with thorns 4–15 mm. Petiole 5–15 mm, yellowish hirtellous to -pilosulous or glabrescent; leaf blade drying papery to thickly papery, ovate-elliptic, elliptic-oblong, or ovate, 2–21 × 1.5–9.5 cm, adaxially glabrous, abaxially glabrescent to strigillose, hirtellous, or pilosulous at least on principal veins, base cuneate or slightly rounded, apex acute or shortly acuminate; secondary veins 5–8 pairs, in abaxial axils with pilosulous domatia; stipules triangular to narrowly triangular, 3–5 mm, strigillose to pilosulous, hirtellous, or glabrescent, long acuminate. Inflorescences congested-cymose, often umbelliform, several to many flowered, 2.5–4 × 3–4.5 cm, densely pilosulous to strigose or strigillose;

peduncle 3–5 mm; bracts lanceolate to ovate, 1.5–2.5 mm, acute to acuminate; pedicels 0.5–1.5 mm. Calyx densely strigose to strigillose; ovary portion ellipsoid to cylindrical, 1–1.2 mm; limb 3–4 mm, shallowly to deeply lobed; lobes narrowly triangular or ovate-triangular, 1–4 mm, acute. Corolla white or yellow, outside puberulent to glabrous; tube (12–)15–24 × 1–4 mm; lobes elliptic-oblong to oblanceolate, 5–9 × 4–4.5 mm, acute. Fruiting pedicels to 5 mm. Berry globose, 8–12 mm in diam., pilosulous to strigillose or glabrous; seeds ca. 5 mm. Fl. Mar–Dec, fr. May–Feb.

Forests, forest margins, or thickets on hills, on mountains, or in fields; near sea level to 1200 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Japan, ?Thailand (*Larsen et al.* 43560, MO!), Vietnam].

The shorter measurements here are taken from W. C. Chen (in FRPS 71(1): 345–346. 1999); the specimens studied all have corolla tubes 15–24 mm.

## 9. BRACHYTOME J. D. Hooker, Hooker's Icon. Pl. 11: 70. 1871.

短萼齿木属 duan e chi mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, dioecious or perhaps polygamo-dioecious, unarmed, often with some internodes reduced. Raphides absent. Leaves opposite or often appearing ternate due to reduced internodes and marked anisophylly grouping 2 leaves at 1 node plus a single leaf at another node, apparently without domatia; stipules persistent or deciduous after terminal 2–4 nodes, interpetiolar or shortly united around stem, triangular. Inflorescences pseudoaxillary, usually borne opposite a single leaf of an anisophyllous pair and appearing leaf-opposed or sometimes just above an undeveloped internode at an apparent 3-leaved node, cymose, few to several flowered, subsessile to pedunculate, bracteate. Flowers subsessile to pedicellate, unisexual or perhaps sometimes bisexual. Calyx limb cupular, 5-lobed or -dentate. Corolla white to cream or pale yellow, funnelform to tubular or subrotate, glabrous inside; lobes 5, convolute in bud. Stamens 5, inserted in corolla throat, exerted, with staminodes included; filaments short; anthers dorsifixed. Ovary 2-celled, ovules many in each cell on peltate axile placentas; stigma 2-lobed, grooved striate, partially exerted. Fruit red to orange, baccate, fleshy, globose to ellipsoid, smooth, with calyx limb persistent, often with fruit base and/or pedicels elongating into stipes; seeds numerous, small, cuneate to flattened, with testa reticulate; endosperm fleshy; embryo small, subterete.

About five species: Bangladesh, Cambodia, China, India, Malaysia, Myanmar, Vietnam; three species in China.

The morphology and branching of this genus were studied by Tirvengadam and Sastre (Bull. Mus. Natl. Hist. Nat., B, Adansonia 8: 257–296. 1986).

*Brachytome* was described as polygamo-dioecious in FRPS (71(1): 360. 1999), but this has not been reported by other sources; the genus was described as unisexual by Puff et al. (Rubiaceae of Thailand, 68. 2005).

- 1a. Branches densely strigose, strigillose, hirtellous, or hispidulous ..... 2. *B. hirtellata*
- 1b. Branches glabrous or sparsely to moderately strigose to strigillose when young, becoming glabrescent with age.
- 2a. Infructescences 3–8 × 3–5 cm, with axes and pedicels mostly well developed; stipules 3–8 mm; berry subglobose, ca. 6 × 5 mm ..... 1. *B. hainanensis*
- 2b. Inflorescences and infructescences 3–5 × 3–5 cm, with axes and pedicels short to well developed; stipules 6–15 mm; berry ellipsoid, 10–20 × 8–15 mm ..... 3. *B. wallichii*

1. *Brachytome hainanensis* C. Y. Wu ex W. C. Chen, Guihaia 7: 298. 1987.

海南短萼齿木 hai nan duan e chi mu

Shrubs, 2.5–3 m tall; branches flattened becoming subterete, glabrous. Petiole 0.4–1.5 cm, glabrous; leaf blade drying papery and usually brown, elliptic-oblong, elliptic, or elliptic-lanceolate, 7–20.5 × 2.5–7 cm, adaxially glabrous, abaxially glabrous or puberulent, base cuneate to obtuse, apex acute to acuminate; secondary veins 8–12 pairs; stipules triangular to

broadly triangular, 3–8 mm, glabrous, acuminate or cuspidate. Inflorescences not seen. Flowers not seen. Infructescences corymbiform-cymose, 3–8 × 3–5 cm, several to many fruited; peduncle 1.5–2 cm; bracts triangular to ovate, 0.5–1 mm, mostly situated at nodes (i.e., branching points); pedicels 3–9 mm. Berry red, ellipsoid to subglobose except with narrow cylindrical base, rounded portion 5–6 × ca. 5 mm plus basal narrow portion ca. 1 mm; seeds yellow, ca. 1.5 mm wide. Fr. Mar.

Forests. Hainan [Vietnam].

**2. *Brachytome hirtellata*** Hu, Bull. Fan Mem. Inst. Biol. 10: 164. 1940.

滇短萼齿木 dian duan e chi mu

Shrubs, ca. 3 m tall; branches somewhat flattened becoming angled and sometimes shallowly channeled, sometimes flexuous, densely hirtellous or hispidulous to strigillose or strigose. Petiole 2–12 mm, densely hirtellous to strigillose or strigose; leaf blade drying membranous or thinly papery, green to yellowish green adaxially, brown or purplish brown abaxially, oblanceolate or oblong-lanceolate to elliptic, 7–21.5 × 2–6 cm, adaxially glabrous or scaberulous to sparsely hirtellous, hispidulous, or strigillose, abaxially glabrescent or densely to sparsely hirtellous or strigillose, base cuneate or acute, apex acute to acuminate; secondary veins 12–20 pairs; stipules ovate to triangular, 4–8 mm, densely strigillose or strigose to glabrous, acute to acuminate. Inflorescences congested-cymose, 1–1.5 × 1–1.5 cm, usually 5–10-flowered, densely hirtellous to strigose or strigillose, sessile or subsessile; bracts ovate to triangular or linear, 0.5–8 mm, situated at nodes, along axes, and usually in pairs and 0.5–2.5 mm immediately below flowers. Flowers sessile to shortly pedicellate, with pedicels to 1 mm. Calyx strigillose to pilosulous; ovary portion obconic, 0.5–1.5 mm; limb 2–2.5 mm, lobed for ca. 1/2 its length; lobes triangular to linear-lanceolate, acute. Corolla white or yellowish white, funnelform to tubular, outside glabrous; tube 4–6 mm; lobes ovate, 1–2 mm. Berry globose, ca. 8 mm in diam., densely hirtellous or hispidulous to strigillose, with stipe or pedicel elongating above paired bracts, up to 12 mm; seeds reddish yellow, ca. 1.5 × 1–1.5 mm. Fl. Mar–Jun, fr. May–Mar.

Forests or thickets at streamsides in valleys; 400–2200 m. Xizang, Yunnan [Vietnam].

These varieties were recognized by W. C. Chen in FRPS (71(1): 362. 1999); some recently collected specimens seem to be intermediate but this species is poorly documented in general, so these are treated here at least for reference.

- 1a. Leaf blade adaxially smooth and glabrous or subglabrous, abaxially subglabrous or sparsely hirtellous or strigillose with pubescence denser along veins ..... 2a. var. *glabrescens*
- 1b. Leaf blade adaxially scaberulous and glabrous to sparsely hirtellous, strigillose, or hispidulous, abaxially densely grayish brown hirtellous to strigillose ..... 2b. var. *hirtellata*

**2a. *Brachytome hirtellata* var. *glabrescens*** W. C. Chen, Acta Phytotax. Sin. 22: 147. 1984.

疏毛短萼齿木 shu mao duan e chi mu

Leaf blade adaxially smooth and glabrous or subglabrous, abaxially subglabrous or sparsely hirtellous or strigillose with pubescence denser along veins. Fl. May–Jun, fr. Jun–Mar.

Forests at streamsides in valleys; 400–2200 m. Xizang (Médog), Yunnan [Vietnam].

**2b. *Brachytome hirtellata* var. *hirtellata***

滇短萼齿木(原变种) dian duan e chi mu (yuan bian zhong)

Leaf blade adaxially scaberulous and glabrous to sparsely hirtellous, strigillose, or hispidulous, abaxially densely grayish brown hirtellous to strigillose. Fl. Mar–Jun, fr. May–Dec.

• Forests or thickets at streamsides in valleys; 700–1600 m. Yunnan.

**3. *Brachytome wallichii*** J. D. Hooker, Hooker's Icon. Pl. 11: 70. 1871.

短萼齿木 duan e chi mu

Shrubs or small trees, 1.5–3 m tall; branches flattened to subterete, glabrous or sparsely strigillose or strigose becoming glabrescent with age. Petiole 0.3–1 cm, glabrous; leaf blade drying papery, green adaxially, often flushed with reddish brown abaxially, elliptic-oblong, lanceolate, or oblanceolate, 9–14 × 2.5–4.5 cm, glabrous on both surfaces, base cuneate to acute, apex acuminate; secondary veins 8–10 pairs; stipules triangular to narrowly triangular, 6–15 mm, glabrous to puberulent, acute to acuminate and sometimes falcate. Inflorescences 3–4 × 3–5 cm, several flowered, glabrous; peduncle ca. 0.5 cm; bracts triangular and often fused in pairs, 1–2 mm, usually situated at nodes and perhaps immediately below flowers; pedicels 5–10 mm. Calyx glabrous; ovary portion obconic, 1–1.5 mm; limb 1–1.5 mm, denticulate to lobed for up to 1/3 of its length; lobes broadly triangular. Corolla funnelform, outside glabrous; tube ca. 6 mm; lobes triangular, ca. 1 mm, obtuse. Berry red, ellipsoid, 10–20 × 8–15 mm, with stipe or pedicel elongating, up to 20 mm; seeds 1–1.5 × 1–2 mm. Fr. Sep–Oct.

Forests in valleys; 1200–2000 m. SW Yunnan [Bangladesh, Cambodia, India, Myanmar, Vietnam].

This species was reported by W. C. Chen (in FRPS 71(1): 361. 1999) from Bhutan, but Springate et al. (Fl. Bhutan 2(2): 784. 1999) treated this as reported in error.

## 10. CAELOSPERMUM Blume, Bijdr. 994. 1826–1827.

穴果木属 xue guo mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Lianas or sometimes shrubs or small trees, unarmed. Raphides present. Leaves opposite or rarely ternate, decussate on ascending branches but distichous on horizontal branches, with domatia; stipules persistent at least on apical 2 or 3 nodes and usually becoming hardened with age, at least shortly united around stem [or rarely interpetiolar], triangular and acute to truncate, sometimes shortly 2-toothed. Inflorescences terminal and sometimes in axils of uppermost leaves, corymbiform to paniculiform with flowers grouped in small heads or umbelliform cymes, many flowered, pedunculate, bracteate or bracts reduced. Flowers pedicellate to sessile, free [sometimes fused by their ovaries], bisexual, apparently monomorphic. Calyx with ovary portion usually hemispherical

or campanulate; limb tubular, truncate or 4–6-denticulate. Corolla white becoming yellowed when old, salverform or funnellform, fleshy, variously pubescent inside; lobes 4 or 5(or 6), valvate in bud. Stamens 4 or 5(or 6), inserted in corolla tube, exserted; filaments developed; anthers dorsifixed near middle, 2-parted at base. Ovary 2-celled with ovules 2 in each cell or 4-celled via secondarily developing septa and ovules 1 in each cell, ovules inserted on middle of septum, anatropous or pendulous; stigmas 2, linear to spatulate, exserted or included. Fruit simple [sometimes multiple due to fusion of flowers], dark red to dark purple, drupaceous, fleshy, subglobose to ellipsoid, smooth, with calyx limb persistent; pyrenes 2, 3, or usually 4, 1-celled with 1 seed in each cell, ellipsoid to plano-convex, cartilaginous, densely puberulent; seeds medium-sized; endosperm oily; embryo straight.

Seven to ten species: from tropical Asia to Australia; one species in China.

This genus is similar and has long been considered related to *Morinda* and perhaps will be synonymized eventually, but it has provisionally been maintained by recent workers (Razafimandimbison et al., *Molec. Phylogen. Evol.* 48: 207–223. 2008). This genus was studied by Johansson (Blumea 3: 265–297. 1988), who synonymized the two species recognized by Y. Z. Ruan (in FRPS 71(2): 166–167. 1999) in China together with several other SE Asian names into a wide-ranging, morphologically variable species with the variation apparently continuous.

**1. *Caelospermum truncatum*** (Wallich) Baillon ex K. Schumann in Engler & Prantl, *Nat. Pflanzenfam.* 4(4): 136. 1891.

穴果木 xue guo mu

*Webera truncata* Wallich in Roxburgh, *Fl. Ind.* 2: 538. 1824; *Caelospermum kanehirae* Merrill; *C. morindiforme* Pierre ex Pitard; *C. scandens* Blume.

Lianas or weak shrubs, to 15 m high; branches weakly flattened to subterete or quadrangular, glabrous or glabrescent. Leaves opposite; petiole 10–25 mm, glabrous to puberulent; blade drying leathery or thickly papery and brownish yellow to pale black, elliptic, elliptic-oblong, lanceolate-oblong, ovate, or obovate, 7–15 × 3–10 cm, adaxially glabrous, abaxially paler and glabrous to puberulent, base cuneate to rounded, apex acute, obtuse, or rounded; secondary veins 4–7 pairs, with pilosulous domatia; stipules broadly triangular, 1–4.5 mm, truncate or 2-denticulate. Inflorescence a cymose panicle of 3–9

corymbs or umbels, 6–17 cm, mealy puberulent; peduncles 2.5–4 cm; umbels 3–20-flowered; bracts reduced. Flowers free, subsessile to pedicellate, pedicels to 6(–11) mm. Calyx mealy puberulent to glabrescent; ovary portion subglobose to cupuliform, 1–1.5 mm; limb 1–2 mm, truncate or 4- or 5-denticulate. Corolla salverform, outside glabrous to sparsely papillose; tube (4–)5–6(–9) mm, pubescent in upper part and throat; lobes linear to oblong-linear, (4.5–)5–6(–12) mm. Drupes subglobose, 8–12(–27) mm in diam. Fl. Apr–May, fr. Jul–Sep.

Thickets or sparse forests on hills or mountains; sea level to 1900 m. Guangxi, Hainan [Cambodia, Indonesia (Borneo, Java, Sumatra), Malaysia, Thailand, Vietnam].

Measurements in parentheses here come from Johansson's (Blumea 3: 265–297. 1988) description of this species throughout its range. He noted that the most widely used name for this species is *Caelospermum scandens*, here included as an aid to relating the Chinese species to the SE Asian flora.

## 11. *CANTHIUM* Lamarck, *Encycl.* 1: 602. 1785.

鱼骨木属 yu gu mu shu

Chen Tao (陈涛); Charlotte M. Taylor, Henrik Lantz

*Meyna* Roxburgh ex Link.

Shrubs or small trees, sometimes dioecious, sometimes with short shoots, unarmed or sometimes with paired straight supra-axillary thorns. Raphides absent. Leaves opposite, with or without domatia; stipules persistent or caducous, interpetiolar, shortly united around stem, or fused to petiole bases, triangular, internally (i.e., adaxially) sometimes sericeous to pilose. Inflorescences axillary, cymose to fasciculate, few to several flowered, sessile to pedunculate, bracteate with bracts sometimes fused in calyculate pairs. Flowers subsessile to pedicellate, bisexual and monomorphic (*Canthium* s.s.) or sometimes unisexual. Calyx with ovary portion often subglobose to hemispherical; limb very short, truncate or 4- or 5-lobed. Corolla green to white or pale yellow, tubular, urceolate, or funnellform, with tube often constricted at top, inside variously pubescent but usually with ring of introrse hairs in tube; lobes 4 or 5, often long acuminate or aristate at apex, in bud valvate and often with apices held erect and pressed together forming apiculate projection, at anthesis notably reflexed. Stamens 4 or 5, inserted at corolla throat, partially to fully exserted; filaments short or reduced; anthers dorsifixed near base, elliptic to ovate, at anthesis reflexed. Ovary 2–5-celled, ovules 1 in each cell, pendulous from apical placenta; stigma included or exserted, capitate to cupular, entire to variously lobed, usually with style attachment recessed. Fruit brown, yellow, orange, or red, drupaceous, subglobose, ellipsoid, or often dicocous when fully developed or reniform with only 1 seed, fleshy, with calyx limb caducous or infrequently persistent; pyrenes 2–5, 1-celled with 1 seed in each cell, ellipsoid to reniform, bony or crustaceous; seeds medium-sized to large, ellipsoid, cylindrical, or plano-convex; testa membranous; endosperm fleshy; radicle ascending.

About 30 species: tropical and subtropical Africa and Asia; four species (one endemic) in China.

The circumscription and separation of genera of Vanguerieae and especially *Canthium*, *Meyna*, *Psydrax*, *Pyrostria* Commerson ex Jussieu, *Vangueria* Jussieu, and their closely related genera are problematic, controversial, and far from a full resolution. Lantz and Bremer (Bot. J. Linn. Soc. 146: 257–283. 2004) provided revised circumscriptions of several genera; in particular, they synonymized *Meyna* with *Canthium* and moved some species from *Canthium* to *Psydrax*. The Asian lineages have not yet been studied deeply, and the Chinese species may yet be reclassified.

The name *Canthium cavaleriei* H. Léveillé (Repert. Spec. Nov. Regni Veg. 10: 434. 1912) is based on a specimen from Guizhou; this name was not treated in FRPS. As the specimen has not been seen and its description is scanty, its identity is unknown. It has been suggested to be related to *Lasianthus*, but according to Lauener and Ferguson (Notes Roy. Bot. Gard. Edinburgh 32: 103. 1972) that is incorrect.

- 1a. Plants unarmed or usually armed with thorns; flowers borne in fascicles on peduncles 1–2 mm ..... 3. *C. horridum*  
 1b. Plants without thorns; flowers borne in fascicles on peduncles 4–8 mm, or in cymes with peduncles 8–25 mm and pedicels 2–8 mm.  
 2a. Leaves 9–19 × 4–8.5 cm; inflorescences corymbiform to cymose, 2.5–3 × ca. 2 cm in flower, to 7 × 9 cm in fruit; fruit 10–20 × 9–15 mm ..... 4. *C. simile*  
 2b. Leaves 3–9 × 1.5–5 cm; inflorescences fasciculate to subumbelliform, 1–3.5 cm in flower and fruit; fruit 8–10 mm in diam.  
 3a. Flowers unisexual on dioecious plants; secondary leaf veins 3 or 4 pairs; stipules persistent; corolla tube ca. 1.5 mm and lobes 2–6 mm; ovary locules and pyrenes 2 ..... 1. *C. gynochthodes*  
 3b. Flower bisexual; secondary leaf veins 5 or 6 pairs; stipules caducous; corolla tube ca. 3 mm and lobes ca. 3 mm; ovary locules and pyrenes 3 or 4 ..... 2. *C. hainanense*

**1. *Canthium gynochthodes* Baillon, Adansonia 12: 199. 1878.**

朴菜木 po lai mu

*Canthium cumingii* Vidal; *Plectronia cumingii* (Vidal) Merrill; *P. gynochthodes* (Baillon) Merrill; *P. moluccana* Merrill; *P. umbellata* K. Schumann.

Small trees, height not noted, often rather succulent; branches flattened becoming subterete, glabrous. Petiole 1–5 mm, glabrous; leaf blade drying thinly leathery, elliptic to elliptic-oblong or obovate, 3–8 × 1.5–5 cm, glabrous on both surfaces, base acute to obtuse, apex obtuse to shortly acute; secondary veins 3 or 4 pairs, in abaxial axils with foveolate and sometimes also pilosulous domatia; stipules persistent, shortly united around stem, triangular to ovate, 2–4.5 mm, glabrous, aristate to cuspidate. Inflorescences glabrous, 1–3.5 cm, several flowered; peduncles 0.8–2.5 cm, terminating in a pair of bracteoles, these triangular, ca. 1 mm, shortly fused; pedicels 4–7 mm. Flowers unisexual on dioecious plants. Calyx glabrous; ovary portion of pistillate flowers ca. 1.2 mm; limb ca. 0.5 mm, truncate to undulate. Corolla white to pale green, outside glabrous; tube ca. 1.5 mm; lobes 4, 2–2.5(–6) mm, acute. Ovary 2-celled; stigma ca. 0.3 mm. Drupes orangish yellow, oblate or obovoid to dicocous, ca. 8 × 10 mm, smooth, glabrous, with calyx limb persistent; pyrenes 2. Fl. Aug.

Forests on mountain ridges. Taiwan [Philippines].

Only very young flower buds have been seen so far from China; the descriptions here of the mature flowers and the fruit are based in large part on the description by Liu and Yang (Fl. Taiwan, ed. 2, 4: 247–248. 1998) and on Philippine specimens. The synonymy here is taken from Merrill (Enum. Philipp. Pl. 3: 536–537. 1923). The accepted species epithet was incorrectly spelled as “*gynochodes*” by Liu and Yang (loc. cit.: 247).

*Canthium dicoccum* var. *obovatifolium* should probably be compared with this species. The variety is poorly known and is here included with the species in which it was described, now called *Psydrax dicocca*; but its inclusion in that species is questionable, and its description suggests it is very similar to *C. gynochthodes*.

**2. *Canthium hainanense* (Merrill) Lantz, comb. nov.**

琼梅 qiong mei

Basionym: *Meyna hainanensis* Merrill, Lingnan Sci. J. 14: 57. 1935.

Small trees, 3–6 m tall; branches weakly flattened to subterete, glabrous or puberulent, at nodes with stipule bases together with bases of petioles usually markedly thickened with thickened portion sometimes tardily splitting interpetiolarly, usually with stout lateral short shoots 0.5–1 cm, these densely covered with scalelike old stipule bases. Leaves borne at nodes near apex of developed stems or clustered on short shoots; petiole 5–8 mm, glabrous, sometimes weakly articulate near base; blade drying papery or thinly papery, ovate, oblong-ovate, or elliptic-oblong, 3–9 × 1.5–5 cm, adaxially glabrous or rarely strigillose, abaxially strigillose or strigose, base obtuse to rounded, apex acute or acuminate; secondary veins 5 or 6 pairs, in abaxial axils with pilosulous domatia; stipules shortly united around stem with basal portion persistent becoming thickened and upper portion caducous, triangular to lanceolate, 2–5 mm, often keeled, acuminate to aristate. Inflorescences fasciculate to subumbelliform and subsessile, 1–1.5 cm, few to several flowered, puberulent or hirtellous to glabrescent; peduncles 4–8 mm; bracts reduced. Calyx puberulent; ovary portion obconic, ca. 0.5 mm; limb with lobes (4 or) 5, triangular, 0.5–0.8 mm, acute. Corolla color not noted, funnellform, outside glabrous; tube ca. 3 mm, inside pubescent in upper half; lobes (4 or) 5, lanceolate to spatulate-triangular, ca. 3 mm, acute to acuminate. Ovary 3- or 4-celled; stigma ca. 0.8 mm. Drupes with color not noted, subglobose, 8–10 mm in diam., puberulent to glabrescent, with calyx limb persistent; pyrenes 3 or 4. Fl. Apr–Aug, fr. Jun.

- Broad-leaved forests; 200–300 m. Hainan.

The illustration of this species presented by W. C. Ko (in FRPS 71(2): 8, t. 3. 1999) shows four calyx lobes and four corolla lobes; however, these structures both were described as five in the protologue, and the specimens seen have five calyx lobes.

**3. *Canthium horridum* Blume, Catalogus, 45. 1823.**

猪肚木 zhu du mu

*Canthium hebecladum* Candolle; *C. pauciflorum* Blanco; *Plectronia horrida* (Blume) Benth. & J. D. Hooker.

Shrubs, 2–3 m tall; branches flattened to subterete, often rather slender, strigillose to strigose or pilosulous, sometimes with lateral short shoots to 0.5 cm; thorns slender to stout, 3–30 mm, straight, or sometimes absent. Leaves paired along developed stems or sometimes clustered on lateral short shoots;

petiole 2–3 mm, strigillose to pilosulous; blade drying papery, ovate to lanceolate or elliptic, 2–6 × 1–3.5 cm, adaxially glabrous or strigillose to hispidulous along principal veins or throughout, abaxially puberulent to strigillose or hispidulous, base rounded or obtuse, apex obtuse, acute, or weakly acuminate; secondary veins 2 or 3 pairs, in abaxial axils with pilosulous and/or foveolate domatia; stipules deciduous after distalmost several nodes, triangular to ovate, 2–3 mm, densely strigillose to strigose, acute. Inflorescences fasciculate, 0.5–1 cm, few flowered, strigillose to glabrescent; peduncles 1–3 mm, each with a pair of triangular bracteoles ca. 1 mm and fused in pairs. Calyx puberulent to glabrous; ovary portion obconic, ca. 0.8 mm; limb 0.5–0.8 mm, truncate to undulate. Corolla white, funnellform, outside glabrous; tube suburceolate, ca. 2 mm; lobes 5, triangular-oblong, ca. 3 mm, acuminate. Ovary 2-locular; stigma ca. 0.5 mm. Drupes yellow, ovoid to subglobose, obovoid, or somewhat dicocous, laterally somewhat flattened, 15–25 × 10–20 mm, smooth, glabrous, with calyx limb persistent; pyrenes 2, weakly tuberculate. Fl. Apr–Jun, fr. Jul–Nov.

Thickets at low elevations; near sea level to 500 m. Guangdong, Guangxi, Hainan, Yunnan [India, Malaysia, Thailand, Vietnam].

The name *Canthium parvifolium* Roxburgh has sometimes been applied to the Chinese plants that are here called *C. horridum*. W. C. Ko (in FRPS 71(2): 10. 1999) considered it a misapplied name, listing it as "*Canthium parvifolium* auct. non Roxb."

#### 4. *Canthium simile* Merrill & Chun, Sunyatsenia 2: 19. 1934.

大叶鱼骨木 da ye yu gu mu

Erect shrubs to small trees, 4–10(–18) m tall, unarmed;

branches glabrous, somewhat compressed becoming terete. Leaves borne along developed stems; petiole 5–8 mm, glabrous; blade drying thinly to thickly papery, ovate to ovate-oblong or elliptic-oblong, 9–19 × 4–8.5 cm, adaxially shiny and glabrous or sometimes pustulose, abaxially glabrous to pilosulous or pilose, base obtuse to rounded, apex shortly acuminate; secondary veins 6–8 pairs, in abaxial axils with small foveolate domatia; stipules deciduous, shortly united around stem, triangular, 2–8 mm, sparsely pilosulous to glabrous, keeled, cuspidate to acuminate. Inflorescences corymbiform to cymose, 2.5–3 × ca. 2 cm, several flowered, puberulent to hirtellous; peduncle 10–14 mm; bracts reduced; pedicels 2–3 mm. Calyx puberulent to glabrous; ovary portion obconic to hemispherical, 1–1.5 mm; limb ca. 0.5 mm, 5-lobed; lobes broadly ovate-triangular, acute. Corolla white, urceolate-tubular, outside glabrous; tube 1.5–2 mm, inside villous in throat; lobes 5, triangular to spatulate, 1.5–3 mm, acute. Ovary 2-locular; stigma ca. 1.2 mm. Inflorescences expanded, to 7 × 9 cm; fruiting pedicels to 12 mm. Drupes with color not noted, obovoid, laterally compressed, often somewhat dicocous, 10–20 × 9–15 mm, glabrescent, with calyx limb deciduous; pyrenes 2, plano-convex. Fl. Jan–Mar, fr. Jun–Jul.

Broad-leaved forests at low to middle elevations; 200–1500 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

This species is newly reported here from Vietnam, based on Thorel 1294 (GH).

The measurements of the flower parts given by Merrill and Chun in the protologue do not agree with the measurements inferred from their figure 2; their figure seems to have been reproduced at twice the size they planned.

## 12. CATUNAREGAM Wolf, Gen. Pl. 75<sup>+</sup>. 1776.

山石榴属 shan shi liu shu

Chen Tao (陈涛); Charlotte M. Taylor

*Xeromphis* Rafinesque.

Shrubs or small trees, often with short shoots, often armed with spines or spinescent short shoots. Raphides absent. Leaves opposite or often clustered and apparently fasciculate on short shoots, subsessile to petiolate, usually with domatia; stipules deciduous or caducous, interpetiolar, triangular. Inflorescences terminal on short shoots or these sometimes reduced giving an appearance of axillary position, 1-flowered, or cymose to fasciculate and 2–6-flowered, sessile to pedunculate, bracteate or bracts reduced. Flowers subsessile to pedicellate, bisexual, monomorphic. Calyx limb deeply 5-lobed, lobes spatulate to obovoid. Corolla white to cream or pale green, campanulate to subrotate, usually densely sericeous outside, variously pubescent inside; lobes 5[–10], convolute in bud. Stamens 5, inserted in corolla throat, partially to fully exserted; filaments short; anthers dorsifixed. Ovary 2-celled, ovules many in each cell on axile placentas attached at center of septum; stigma ellipsoid or 2-lobed, exserted. Fruit generally yellowish brown, baccate, leathery to thickly fleshy or infrequently hard, globose, ellipsoid, or ovoid-globose, with calyx limb persistent; seeds numerous, medium-sized, ellipsoid, angled, or reniform, embedded in fleshy or mucilaginous pulp.

About five to perhaps ten species: widespread in Africa, also in Bhutan, China, Cambodia, India, Indonesia, Kashmir, Laos, Madagascar, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam; one species in China.

The calyx limb enlarges markedly during the development of the fruit. At least some species of *Catunaregam* in Africa have nocturnal sweetly fragrant flowers (Bridson & Verdcourt, Fl. Trop. E. Africa, Rub. (Pt. 2), 496–500. 1988), and *Catunaregam* in China may also. Many species of related genera also have secondary pollen presentation, and these features may be present in *Catunaregam* also.

1. *Catunaregam spinosa* (Thunberg) Tirvengadam, Bull. Mus. Natl. Hist. Nat., Sér. 3, Bot. 35: 13. 1978.

山石榴 shan shi liu

*Gardenia spinosa* Thunberg, *Gardenia*, 16. 1780; *G. dumetorum* Retzius; *Randia dumetorum* (Retzius) Lamarck; *Randia spinosa* (Thunberg) Poirét; *Xeromphis retzii* Rafinesque; *X. spinosa* (Thunberg) Keay.

Shrubs or small trees, 1–10 m tall; branches rather stout, hirsute, pilose, pilosulous, or puberulent to glabrescent, armed with axillary stout paired thorns 1–5 cm. Petiole 2–8 mm, pilose, pilosulous, or hirtellous to glabrous; leaf blade drying papery or subleathery, obovate or oblong-obovate or rarely ovate to spatulate, 1.8–11 × 1–5.7 cm, both surfaces glabrous to strigillose, strigose, hirtellous, or sparsely hirsute at least along principal veins, base cuneate and sometimes decurrent, margins entire or often shortly ciliate, apex acute; secondary veins 4–7 pairs, often with pilosulous domatia in abaxial axils; stipules caducous, ovate to broadly triangular, 3–4.5 mm, acute to aristate. Inflorescences terminal on lateral short shoots together with tufted leaves, 1–3-flowered; pedicels 2–5 mm, brown villous or -hirtellous. Calyx brown villous, -hirtellous, or -strigose; ovary portion ovoid to ellipsoid, 3.5–7 × 4–5.5 mm; limb slightly dilated, deeply lobed; lobes broadly elliptic to oblan-

ceolate or obovoid, 5–8 × 3–6 mm, acute to rounded. Corolla white, becoming pale yellow with age, campanulate; tube 5–6 mm, sparsely villous in throat; lobes ovate or ovate-oblong, 6–11 × (5.5–)8–9 mm, spreading, rounded to subtruncate. Anthers ca. 3 mm, fully exserted. Style 4–6 mm; stigma fusiform, with 2 coherent lobes, ca. 2 mm. Berry globose, 2–4 cm in diam., glabrous or sparsely pilose or strigose; seeds 4–5 mm. Fl. Mar–Jun, fr. May–Jan.

Thickets or forests at streamsides, on hills or mountain slopes, or in valleys or fields; near sea level to 1600 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Cambodia, India, Indonesia, Kashmir, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam; Africa, Madagascar].

W. C. Chen (in FRPS 71(1): 338–340. 1999) noted that this species is sometimes climbing, but this has not been noted by any other authors nor seen on specimens.

### 13. CEPHALANTHUS Linnaeus, Sp. Pl. 1: 95. 1753.

风箱树属 feng xiang shu shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees, unarmed; buds conical. Raphides absent. Leaves verticillate or opposite, distichous, usually with domatia; stipules persistent [or sometimes caducous], interpetiolar, triangular, at apex sometimes with a black gland. Inflorescences terminal and sometimes in axils of uppermost leaves, capitate with several globose heads, many flowered, pedunculate, bracteate; bracteoles clavate to clavate-spatulate. Flowers sessile, bisexual, monomorphic. Calyx limb 4(or 5)-lobed. Corolla white to cream, salverform to funnelform, variously pubescent inside; lobes 4, imbricate (and quincuncial) in bud. Stamens 4, inserted in corolla throat, partially exserted; filaments short; anthers dorsifixed, bifid at base. Ovary 2-celled, ovules 1 in each cell, apical and pendulous, anatropous; stigma clavate to capitate, exserted. Fruiting heads globose. Fruit schizocarpous, obconic to turbinate, dry, with calyx limb persistent; mericarps 2, indehiscent, with 1 seed, obconic, stiffly papery; seeds medium-sized, oblong-ellipsoid, with white spongy aril.

Six species: three in the Americas, two in Asia, one in Africa; one species in China.

**1. *Cephalanthus tetrandrus*** (Roxburgh) Ridsdale & Bakhuizen f., *Blumea* 23: 182. 1976 [*"tetrandra"*].

风箱树 feng xiang shu

*Nauclea tetrandra* Roxburgh, *Fl. Ind.* 2: 125. 1824; *Cephalanthus glabrifolius* Hayata; *C. naucleoides* Candolle; *C. ratoensis* Hayata.

Deciduous shrubs or small trees, 1–5 m tall; branches subangled to terete, densely pilosulous or tomentulose to usually glabrous. Leaves opposite or in whorls of 3–5, with number often irregular on a stem; petiole 5–10 mm, densely tomentulose or pilosulous to usually glabrous; blade drying stiffly papery to subleathery, ovate to ovate-lanceolate, elliptic, or elliptic-oblong, 6.5–15 × 3–6 cm, adaxially glabrous to sparsely puberulent and often rugulose, abaxially densely pilosulous to usually glabrous, base obtuse, rounded, or subcordate, apex acute to acuminate; secondary veins 8–12 pairs, often with pilosulous domatia in axils or along costa; stipules persistent or often deciduous leaving a persistent truncate basal portion, broadly ovate, 3–5 mm, adaxially enclosing a ring of persistent white trichomes 0.5–1 mm, abaxially glabrous to occasionally densely pilosulous, apex cuspidate, often with a black terminal gland. Inflorescence densely tomentulose or pilosulous to usu-

ally glabrous; peduncles 2.5–6 cm; flowering heads 1–10, 8–12 mm in diam. across calyces, 20–25 mm in diam. across corollas; bracteoles linear-clavate, ca. 2 mm, strigose. Calyx with ovary portion obconic, ca. 1 mm, glabrous, surrounded at base by ring of pilose trichomes; limb with tubular portion 1–2 mm, glabrous to sparsely puberulent; lobes spatulate-oblong, 1–2 mm, densely puberulent, obtuse to rounded, in sinuses usually with stipitate or sessile black gland. Corolla outside glabrous; tube 7–12 mm, pubescent inside; lobes spatulate-oblong, 1–2 mm, obtuse or rounded, in sinuses often with stipitate black gland. Stigma ellipsoid or clavate, ca. 0.5 mm, exserted by 4–6 mm. Fruiting head 10–20 mm in diam. Mericarps 4–6 mm, glabrous; seeds brown, 3–5 mm. Fl. Jun–Sep, fr. Jul–Sep.

Shady sites at roadsides or streamsides; sea level to 700 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Taiwan, Yunnan, Zhejiang [Bangladesh, India, Laos, Myanmar, Thailand, Vietnam].

This species was long considered conspecific with *Cephalanthus occidentalis* Linnaeus of North America; consequently, that name has been frequently but erroneously used for the Asian plants. Ridsdale (*Blumea* 23: 177–188. 1976) concluded that only one species of *Cephalanthus* is found in Asia and it is distinct from the North American species. Ridsdale (loc. cit.: 180–181) reported that this species is tolerant of wet soils and sometimes cultivated for ground stabilization.

# 14. CERISCOIDES (Benthām & J. D. Hooker) Tirvengadam, Bull. Mus. Natl. Hist. Nat., Sér. 3, Bot. 35: 13. 1978.

木瓜榄属 mu gua lan shu

Chen Tao (陈涛); Charlotte M. Taylor

*Gardenia* sect. *Ceriscoides* Benthām & J. D. Hooker, Gen. Pl. 2: 90. 1873.

Shrubs or small trees, dioecious [or polygamo-dioecious], often with short shoots, unarmed or with spines or spinescent short shoots. Raphides absent. Leaves opposite but usually crowded on short shoots and apparently fasciculate, sometimes with domatia; stipules caducous, interpetiolar, triangular. Inflorescences terminal on lateral branches or short shoots [sometimes cauliflorous], sessile to pedunculate, bracteate, staminate 2-flowered or 2- or 3-flowered and cymose, pistillate 1-flowered. Flowers sessile to pedicellate, unisexual [sometimes bisexual and monomorphic]. Calyx with ovary portion hemispherical to ellipsoid in pistillate flowers, markedly turbinate with base narrowed in staminate flowers; limb subtruncate to 5(–7)-lobed. Corolla white to pale green, tubular-campanulate or funnelform, glabrous inside; lobes 5(–7), convolute in bud. Stamens 5(–7), inserted in corolla throat, included, staminodes markedly reduced; filaments short; anthers dorsifixed. Ovary 1-celled, ovules numerous in each cell on 2–4[–6] parietal placentas; stigmas 2[–6]-lobed, included. Fruit brown, baccate, fleshy, globose to ellipsoid, smooth, with calyx limb persistent; seeds numerous, large, ellipsoid to lenticular, embedded in fleshy pulp.

About 11 species: China, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; one species (endemic) in China.

*Ceriscoides* was recently studied by Azmi (Harvard Pap. Bot. 7(2): 443–464. 2003). H. S. Lo (in FRPS 71(1): 337. 1999) described the placentas as 2–4 and the stigmas of our species as 2, but Azmi (loc. cit.: 445) described both of these as 3–6.

**1. *Ceriscoides howii*** H. S. Lo, Bull. Bot. Res., Harbin 18: 281. 1998.

木瓜榄 mu gua lan

Shrubs, 3–4 m tall; branches angled, pale red or pale yellow, often stout, armed with spines 2.5–4 mm. Petiole 2–5 mm, glabrous; leaf blade drying olive-green and abaxially paler, narrowly elliptic or oblong-lanceolate, 5–11 × 1.5–4 cm, both surfaces glabrous, base obtuse to acute or rarely subrounded, apex acuminate to slightly obtuse; secondary veins 5 or 6 pairs, with pilosulous domatia in abaxial axils; stipules triangular, ca. 2

mm. Inflorescences glabrescent; bracteoles squamiform, erose. Flowers subsessile. Calyx glabrous; limb ca. 4.5 mm, subtruncate or 5-denticulate. Corolla pale yellow, tubular-campanulate to tubular-funnelform, glabrous outside; tube at base ca. 3 mm in diam., in throat 6–7 mm in diam., glabrous inside, in staminate flower 10–11.5 mm, in pistillate flower 13–13.5 mm; lobes 5, suborbicular, 3.5–4 mm, obtuse. Style stout, 5–6 mm. Berry brown, ovoid to subglobose, 3.5–4.5 cm, glabrous, smooth; seeds dark brown, oblong or ellipsoid, 8–10 mm, rather shiny. Fl. Oct, fr. Apr of following year.

● Forests in valleys; 400–500 m. Hainan.

# 15. CHASSALIA Commerson ex Poiret in Lamarck, Encycl. Suppl. 2: 450. 1812.

弯管花属 wan guan hua shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs, subshrubs, or small trees, unarmed. Raphides present. Leaves opposite or in whorls of 3, sometimes with domatia; stipules persistent or sometimes with top portion deciduous, interpetiolar or united around stem, triangular to bifid, sometimes with basal portion becoming hardened, sometimes glandular at apex or on short appendages. Inflorescence terminal, thyriform to cymose, many flowered, sessile to pedunculate, bracteate. Flowers sessile or pedicellate, bisexual, usually distylous. Calyx limb 5-lobed [to truncate or denticulate]. Corolla white to pink or pale yellow, tubular to funnelform, with tube often curved, variously glabrous or pubescent inside; lobes 5, valvate in bud. Stamens 5, inserted in corolla tube, included or exserted; filaments short or absent; anthers dorsifixed. Ovary 2-celled, ovules 1 in each cell, basal; stigmas 2, linear, included or exserted. Infructescence frequently becoming purple with axes swollen and jointed. Fruit purple to black, drupaceous, fleshy, ellipsoid, subglobose, or ovoid, with calyx limb persistent; pyrenes 2, plano-convex, 1-celled, each with 1 seed, smooth on dorsal surface, on ventral surface with a large concave excavation; seeds medium-sized, compressed orbicular; endosperm fleshy; radicle cylindrical, basiscopic.

About 40 species: widespread in tropical Africa, Asia, and Madagascar, and the Mascarene Islands; one species in China.

**1. *Chassalia curviflora*** (Wallich) Thwaites, Enum. Pl. Zeyl. 150. 1859.

弯管花 wan guan hua

Subshrubs, erect, 1–2 m tall; branches weakly flattened to subterete, glabrous or rarely sparsely puberulent. Leaves oppo-

site; petiole 1–4 cm, glabrous; blade drying membranous to thinly papery and often yellowish green, oblong-elliptic, elliptic, oblanceolate, or narrowly lanceolate, 6–27 × 1.5–7.5 cm, glabrous, base cuneate to attenuate, apex acuminate to long acuminate; secondary veins 8–17 pairs, without domatia; stipules persistent, united shortly around stem, with interpetiolar portion

broadly ovate or broadly triangular, 1.5–4.5 mm, acute or obtuse, entire or usually shortly bifid, with 1 or 2 bristles 0.3–1 mm, often gland-tipped. Inflorescence cymose, pyramidal to rounded, several to many flowered, puberulent; peduncle 1–5 cm; branched portion 3–7 cm; axes weakly flattened; bracts lanceolate to triangular or usually multifid, 0.5–3 mm. Flowers subsessile, trimorphic: with anthers exserted and stigmas included, with anthers included and stigmas exserted, or with anthers and stigmas both exserted. Calyx with hypanthium portion ellipsoid to obovoid, 1–1.5 mm, glabrous; limb 5-lobed, 0.5–1 mm; lobes 0.3–0.5 mm, acute. Corolla white with pink, red, or orange on lobes, outside glabrous to sparsely puberulent and longitudinally ridged to winged along tube then midribs of lobes; tube shallowly to markedly curved, straight or bent at base, 10–15 mm, pubescent inside; lobes (4 or) 5, ovate-triangular, 2–2.5 mm, at apex thickened. Infructescence axes becoming swollen and red. Fruit purple, oblate to globose or weakly didymous, 5–7 × 6–9 mm. Fl. Apr–Jun, fr. Apr–Jan.

Wet places, forest understories, at low elevations; 100–2000 m. Guangdong, Guangxi, Hainan, Xizang, Yunnan [Bangladesh, Bhutan, Borneo, Cambodia, E and NE India (including Andaman Islands), Indonesia, Malaysia, Philippines, Singapore, Sri Lanka, Thailand, Vietnam].

At anthesis the corolla tube curves upward so that the base of the tube is suberect, the middle portion of the tube arcs toward the horizontal, and the mouth of the corolla opens outward to the side (Puff et al., Rubiaceae of Thailand, 101. 2005). Other authors have found this species distylous with the flowers 5-merous or infrequently 4-merous on aberrant individual flowers, as in many Rubiaceae; H. S. Lo (in FRPS 71(2): 61. 1999) described it as tristylous with often 4 corolla lobes.

- 1a. Leaves oblong-elliptic, elliptic, or oblanceolate, 6–27 × 2.5–7.5 cm, with secondary veins distinct on adaxial surface ..... 1a. var. *curviflora*

- 1b. Leaves narrowly lanceolate, 13–27 × 1.5–4.5 cm, with secondary veins distinct to indistinct on adaxial surface ..... 1b. var. *longifolia*

**1a. *Chassalia curviflora* var. *curviflora***

弯管花(原变种) wan guan hua (yuan bian zhong)

*Psychotria curviflora* Wallich in Roxburgh, Fl. Ind. 2: 167. 1824.

Leaves oblong-elliptic, elliptic, or oblanceolate, 6–27 × 2.5–7.5 cm; secondary veins distinct on adaxial surface. Fl. Apr–Jun, fr. Apr–Jan.

Wet places, forest understories; 100–2000 m. Guangdong, Guangxi, Hainan, Xizang, Yunnan [Bangladesh, Bhutan, Borneo, Cambodia, E and NE India (including Andaman Islands), Indonesia, Malaysia, Philippines, Singapore, Sri Lanka, Thailand, Vietnam].

**1b. *Chassalia curviflora* var. *longifolia*** J. D. Hooker, Fl. Brit. India 3: 177. 1880.

尖叶弯管花 jian ye wan guan hua

*Psychotria longifolia* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 133. 1850, not Hoffmannsegg ex Roemer & Schultes (1819), nor Sprengel (1824); *Chassalia longifolia* K. M. Wong.

Leaves narrowly lanceolate, 13–27 × 1.5–4.5 cm; secondary veins distinct or often indistinct on adaxial surface. Fl. May, fr. Jul.

Wet places, forest understories; 100–2000 m. Guangdong, Guangxi, Hainan, Xizang, Yunnan [Bangladesh, Bhutan, Borneo, Cambodia, E and NE India (including Andaman Islands), Indonesia, Malaysia, Philippines, Singapore, Sri Lanka, Thailand, Vietnam].

Plants that match this variety are uncommonly collected and are provisionally separated here.

## 16. CINCHONA Linnaeus, Sp. Pl. 1: 172. 1753.

金鸡纳属 jin ji na shu

Chen Tao (陈涛); Charlotte M. Taylor

*Kinkina* Adanson; *Quinquina* Boehmer.

Shrubs or usually trees, unarmed; buds flattened with stipules erect and pressed together; bark usually notably bitter. Raphides absent. Leaves opposite, decussate, usually with well-developed domatia; stipules caducous, interpetiolar or shortly united around stem, ligulate to obovate, entire. Inflorescences terminal and often also in axils of uppermost leaves, cymose to paniculiform, many flowered, pedunculate, bracteate. Flowers pedicellate, bisexual, fragrant, usually distylous. Calyx limb 5-lobed. Corolla yellow, pink, purple, red, or occasionally white, salverform or funnellform, inside glabrous or pubescent in throat, with tube often weakly 5-ridged outside; lobes 5, valvate in bud, with margins densely ciliate to villous. Stamens 5, inserted in corolla tube, included to partially exserted; filaments short to developed, glabrous; anthers dorsifixed. Ovary 2-celled, ovules many in each cell on axile placentas; stigma 2-lobed, lobes capitate to linear. Fruit capsular, ovoid to cylindrical or ellipsoid, septicidally dehiscent into 2 valves from base or sometimes from apex with valves then loculicidal through septum, stiffly papery to woody, often lenticellate, with calyx limb persistent; seeds numerous, medium-sized, ellipsoid to fusiform and somewhat flattened with membranous marginal wing and elliptic central seed portion; endosperm fleshy; cotyledons ovate.

Twenty-three species: Central America (Costa Rica, Panama) and South America (Bolivia, Colombia, Ecuador, Peru, Venezuela) and cultivated as species and hybrids in tropical regions worldwide; two species (both introduced) in China.

Several species of *Cinchona* are the natural source of quinine, which has long been used worldwide as a treatment for malaria. Quinine is found along with several other alkaloids in high concentrations in some species of *Cinchona*, particularly the bark; these alkaloids give the plants their bitter taste. *Cinchona* is native to South America, where its species are not all well differentiated, are morphologically variable, and hybridize freely especially in cultivation, where numerous artificial hybrids have been created. *Cinchona* was recently monographed by Andersson (Mem. New York Bot. Gard. 80: 1–75. 1998), followed here, who clarified the identities of the commonly cultivated species.

*Cinchona officinalis* (Linnaeus, Sp. Pl. 1: 172. 1753; 正鸡纳树 *zheng ji na shu*) is native to South America (Ecuador) and perhaps occasionally cultivated in tropical regions worldwide. No confirmed documentation of this species has been seen from China. The name has long been incorrectly used in cultivation for plants treated here as *Cinchona calisaya* (Andersson, loc. cit.: 55–57). It is included for reference in the key to species.

- 1a. Leaf blade usually relatively broad, ovate, ovate-elliptic, or elliptic-oblong, 5.5–17 cm wide, abaxially moderately to densely hirtellous at least when young and with pilosulous domatia but without crypt domatia in axils of veins ..... 2. *C. pubescens*
- 1b. Leaf blade usually of average or relatively narrow width, lanceolate, oblong-lanceolate, elliptic, obovate-lanceolate, or elliptic-oblong, 2–11 cm wide, abaxially glabrous or puberulent to hirtellous and with or without crypt domatia.
  - 2a. Leaf blade without crypt domatia ..... *C. officinalis* (see comment above)
  - 2b. Leaf blade with crypt domatia.
    - 3a. Leaves with domatia best developed in proximal part of blade; calyx lobes comprising more than 1/2 length of calyx limb; capsules stiffly papery to woody ..... 1. *C. calisaya*
    - 3b. Leaves with domatia best developed in distal part of blade; calyx lobes comprising less than or up to ca. 1/2 length of calyx limb; capsules stiffly papery ..... *C. officinalis* (see comment above)

**1. *Cinchona calisaya*** Weddell, Ann. Sci. Nat., Bot., sér. 3, 10: 6. 1848.

金鸡纳树 *jin ji na shu*

*Cinchona calisaya* var. *ledgeriana* Howard; *C. ledgeriana* (Howard) Bernelot Moens ex Trimén; *Quinquina calisaya* (Weddell) Kuntze; *Q. ledgeriana* (Howard) Kuntze.

Trees or shrubs, to 15(–25) m tall; bark grayish brown, thin, with many shallow fissures; branches flattened to sub-quadrangular, puberulent to hirtellous or glabrescent. Petiole 3–20(–30) mm, glabrous or hirtellous or puberulent; leaf blade drying papery or thinly leathery, oblong-lanceolate, elliptic-oblong, or lanceolate, 7–16(–21.5) × 2.5–6(–11) cm, both surfaces glabrous or sparsely puberulent to hirtellous abaxially, base acute to cuneate, apex obtuse to rounded or rarely acute; secondary veins 7–11 pairs, usually with crypt domatia, these best developed in proximal part of blade; stipules 10–20 mm, glabrous to puberulent or hirtellous, obtuse to rounded. Inflorescences 5–23 × 5–18 cm, densely hirtellous to puberulent; bracts triangular, 0.5–3 mm; pedicels 1–8 mm. Calyx densely sericeous; ovary portion ellipsoid, 1.5–2 mm; limb 1–2 mm, sparsely puberulent, partially lobed; lobes ovate-triangular, 0.5–1 mm. Corolla white, pale yellow, or pale pink, glabrous to puberulent outside; tube cylindrical, 5–9 mm, glabrous inside; lobes lanceolate, 3–4(–6) mm, acute. Capsules 8–30 × 3–8 mm, stiffly papery to woody, puberulent or pilosulous to glabrescent; seeds 3–10 × 1.6–3.7 mm (including wing). Fl. Jun–Feb.

Cultivated. Hainan, Taiwan, S Yunnan [native to South America (Bolivia, Peru); cultivated in tropical regions worldwide].

Plants cultivated under the trade name *Cinchona ledgeriana* were considered to belong to *C. calisaya* by Andersson (Mem. New York Bot. Gard. 80: 55–57. 1998). The description of the plants treated as *C. ledgeriana* by W. C. Chen (in FRPS 71(1): 224–225. 1999) agrees with Andersson's classification of *C. lancifolia* Mutis and also generally

matches the cultivated hybrid *C. lucumifolia* Pavon ex Lindley × *C. pubescens* (Andersson, loc. cit.: 60).

**2. *Cinchona pubescens*** Vahl, Skr. Naturhist.-Selsk. 1: 19. 1790.

鸡纳树 *ji na shu*

*Cinchona succirubra* Pavon ex Klotzsch.

Trees and shrubs, to 12 m tall; bark grayish brown, sometimes striped with white and/or longitudinally fissured; branches somewhat flattened to subterete or angled, densely pilosulous or hirtellous to puberulent or glabrescent. Petiole 1.5–4 cm, glabrous or puberulent to hirtellous; leaf blade drying papery, ovate, ovate-elliptic, or elliptic-oblong, 10–24.5 × 5.5–17 cm, adaxially glabrous to pilosulous or puberulent, abaxially hirtellous to pilosulous or puberulent and often reddened at least when young, base obtuse to rounded or truncate, apex obtuse to rounded; secondary veins 6–11 pairs, with pilosulous domatia; stipules 10–25 mm, sparsely pilosulous, obtuse to rounded. Inflorescences 6–23 × 6–23 cm, pilosulous or hirtellous to puberulent; bracts triangular, 0.5–3 mm; pedicels 1–3 mm. Calyx with ovary portion ellipsoid, 2–3 mm, densely pilosulous; limb 1.5–3 mm, sparsely to densely pilosulous or hirtellous, shallowly lobed; lobes triangular, 0.5–1 mm. Corolla white or pink, outside glabrescent to pilosulous or puberulent; tube cylindrical, 8.5–14 mm; lobes ovate-lanceolate, 4–6 mm, acute. Capsules 10–18(–41) × 5–7 mm, pilosulous to glabrescent; seeds 7–12 × 2–3 mm (including wing). Fl. and fr. Jun–Feb.

Cultivated. Guangxi (Nanning), Hainan, Taiwan, S Yunnan [native to Central America (Costa Rica) and South America (Bolivia, Colombia, Ecuador, Peru, Venezuela); often cultivated in tropical regions worldwide].

This is the most frequently cultivated species and hybrid parent of *Cinchona*. It is variable morphologically in cultivation and also in its native range.

## 17. CLARKELLA J. D. Hooker, Fl. Brit. India 3: 46. 1880.

岩上珠属 *yan shang zhu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Small herbs from tubers, apparently perennial, unarmed, usually with a cluster of prophylls at stem base. Raphides present. Leaves opposite, isophyllous or sometimes markedly anisophyllous at basalmost node, without domatia; stipules persistent, inter-

petiolar and fused to petioles, triangular, perhaps sometimes glandular on margins. Inflorescences terminal, cymose, umbelliform, or subfasciculate, few to several flowered, pedunculate or sessile and tripartite, bracteate. Flowers pedicellate, bisexual with biology unknown. Calyx limb well developed, markedly reticulate veined, 5(–7)-lobed for ca. 1/2 length. Corolla white, slenderly salverform or funnelform-salverform, glabrous inside; lobes 5, valvate in bud. Stamens 5, inserted at base of corolla tube, included; filaments short. Ovary 2-celled, ovules numerous in each cell on axile placentas inserted not far below middle of septum; disk pilosulous; stigma 2-lobed, pubescent. Fruit indehiscent, obconical, dry, with funnelform calyx limb persistent; seeds numerous, small, subellipsoid, black papillose or -granular.

One species: China, N India, N Myanmar, Thailand.

This is a poorly known species or genus that apparently prefers wet limestone substrates and is similar to *Pseudopyxis*.

**1. *Clarkella nana*** (Edgeworth) J. D. Hooker, Fl. Brit. India 3: 46. 1880.

岩上珠 *yan shang zhu*

*Ophiorrhiza nana* Edgeworth, Trans. Linn. Soc. London 20: 60. 1846; *Clarkella siamensis* Craib; *O. pellucida* H. Léveillé.

Low herbs, to 10 cm tall; tubers ellipsoid-oblong, 1–1.5 cm, scaly; stems unbranched, subterete, glabrous to densely villosulous. Leaves opposite or sometimes only 1 leaf developing at basalmost node; petiole 0.5–5 cm, glabrous to puberulent; blade drying membranous or thinly papery, ovate to broadly ovate, 1–6 × 1–4 cm, both surfaces glabrous to puberulent or villosulous, base obtuse to cordulate and sometimes oblique,

apex acute to rounded; secondary veins 4–8 pairs; stipules triangular to narrowly triangular, 0.2–0.5 mm. Inflorescence 0.8–3 cm, 3–25-flowered, villosulous to puberulent; bracts ovate to narrowly oblong, 0.5–12 mm; pedicels 1–3.5 mm. Calyx densely puberulent to villosulous; hypanthium portion 1–2 mm; lobes triangular to ovate, 1–3 mm, markedly unequal on an individual flower. Corolla outside villosulous to puberulent; tube 10–14 mm; lobes elliptic to suborbicular, ca. 3 mm, ciliate. Fruit 7–8 mm, villosulous, with calyx limb becoming 2–4.5 mm with increase in size principally in growth of basal, unlobed portion. Fl. and fr. Aug.

On wet rocks, usually limestone; ca. 1400 m. Guangdong (Lian-nan), N Guangxi (Nandan), C Guizhou, N Yunnan [N India, N Myanmar, Thailand].

## 18. *COFFEA* Linnaeus, Sp. Pl. 1: 172. 1753.

咖啡属 *ka fei shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Cafe* Adanson.

Shrubs or small trees, unarmed, often resinous on young growth; lateral branches usually spreading horizontally. Raphides absent. Leaves opposite or rarely in whorls of 3, distichous at least on lateral branches, often with foveolate and/or pilosulous domatia; stipules persistent, shortly united around stem, generally triangular, sometimes aristate. Inflorescences axillary, in each axil with 1 to several capitate to fasciculate, 1- to several-flowered cymes, these sessile to shortly pedunculate, bracteate; bracts often fused in cupulate pairs (i.e., forming a calyculus). Flowers sessile or shortly pedicellate, bisexual, monomorphic. Calyx limb obsolete or occasionally truncate or 4–6-toothed. Corolla white or pink, salverform or funnelform, inside glabrous or villous in throat; lobes 4–9, convolute in bud. Stamens 4–8, inserted in corolla throat, exserted; filaments absent or short; anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, attached at middle of septum; stigma 2-lobed, exserted. Fruit red, yellow, orange, blue, or black, drupaceous, globose to ellipsoid, fleshy or infrequently dry, with calyx limb when developed persistent; pyrenes 2, each 1-celled, with 1 seed, plano-convex, leathery or papery, on ventral (i.e., adaxial) face with longitudinal groove; seeds medium-sized to large, longitudinally grooved on ventral face; radicle terete, basiscopic.

About 103 species: native to tropical Africa, Madagascar, and the Mascarene Islands, several species and hybrids cultivated in moist tropical regions worldwide; five species (all introduced) in China.

Several species of *Coffea* are widely cultivated as a source of the drink coffee, a leading world commodity. Species limits and identifications are often difficult for wild plants, due to the complexity of the genus, its evolutionary behavior, and its numerous reduced morphological features; and the taxonomy of cultivated plants is additionally complicated by extensive, sometimes poorly documented hybridization for crop improvement during several centuries. The genus is native to Africa, Madagascar, and the Mascarenes; plants found outside this region are cultivated. Cultivated plants of *Coffea* generally persist after active cultivation is abandoned but do not generally establish growing permanent populations or spread. Cultivated *Coffea* is surveyed usefully by Purseglove (Trop. Crops: Dicot. 451–492. 1968). *Coffea arabica* is the most valuable species, producing highest quality coffee; this is a tetraploid species (Stoffelen et al., Opera Bot. Belg. 7: 237–248. 1996). *Coffea canephora* is generally the most productive species, producing a lower quality coffee; this is a diploid species (Purseglove, loc. cit.: 482–488). *Coffea liberica* also produces a lower quality coffee than *C. arabica*, is also diploid (Purseglove, loc. cit.: 488–491), and is less often cultivated. W. C. Ko (in FRPS 71(2): 22–25. 1999) additionally treated two species, *C. congensis* and *C. stenophylla*, that have been hybridized with commercial coffee (Purseglove, loc. cit.: 458) and may persist from old plantations, but these are also two names that have been widely confused in cultivation with *C. arabica* and *C. canephora* (Davis et al., Bot. J. Linn. Soc. 152: 483, 497. 2006). Some frequently used synonymous names are included here for reference.

*Coffea* is similar to *Psilanthus* J. D. Hooker, and some species have been variously treated in each genus depending on the current circum-

scriptions. Davis et al. (Monogr. Syst. Bot. Missouri Bot. Gard. 104: 398–420. 2005) addressed this problem and concluded by separating the genera; in their circumscription *Psilanthus* is not known from China. Traditional *Coffea* descriptions often retain characters of *Psilanthus*, including that of W. C. Ko (loc. cit.: 20–25). *Coffea benghalensis* B. Heyne ex Schultes and *C. jenkinsii* J. D. Hooker were included in the Fl. Xizang. (4: 445–447. 1985). Davis et al. (loc. cit. 2006: 501) treated the first of these species as *P. benghalensis* (B. Heyne ex Schultes) J.-F. Leroy; Purséglove (loc. cit.: 458) listed it as a native species of SE Asia and Sumatra sometimes cultivated for coffee in India. Davis et al. (loc. cit. 2006: 504) treated *C. jenkinsii* as a species of *Nostolachma* T. Durand; *N. jenkinsii* (J. D. Hooker) Deb & Lahiri.

The fruit of *Coffea* are sometimes described informally as “berries” because of their size and fleshy texture, but morphologically they are similar to other drupes of Rubiaceae; thus, this technical terminology is used here. The fruit of *Coffea* are also commercially sometimes called “cherries.”

- 1a. Blades of outer, unshaded leaves larger, usually 15–40 × 6–22 cm, with apex acuminate to obtuse; fruit red.
  - 2a. Leaf blade without domatia or with glabrous foveolate domatia in abaxial vein axils; fruit ovoid-globose with length generally equal to width, 10–12 × 10–12 mm ..... 2. *C. canephora*
  - 2b. Leaf blade with glabrous or pilosulous foveolate domatia in abaxial vein axils; fruit ellipsoid, longer than wide, 19–21 × 15–17 mm ..... 4. *C. liberica*
- 1b. Blades of outer, unshaded leaves smaller, mostly shorter than or up to 15 × 7 cm, with apex acute to at least shortly acuminate; mature fruit red to black or bluish black.
  - 3a. Inflorescences with cymes 1 or 2 in each axil, each cyme 2–4-flowered; mature fruit black or bluish black; leaf blade narrowly elliptic-oblong to narrowly oblanceolate, 4–10 × 1.5–2.5 cm; corolla with 6–9 lobes ..... 5. *C. stenophylla*
  - 3b. Inflorescences with cymes 1–4 per axil, each cyme 2–5-flowered; mature fruit red; leaf blade elliptic, elliptic-oblong, ovate-lanceolate, ovate, or lanceolate-elliptic, 3–8.5 cm wide; corolla with 4–6 lobes.
    - 4a. Stipules aristate at apex; leaves of unshaded outer branches with lateral veins 7–13 pairs, with glabrous foveolate domatia in abaxial vein axils; fruit smooth or usually drying with a shallow sulcus or indentation along septum ..... 1. *C. arabica*
    - 4b. Stipules obtuse to acute at apex; leaves of unshaded outer branches with lateral veins 6–9 pairs, with pilosulous domatia in abaxial vein axils; fruit drying smooth ..... 3. *C. congensis*

**1. *Coffea arabica* Linnaeus, Sp. Pl. 1: 172. 1753.**

中粒咖啡 zhong li ka fei

小粒咖啡 xiao li ka fei

*Coffea robusta* L. Linden.

Small trees or large shrubs, 5–8 m tall; branches flattened to subterete, glabrous. Petiole 8–15 mm, glabrous; leaf blade drying thinly leathery, elliptic, elliptic-oblong, or occasionally ovate-lanceolate, (2–)6–14(–22) × 3.5–5(–8.5) cm, glabrous on both surfaces, base cuneate to obtuse or rarely rounded, margins occasionally crisped-undulate, apex acuminate with tip usually 10–15 mm; secondary veins 7–10(–13) pairs, without domatia or with glabrous foveolate domatia; stipules broadly triangular, 3–8(–12) mm, aristate at least on youngest branches. Inflorescences with 1 to several cymes in each axil, each cyme subcapitate to fasciculate, (1 or)2–5-flowered, sessile to pedunculate with peduncles to 4 mm; bracts cupuliform, 1–2 mm; pedicels to 2 mm. Calyx glabrous; ovary portion ellipsoid, 1–3 mm; limb truncate to undulate or denticulate, 0.2–1 mm. Corolla white, funnelform, outside glabrous; tube 5–15 mm; lobes (4 or)5(or)6, spatulate-elliptic, 9–20 mm, obtuse. Drupe red, ellipsoid to subglobose, 11–16 × 9–14 mm, when dry smooth or sometimes weakly didymous, glabrous. Fl. Mar–Jul, fr. Oct–Jan.

Cultivated in moist, usually cool tropical regions; 200–700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [native to E Africa (Ethiopia, N Kenya, Sudan); cultivated worldwide].

This species is tetraploid and is the source of “Arabica Coffee.” It has been widely hybridized with several other *Coffea* species to produce commercial coffee plants; flower size varies markedly among many of these.

**2. *Coffea canephora* Pierre ex Froehner, Notizbl. Königl. Bot. Gart. Berlin 1: 237. 1897.**

Small trees or shrubs, 4–8 m tall; branches flattened becoming subterete, glabrous. Petiole 10–20 mm, glabrous; leaf blade drying thickly papery, elliptic, elliptic-oblong, or occasionally ovate-oblong, (12–)15–30(–40) × (4.5–)6–12(–22) cm, glabrous on both surfaces, base cuneate to obtuse, margins flat or occasionally crisped-undulate, apex acuminate with tip 10–18 mm; secondary veins (8–)10–12(–17) pairs, without domatia or with glabrous foveolate domatia; stipules triangular, 6–18 mm, obtuse to acute, aristate. Inflorescences with cymes 1–3(–7) in each axil, each cyme subcapitate to fasciculate, 3–6-flowered, subsessile to pedunculate with peduncles to 7 mm; bracts cupular, 1–3 mm; pedicels to 2 mm. Calyx glabrous; ovary portion ellipsoid, 1–2 mm; limb reduced or denticulate, 0.1–0.5 mm. Corolla white to pink, funnelform, outside glabrous; tube 5–16 mm; lobes (4 or)5–7(or)8, spatulate to narrowly elliptic, 8–19 mm, obtuse to rounded. Drupe red, subglobose, 10–12 × 10–12 mm, smooth when dry, glabrous. Fl. Apr–Jun, fr. Oct–Dec.

Cultivated in moist, often warm tropical regions. Fujian, Guangdong, Hainan, Yunnan [widespread in tropical Africa; commonly cultivated worldwide].

This species is diploid and is cultivated as “Robusta Coffee.” It has been widely hybridized with several other species to produce commercial coffee plants.

**3. *Coffea congensis* Froehner, Notizbl. Königl. Bot. Gart. Berlin 1: 235. 1897.**

刚果咖啡 gang guo ka fei

Shrubs, 2–6 m tall; branches flattened, glabrous. Petiole 5–10 mm, glabrous; leaf blade drying thinly leathery, elliptic-oblong to ovate or lanceolate-elliptic, 8–15 × 3–7 cm, glabrous on both surfaces, base cuneate or obtuse to rounded, apex acute to shortly acuminate with tip 5–10 mm; lateral veins 6–9 pairs, usually with pilosulous domatia; stipules triangular to broadly triangular, 2–5 mm, obtuse to acute but not aristate. Inflorescences with cymes 1–4 in each axil, each cyme subcapitate to fasciculate, 2–4-flowered, sessile to pedunculate with peduncles to 4 mm; bracts cupuliform, 1–3 mm; pedicels to 3 mm. Calyx glabrous; ovary portion cylindrical-ellipsoid, 1–1.5 mm; limb reduced or undulate, 0.1–0.5 mm. Corolla white, funnelform, outside glabrous; tube 7–10 mm; lobes 5 or 6, spatulate to narrowly elliptic, 7–10 mm, obtuse to rounded. Drupe red, ellipsoid to ovoid-oblong, 10–12 × 8–10 mm, smooth when dry, glabrous. Fr. Dec.

Cultivated in moist forest regions. Hainan [native to Africa (Congo River basin: Democratic Republic of Congo, Republic of Congo), growing as rheophyte; widely planted in tropical regions, though perhaps not so often in recent decades].

This species is presumably diploid and has been occasionally hybridized with other species to produce commercial coffee (Purse-glove, Trop. Crops: Dicot. 458. 1968; Bridson, Fl. Trop. E. Africa, Rub. (Pt. 2), 703. 1988).

**4. *Coffea liberica* W. Bull ex Hiern, Trans. Linn. Soc. London, Bot. 1: 171. 1876.**

大粒咖啡 da li ka fei

*Coffea dewevrei* De Wildeman & T. Durand.

Small trees or large shrubs, 6–15 m tall; branches flattened to weakly angled, often rather stout, glabrous. Petiole 8–20 mm, often rather stout, glabrous; leaf blade drying thinly leathery to stiffly papery, elliptic to obovate or obovate-elliptic, 14–38 × 5.5–12(–20.5) cm, glabrous on both surfaces, base cuneate to obtuse, margins flat, apex obtuse to shortly acuminate with tip 4–10 mm; secondary veins 7–10(–13) pairs, without domatia or with glabrous to pilosulous foveolate domatia; stipules broadly triangular, 2–4.5 mm, obtuse to acute but not aristate. Inflorescences with cymes 1–3 per axil, each cyme fasciculate to subcapitate, 2–10-flowered, subsessile; bracts cupuliform, 1–3 mm; pedicels to 1 mm. Calyx glabrous; ovary portion ellipsoid-

cylindrical, 1.5–3.5 mm; limb reduced or glandular-denticulate, to 0.2 mm. Corolla white, funnelform, outside glabrous; tube 4–13 mm; lobes 6–8, spatulate to lanceolate or narrowly elliptic, 8–16 mm, obtuse to rounded. Drupe red, ellipsoid, 19–21 × 15–17 mm, smooth when dry, glabrous. Fl. Jan–May, fr. presumably Aug–Nov.

Cultivated in moist, warm to cool regions. Fujian, Guangdong, Hainan, Yunnan [widespread in tropical Africa; widely but not intensively cultivated in tropical regions worldwide].

This species is diploid and is cultivated as “Liberica Coffee.” It has been hybridized with several other species to produce commercial coffee plants.

**5. *Coffea stenophylla* G. Don, Gen. Hist. 3: 581. 1834.**

狭叶咖啡 xia ye ka fei

Shrubs to small trees, 3–6 m tall; branches flattened to subterete, glabrous. Petiole 3–5 mm, glabrous; leaf blade drying thinly leathery, narrowly oblanceolate to narrowly elliptic-oblong, 4–10 × 1.5–2.5 cm, glabrous on both surfaces, base acute to cuneate, margins generally flat, apex acuminate with tip 10–20 mm; secondary veins 7–10 pairs, without domatia or with glabrous foveolate domatia; stipules broadly triangular, 2–3.5 mm, obtuse to acute and sometimes shortly mucronate. Inflorescences with cymes 1 or 2 per axil, each branched to subcapitate or fasciculate, 2–4-flowered, subsessile to pedunculate with peduncles to 2.5 mm; bracts cupuliform, 1–2 mm; pedicels to 6 mm. Flower buds resinous. Calyx glabrous; ovary ellipsoid, 1–1.5 mm; limb reduced, truncate. Corolla white or pale pink, funnelform, outside glabrous to puberulent; tube 6–8 mm; lobes 6–8(or 9), spatulate, 12–15 mm, obtuse. Drupe black or bluish black, subglobose to ovoid, 12–13 × 8–10 mm. Fl. Mar–Apr, fr. Dec.

Cultivated in moist, probably warm forest regions. Hainan (Chengmai) [native to W Africa; formerly occasionally cultivated in Old World tropics, apparently primarily in coffee research stations].

This species is diploid and is cultivated as “Highland Coffee of Sierra Leone.” It has been occasionally hybridized with other species to produce commercial coffee plants and reported as cultivated by older authors (Purse-glove, Trop. Crops: Dicot. 459. 1968; Bridson, Fl. Trop. E. Africa, Rub. (Pt. 2), 703. 1988, with documentation).

## 19. COPTOSAPelta Korthals, Ned. Kruidk. Arch. 2(2): 112. 1851.

流苏子属 liu su zi shu

Chen Tao (陈涛); Charlotte M. Taylor

Lianas or scandent shrubs, unarmed. Raphides absent. Leaves opposite, sometimes with domatia; stipules caducous, interpetiolar, triangular. Inflorescences axillary [to terminal], 1-flowered [or cymose and several to many flowered], pedunculate, bracteate. Flowers sessile, pedunculate, or pedicellate, bisexual, monomorphic. Calyx limb 5-lobed. Corolla pale yellow or white becoming yellowed with age, salverform, variously glabrous or pubescent inside; lobes 5, convolute to right in bud. Stamens 5, inserted in corolla throat, exserted; filaments short; anthers basifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas; stigma fusiform, exserted. Fruit capsular, subglobose, loculicidally dehiscent with valves sometimes secondarily separating along septum, woody, with calyx limb persistent; seeds several, medium-sized to large, flattened, suborbicular, bordered by a regularly erose wing; endosperm fleshy; embryo straight; cotyledons short; radicle terete, basiscopic.

Sixteen species: China, Indonesia, Japan, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; one species in China.

The 3–5-porate pollen of *Coptosapelta* was studied by Verellen et al. (J. Pl. Res. 117: 57–68. 2003), who also noted that the genus has secondary pollen presentation and accumulates aluminum in the leaves. Based on molecular and some morphological characters, *Coptosapelta* is now considered rather isolated and one of the most basal lineages in Rubiaceae (Bremer et al., Syst. Biol. 48: 413–435. 1999; Bremer & Manen, Pl. Syst. Evol. 225: 43–72. 2000), with its closest relative probably being *Acranthera* and these two genera most closely related to *Luculia* (Rydin et al., Pl. Syst. Evol. 278: 101–123. 2009).

**1. *Coptosapelta diffusa*** (Champion ex Benth) Steenis, Amer. J. Bot. 56: 806. 1969.

流苏子 liu su zi

*Thysanosperrum diffusum* Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 4: 168. 1852.

Lianas or scandent shrubs, 2–5 m or taller, often much branched; branches densely hirtellous or strigillose to strigose often becoming glabrescent with age. Petiole 2–5 mm, hirsute to strigose or rarely glabrous; leaf blade drying papery to leathery and often yellowish green, ovate or ovate-oblong to lanceolate, 2–9.5 × 0.8–3.5 cm, adaxially rather shiny and glabrous except strigose to hirsute along costa, abaxially glabrous except strigose to hirsute on principal veins, base rounded to obtuse, margins sometimes sparsely ciliate and/or thinly revolute, apex acute or acuminate; secondary veins 4 or 5 pairs; stipules lanceolate to narrowly triangular, 2–7 mm, acute. Inflorescences

with peduncles slender, 3–20 mm, glabrous or usually strigose to hirtellous; bracts 1 or 2 on upper part of peduncle, 0.5–1 mm. Calyx glabrous to strigillose; ovary portion subglobose, 1–2 mm; limb deeply lobed; lobes ovate-triangular, 0.8–1 mm. Corolla outside glabrous to strigillose or sericeous, inside hirtellous in upper part of tube and usually onto basal half of lobes; tube cylindrical to somewhat funnelform, 8–15 mm; lobes elliptic-oblong to spatulate, 4–6 mm, obtuse to rounded. Anthers 3.5–4 mm. Stigma 2.5–3 mm. Capsule brownish yellow, compressed globose or compressed ellipsoid, weakly didymous, 4–6 × 5–8 mm; seeds 1.5–2 mm in diam. Fl. May–Jul, fr. Jun–Dec.

Thickets or forests on mountains or hills; 100–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan (Ryukyu Islands)].

This is a commonly collected species in China.

## 20. **DAMNACANTHUS** C. F. Gaertner, Suppl. Carp. 18. 1805.

虎刺属 hu ci shu

Chen Tao (陈涛); Charlotte M. Taylor

*Tetraplasia* Rehder.

Shrubs, sometimes with paired infrastipular or superaxillary spines; branches sometimes with complex sympodial growth with reduced internodes and prophylls (*Damnacanthus indicus*); roots at least sometimes moniliform (i.e., nodose or “node-like constricted”). Raphides present. Leaves opposite, apparently without domatia; stipules persistent and becoming hardened or sometimes falling by fragmentation, interpetiolar or shortly united around stem, generally triangular, acute or shortly bifid to multifid. Inflorescences pseudoaxillary, superaxillary, apparently terminal, and/or paired on short shoots giving an appearance of being axillary, 1-flowered or usually cymose to fasciculate and 2–4-flowered, subsessile to apparently shortly pedunculate (i.e., borne on a leafless short shoot), bracteate with bracts usually small and glandular-fimbriate. Flowers subsessile to pedicellate and often nodding, bisexual, monomorphic or distylous. Calyx limb cupular or campanulate, 4-lobed (or 5-lobed, *D. henryi*). Corolla white to yellow or pale purple, tubular-funnelform, often leathery, inside densely pubescent in throat to throughout; tube rarely fenestrate (*D. henryi*); lobes 4 (or 5, *D. henryi*), valvate in bud. Stamens 4, inserted in upper part of corolla tube, included or exserted; filaments short; anthers dorsifixed. Ovary 4-celled (or 2-celled, *D. henryi*), ovules 1 in each cell and attached near top of septum, campylotropous; stigmas 4 (or 2, *D. henryi*), linear, included or exserted. Fruit red, drupaceous, globose to ellipsoid or oblate, fleshy, with calyx limb persistent; pyrenes 4 (or 2, *D. henryi*), each with 1 seed, plano-convex, subglobose, ellipsoid, or obtusely trigonous; seeds medium-sized, subglobose to plano-convex; endosperm corneous; embryo small; radicle hypogeous.

About 13 species: China, N India, Japan, Korea, Laos, Myanmar, Vietnam; 11 species (six endemic) in China.

The morphology of *Damnacanthus* was reviewed in detail by Robbrecht et al. (Blumea 35: 307–345. 1991), who described its complex, sympodial growth pattern and variations found in different species. They considered the stems of *Damnacanthus* to be composed of sympodial units, with varying degrees of development of the individual parts in different species. The most characteristic and apparently complicated growth is found in *D. indicus*, in which each sympodial unit comprises a basal node bearing a pair of prophylls, similar to bud scales or reduced leaves; then, a developed internode; then, a node bearing a pair of normally developed foliage leaves, decussate in orientation to the prophylls; then, a node (without an intervening internode) bearing a pair of thorns, decussate in orientation to the leaves. Growth of the stem continues from one of the axillary buds of the foliage leaves, which gives the thorns the appearance of being stipular or superaxillary in position. The alternating prophylls and foliage leaves produce the characteristic heterophyllous growth of this genus. Species of *Damnacanthus* vary in the characteristic number of nodes in each sympodial unit and in the development (or not) of the thorns. Robbrecht et al. (loc. cit.) interpreted the characteristic “spines” of the genus as reduced shoot systems produced from the axillary buds subtending two undeveloped (and thus missing) leaves. They considered the characteristic 2- or 4-flowered inflorescences of *Damnacanthus* to be formed of one or two sympodial growth units, produced from one or both axils of a node bearing foliage leaves, with each of these units comprising three congested nodes, lacking separating internodes, with the basalmost nodes bearing bractlike scales and the terminal node producing a flower in each axil then stopping growth, thus comprising a 2-flowered cymule. They also noted that, although previous authors have described the ovules of *Damnacanthus* as amphitropous or pendulous, in fact the ovules are unique in the Rubiaceae in being campylotropous.

*Damnacanthus* is represented by at least three species in Japan (Fl. Japan 3a: 224–225. 1993), several of them apparently common and hybridizing, and its taxonomy has been rather intensively studied there and in Taiwan (e.g., Koidzumi, Acta Phytotax. Geobot. 3: 155–160. 1934), where it apparently has some medicinal use. *Damnacanthus* was revised for China by H. S. Lo (Acta Phytotax. Sin. 17(3): 104–109. 1979), then treated comprehensively by Y. Z. Ruan in FRPS (71(2): 167–176. 1999) in an essentially monographic work. Koidzumi (loc. cit.) recognized three sections within *Damnacanthus* and treated *Tetraplasia* as a separate genus, based largely on root characters, but these were not mentioned again until Y. Z. Ruan (loc. cit.: 169) recognized two sections in Chinese *Damnacanthus*, one of them under an unpublished name. The Chinese plants with spines were included in *D. sect. Damnacanthus*; the unarmed plants were separated by Koidzumi in *Tetraplasia* and were included by Ruan in his second, unnamed section.

Naiki and Nagamasu (J. Pl. Res. 116: 105–113. 2003; Amer. J. Bot. 91: 664–671. 2004) surveyed the breeding biology of several Japanese and Chinese species of *Damnacanthus* and found variation in breeding system among species, discovered a correlation between ploidy with breeding system but not leaf size, and reported distyly and dimorphic pollen in this genus.

- 1a. Branches glabrous, hispidulous, hirtellous, or puberulent when young, with spines in axils of stipules or leaves, with at least shortly developed spines at apices (these may appear to be stipule bristles if not observed carefully).
- 2a. Spines 1–6 mm, persistent or deciduous when new leaves come out; leaf blade with midrib flat to impressed or thinly prominulous adaxially.
  - 3a. Leaf blade lanceolate or oblong-lanceolate, 4–15 cm, with or usually without microphylls (i.e., prophylls; reduced leaves), midrib flat to impressed adaxially; spines 1–2 mm; young branches and petioles puberulent or hispidulous; corollas 15–18 mm; stipules caducous ..... 2. *D. giganteus*
  - 3b. Leaf blade ovate, lanceolate, oblong-ovate, or oblong-lanceolate, 3–8 cm, with or without microphylls, midrib thinly prominulous adaxially; spines 2–6 mm; young branches and petioles sparsely hispidulous, puberulent, hirtellous, or glabrescent; corollas 10–15 mm; stipules persistent at least on distalmost nodes ..... 8. *D. macrophyllus*
- 2b. Spines 3–25 mm, persistent; leaf blade with midrib thinly prominulous adaxially.
  - 4a. Leaf blade lanceolate or oblong-lanceolate, 3–7.5 cm, with 5–10 pairs of secondary veins ..... 11. *D. tsaii*
  - 4b. Leaf blade cordiform, ovate, elliptic, broadly elliptic, broadly ovate, or elliptic-ovate, 0.5–4 cm, with 2–4 pairs of secondary veins.
    - 5a. Leaf blade 0.5–3 cm, with secondary veins 2–4 pairs; spines 3–20 mm, 1/2 or more as long as leaf blade ..... 6. *D. indicus*
    - 5b. Leaf blade 3–4 cm, with secondary veins 3–5 pairs; spines 3–10 mm, less than 1/2 as long as leaf blade ..... 9. *D. major*
- 1b. Branches glabrous, without spines.
  - 6a. Low to dwarf shrubs, 0.5–1 m tall; corolla 8–10.5 mm; Taiwan ..... 1. *D. angustifolius*
  - 6b. Low to tall shrubs, 0.4–5 m tall; corolla 8–16 mm; mainland and Hainan.
    - 7a. Leaf blade lanceolate-linear, apex tapered to acute or acuminate tip.
      - 8a. Leaf blade when dry straw-yellow adaxially, olive-green abaxially, and thickly leathery, with secondary veins flat and indistinct adaxially, 6–9 pairs; calyx teeth sharply triangular ..... 3. *D. guangxiensis*
      - 8b. Leaf blade when dry gray, gray-green, or brownish green adaxially, gray-green, brownish green, or straw-yellow abaxially, and papery, with secondary veins flat and indistinct to prominulous adaxially, 9–16 pairs; calyx teeth broadly triangular ..... 7. *D. labordei*
    - 7b. Leaf blade lanceolate, narrowly elliptic, linear, elliptic, elliptic-ovate, elliptic-oblong, or oblong-lanceolate, apex acute to cuspidate or long but rather abruptly acuminate.
      - 9a. Ovary 2-celled, stigmas 2; corolla lobes variably 4 or 5 ..... 5. *D. henryi*
      - 9b. Ovary 4-celled, stigmas 4; corolla lobes regularly 4.
        - 10a. Leaves isomorphic (i.e., prophylls not present), with blade elliptic-ovate, elliptic-oblong, or oblong-lanceolate; Hainan ..... 4. *D. hainanensis*
        - 10b. Leaves dimorphic (i.e., regularly with prophylls), with blade linear at lower part of stem to elliptic, elliptic-oblong, or oblong-lanceolate at upper part of stem; mainland ..... 10. *D. officinarum*

**1. *Damnacanthus angustifolius*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 113. 1908.

台湾虎刺 tai wan hu ci

*Damnacanthus angustifolius* var. *altimontanus* J. C. Liao; *D. angustifolius* f. *stenophyllus* (Koidzumi) T. Yamazaki; *D. angustifolius* var. *stenophyllus* (Koidzumi) Masamune; *D. stenophyllus* (Koidzumi) Masamune; *Tetraplasia angustifolia* (Hayata) Koidzumi; *T. stenophylla* Koidzumi.

Dwarf to low shrubs, 0.5–1 m tall. Branches glabrous,

without spines, when young subquadrate or usually with 8 alternately thick and thin longitudinal ridge lines, becoming 4-angled and yellow. Petiole of developed leaves 1.5–5 mm, glabrous; leaf blade drying stiffly papery, narrowly lanceolate, narrowly elliptic, linear-lanceolate, elliptic, or lanceolate-elliptic, 5–14 × 0.5–3 cm, glabrous throughout or sometimes sparsely puberulent to hispidulous adaxially, base acute to cuneate, margins flat and entire or irregularly serrulate, apex acute to acuminate; midrib thinly prominulous adaxially; secondary veins 5–9 pairs; stipules caducous, interpetiolar, triangular to spatulate, 0.5–1 mm, glabrous, acute to glandular-fimbriate. Inflores-

cences glabrous. Pedicels 2–5 mm. Calyx glabrous; hypanthium portion turbinate, 1.2–1.5 mm; limb ca. 1 mm, lobed for ca. 1/2; lobes triangular. Corolla white, glabrous outside; tube 6–8 mm; lobes triangular, 2–2.5 mm. Drupes oblate, ca. 4 × 6 mm. Fl. Jan–Apr, Oct, fr. Jan, Jun, Oct–Nov.

- Primary forests; 1000–2500 m. Taiwan.

*Damnacanthus angustifolius* var. *altimontanus* is recognized as distinct in the Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) but was formally synonymized in the Fl. Taiwan (ed. 2, 4: 251. 1998), which is followed here.

This species was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004). This species was reported from Guangdong by Merrill and Chun (Suntatsenia 1(1): 80. 1930) but said to be restricted to Taiwan by Y. Z. Ruan in FRPS (71(2): 173–174. 1999); the Guangdong plants were apparently included by Ruan (loc. cit.: 174–175), followed here, as *Damnacanthus labordei*.

**2. *Damnacanthus giganteus*** (Makino) Nakai, Trees Shrubs Japan, 412. 1922.

短刺虎刺 duan ci hu ci

*Damnacanthus indicus* C. F. Gaertner var. *giganteus* Makino, Bot. Mag. (Tokyo) 18: 33. 1904; *D. macrophyllus* Siebold ex Miquel f. *giganteus* (Makino) T. Yamazaki; *D. macrophyllus* var. *giganteus* (Makino) Koidzumi; *D. subspinatus* Handel-Mazzetti.

Shrubs or rarely small trees, 0.5–2(–7.5) m tall. Roots moniliform. Branches usually 4-angulate or terete to flattened, dark green and sparsely hispidulous or puberulent to glabrous when young, becoming grayish yellow and glabrous, with few spines 1–2 mm and deciduous or sometimes persistent. Petiole of developed leaves 2–5 mm, sparsely puberulent to glabrous; leaf blade drying leathery, lanceolate or oblong-lanceolate, 4–14(–15) × 2–3(–5) cm, adaxially glabrous, abaxially glabrous or rarely densely puberulent along veins, base obtuse to rounded, margins flat to usually revolute and/or sometimes crisped, apex acuminate or acute; midrib flat to impressed adaxially; secondary veins 5–7 pairs; stipules caducous, interpetiolar, 1–2 mm, puberulent to glabrous, acute to bifid, thickened. Inflorescences strigillose to glabrescent. Pedicels 1–2 mm. Calyx strigillose to puberulent; hypanthium portion turbinate, 1.2–1.5 mm; limb 1–1.5 mm, lobed for 1/4–1/2; teeth broadly triangular. Corolla white, glabrous outside; tube 13–16 mm; lobes ovate-triangular, ca. 2 mm. Drupes ca. 4 × 5–8 mm, with pedicels sometimes elongated to 3 mm. Fl. Mar–May, fr. Oct–Jan.

Sparse or dense forests or thickets; 500–1100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Yunnan, Zhejiang [Japan].

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported the breeding biology of this species as monomorphic with “pin” type flowers (i.e., with stigmas exerted and anthers included).

**3. *Damnacanthus guangxiensis*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 320. 1999.

广西虎刺 guang xi hu ci

Shrubs, height not noted. Branches terete, glabrous, with-

out spines. Petiole ca. 6 mm, glabrous; leaf blade drying thickly leathery, straw-yellow adaxially, olive-green abaxially, lanceolate-linear, 13–22 × 1–2 cm, adaxially glabrous, abaxially sparsely pilosulous, base cuneate, margins entire and flat, apex acute then shortly tapered-acuminate; midrib prominent adaxially; secondary veins 6–9 pairs; stipules caducous or deciduous through fragmentation, interpetiolar, triangular, acute to glandular-fimbriate. Pedicels ca. 2 mm. Calyx glabrous; hypanthium portion cupuliform, ca. 1 mm; limb ca. 1 mm, lobed for ca. 1/2; teeth 4 or 5, narrowly triangular, acuminate. Corolla white, outside glabrous; tube ca. 8 mm, pubescent inside; lobes ovate to triangular, ca. 4 mm. Fruit unknown. Fl. winter–spring.

- Forests on mountains; ca. 1200 m. Guangxi (Lingyun).

**4. *Damnacanthus hainanensis*** (H. S. Lo) H. S. Lo ex Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 176. 1999.

海南虎刺 hai nan hu ci

*Damnacanthus henryi* (H. Léveillé) H. S. Lo subsp. *hainanensis* H. S. Lo, Acta Phytotax. Sin. 17(3): 108. 1979.

Shrubs, 1–4 m tall. Branches brown, angulate or ridged, glabrous, without spines. Petiole of developed leaves 2–8 mm, glabrous; leaf blade drying black, elliptic-ovate, oblong, or oblong-lanceolate, 6–11 × 2–4.5 cm, glabrous, base rounded or cuneate, margins thinly revolute, apex cuspidate; midrib prominulous adaxially; secondary veins 5–7 pairs; stipules caducous, interpetiolar, triangular. Pedicels ca. 2 mm. Calyx limb subtruncate or lobed; teeth triangular. Corolla white, outside glabrous; tube ca. 14 mm; lobes 4, ovate-lanceolate. Drupes ca. 8 mm in diam., glabrous. Fl. May, fr. Nov.

- Forests, forest margins; 800–1800 m. Hainan.

**5. *Damnacanthus henryi*** (H. Léveillé) H. S. Lo, Acta Phytotax. Sin. 17(3): 108. 1979.

云桂虎刺 yun gui hu ci

*Canthium henryi* H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 178. 1914; *Prismatomeris brevipes* Hutchinson; *P. henryi* (H. Léveillé) Rehder.

Shrubs or small trees, 1.5–5 m tall. Branches 4-angled to flattened, pale brown, smooth, glabrous. Petiole of developed leaves 2–5 mm, glabrous; leaf blade drying papery or leathery, lanceolate, narrowly elliptic, elliptic, or elliptic-oblong, 5–13 × 1–4 cm, glabrous, base acute or cuneate and often decurrent, margins entire and flat to usually thinly revolute, apex acute to long acuminate; midrib thinly prominulous adaxially; secondary veins 5–7 pairs; stipules caducous, interpetiolar, triangular to narrowly triangular, 1–1.5 mm, glabrous, acute. Inflorescences glabrous. Pedicels 2–3.5 mm. Calyx glabrous; hypanthium portion turbinate, 1–1.5 mm; limb ca. 0.8 mm, lobed for 2/3–3/4; lobes 4 or 5, narrowly triangular, sometimes separated by subtruncate sinuses. Corolla white or pale purple, glabrous outside; tube 9–12 mm, fenestrate at base; lobes 4 or 5, ovate-lanceolate, 3–4 mm. Drupes 5–8 mm in diam.; pyrenes 2, subglobose. Fl. Oct, fr. Dec–Feb.

- Dense forests on mountains; 1200–2500 m. Guangxi, Guizhou, Yunnan.

This species is here provisionally included in *Damnacanthus* based on its inflorescence morphology. It was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004).

**6. *Damnacanthus indicus*** C. F. Gaertner, Suppl. Carp. 18. 1805.

虎刺 hu ci

*Damnacanthus esquirolii* H. Léveillé; *D. formosanus* (Nakai) Koidzumi; *D. indicus* var. *formosanus* Nakai; *D. indicus* var. *lancifolius* Makino; *D. lancifolius* (Makino) Koidzumi.

Shrubs, 0.3–1.5 m tall. Roots fleshy, moniliform. Branches densely hispidulous to hirtellous, sometimes becoming glabrescent, terete or sometimes 4-angled, with numerous persistent spines 3–20 mm. Petiole of developed leaves 0.5–3 mm, strigillose, hispidulous, or glabrescent; leaf blade drying stiffly papery to leathery and discoloured, ovate, cordiform, elliptic-ovate, elliptic, or broadly elliptic, 0.5–2(–3) × 0.5–1(–1.5) cm, adaxially glabrous, abaxially glabrous or sparsely hirtellous to strigillose along veins, base obtuse to rounded, truncate, or cordulate, sometimes oblique, margins entire and flat, apex acute; midrib thinly prominent adaxially; secondary veins 2 or 3 (or 4) pairs; stipules quickly fragmenting or caducous, interpetiolar, narrowly to broadly triangular, 0.3–1 mm, strigillose to glabrescent, acute to glandular-fimbriate. Inflorescences strigillose to hispidulous. Pedicels 0.5–8 mm. Calyx strigillose to glabrous; hypanthium portion turbinate, 1–1.5 mm; limb 0.8–2 mm, lobed for 1/4–4/5; lobes broadly triangular to narrowly triangular. Corolla white, glabrous outside; tube 7–9 mm; lobes elliptic to lanceolate-elliptic, 2.5–5 mm. Drupes 4–6 mm in diam. Fl. Mar–Jun, fr. Mar–Jan.

Sparse or dense forests on hills or mountains, rocky thickets; 100–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [N and NE India, Japan, Korea].

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported that populations they studied are either monomorphic, with only pin-type flowers, or distylous. Koidzumi (Acta Phytotax. Geobot. 3: 158. 1934) reported *Damnacanthus lancifolius* from Yunnan and treated *D. esquirolii* as a synonym of that name; these names were apparently overlooked by Y. Z. Ruan (in FRPS 71(2): 169. 1999).

**7. *Damnacanthus labordei*** (H. Léveillé) H. S. Lo, Acta Phytotax. Sin. 17(3): 107. 1979.

柳叶虎刺 liu ye hu ci

*Canthium labordei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 178. 1914; *Lasianthus labordei* (H. Léveillé) Rehder; *Prismatomeris labordei* (H. Léveillé) Merrill ex Rehder; *P. linearis* Hutchinson.

Small shrubs, 0.4–2 m tall. Roots fleshy, moniliform. Branches 4-angled to flattened and usually with a well-developed longitudinal ridge descending from stipule midrib on each side, yellow to pale brown, glabrous, without spines. Petiole of developed leaves 2–6 mm, glabrous; leaf blade drying papery, gray to brownish green adaxially, gray-green, brownish green, or straw-yellow abaxially, lanceolate to lanceolate-linear, 5–21 × 0.6–2.5 cm, glabrous or sometimes pubescent along veins adaxially, base cuneate or acute, margins entire or irregularly

serrulate and flat to thinly revolute, apex tapered and acuminate with tip often flexuous; midrib thinly prominent adaxially; secondary veins 9–16 pairs; stipules caducous, interpetiolar, triangular, 0.5–1 mm, acute to glandular-fimbriate. Inflorescences glabrous. Pedicels 2–3 mm. Calyx glabrous; hypanthium portion turbinate, ca. 1 mm; limb 0.5–1 mm, lobed for 1/4–1/2; lobes broadly triangular. Corolla white to yellow, outside glabrous; tube 5–9 mm; lobes ovate, ca. 3 mm. Drupes ca. 8 mm in diam. Fl. Feb–Mar, Oct–Dec, fr. Sep–Dec.

Sparse or dense forests or thickets; 800–1800 m. N Guangdong, N Guangxi, Guizhou, Hunan, Sichuan, Yunnan [Vietnam].

This species was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004).

**8. *Damnacanthus macrophyllus*** Siebold ex Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 110. 1867 [*“macrophylla”*].

浙皖虎刺 zhe wan hu ci

*Damnacanthus indicus* C. F. Gaertner f. *macrophyllus* (Siebold ex Miquel) Makino; *D. indicus* var. *macrophyllus* (Siebold ex Miquel) Makino; *D. indicus* var. *parvispinus* Koidzumi; *D. major* Siebold & Zuccarini var. *macrophyllus* (Siebold ex Miquel) Maximowicz; *D. major* var. *parvispinus* (Koidzumi) Koidzumi; *D. major* var. *submitis* Maximowicz ex Regel; *D. moniliformis* Koidzumi; *D. minutispinus* Koidzumi; *D. shanii* K. Yao & M. B. Deng.

Shrubs, 1–2 m tall. Roots fleshy, moniliform. Branches puberulent to hispidulous, with 8 alternately thick and thin striae, with few deciduous or persistent spines 2–6 mm. Petiole of developed leaves 1–2 mm, glabrous or sparsely puberulent to puberulent or hirtellous; leaf blade drying stiffly papery, ovate to oblong-ovate, lanceolate, or oblong-lanceolate, 3–6(–8) × 1–2.5(–3) cm, adaxially glabrous, abaxially glabrous or puberulent along veins, base cuneate to rounded, margins flat to thinly revolute, apex shortly acuminate or acute; midrib thinly prominent adaxially; secondary veins 3 or 4(–7) pairs; stipules persistent, interpetiolar, triangular, 0.3–1 mm, puberulent to glabrescent, acute to glandular-multifid or -fimbriate. Inflorescences strigillose to puberulent. Pedicels 1–2 mm. Calyx strigillose to glabrescent; hypanthium portion obconic, 1.2–1.5 mm; limb 1–1.5 mm, lobed for 1/3–1/2; lobes triangular to ovate. Corolla white, outside glabrous; tube 8(–13) mm; lobes ovate-triangular, ca. 2 mm. Drupes ca. 5 mm in diam., with pedicels sometimes elongated to 5 mm. Fl. Apr–Jun, fr. Oct–Dec.

Streamsides in sparse or dense forests on mountains; 800–1000 m. Anhui, Fujian, Guangdong, Guizhou, Yunnan, Zhejiang [Japan].

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported the breeding biology of this species as monomorphic with “pin” type flowers.

*“Damnacanthus subspinosus var. salicifolius”* (M. B. Deng & K. Yao, Bull. Bot. Res., Harbin 10(4): 2. 1990) belongs here but was not validly published because two gatherings were designated as types (Vienna Code, Art. 37.2).

**9. *Damnacanthus major*** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 177. 1846.

大卵叶虎刺 da luan ye hu ci

*Damnacanthus indicus* C. F. Gaertner f. *major* (Siebold & Zuccarini) Makino; *D. indicus* subsp. *major* (Siebold & Zuccarini) T. Yamazaki; *D. indicus* var. *major* (Siebold & Zuccarini) Makino ex Nakai.

Shrubs, 1–2 m tall. Roots fleshy, white or pale purple, moniliform. Branches densely hispidulous to hirtellous when young, sometimes becoming glabrescent, terete or sometimes 4-angled, with numerous spines 3–10 mm, persistent. Petiole of developed leaves 1–4 mm, strigillose to hirtellous; leaf blade drying papery, broadly ovate, ovate, or elliptic-ovate, 3–4 × 1.5–2 cm, adaxially glabrous, abaxially glabrous or sometimes sparsely hispidulous along veins, base obtuse or rounded, margins flat and entire, apex acute; midrib thinly prominent adaxially; secondary veins 3–5 pairs; stipules quickly fragmenting or caducous, interpetiolar, broadly triangular, 0.5–1 mm, strigillose to glabrescent, obtuse to acute. Inflorescences strigillose. Pedicels ca. 1 mm. Calyx strigillose or puberulent; hypanthium portion obconic, 1–2 mm; limb ca. 2 mm, deeply lobed; lobes narrowly to broadly triangular. Corolla white, outside glabrous; tube ca. 11 mm; lobes ovate-triangular, ca. 4 mm. Drupes 5–10 mm in diam. Fl. Apr; fr. winter.

Sparse forests and thickets on mountains; 600–700 m. Guangdong, Zhejiang [Japan, Korea].

These plants were treated as a subspecies of *Damnacanthus indicus* in the Fl. Japan (3a: 224–225. 1993) and also considered there to be restricted to Japan and Korea.

**10. *Damnacanthus officinarum*** C. C. Huang in H. S. Lo, Acta Phytotax. Sin. 17(3): 108. 1979.

四川虎刺 xi chuan hu ci

Shrubs, 1–2.5 m tall. Roots fleshy, moniliform. Branches slightly flattened when young becoming terete, glabrous, without spines. Petiole of developed leaves ca. 5 mm, glabrous; leaf blade drying leathery, brown or straw-yellow adaxially, straw-yellow or olive-green abaxially, elliptic, elliptic-oblong, or oblong-lanceolate on upper part of stem, to linear on lower part of

stem, 5–13(–16) × 2–4(–6) cm, glabrous, base cuneate to acute, margins entire and flat to thinly revolute, apex acute to acuminate; midrib thinly prominent adaxially; secondary veins 6–8 pairs; stipules caducous, interpetiolar, triangular, ca. 1 mm, glabrous, acute. Inflorescences glabrous. Pedicels ca. 2 mm. Calyx glabrous; hypanthium portion cupuliform, ca. 1.5 mm; limb 0.5–1 mm, undulate to lobed for ca. 1/2; lobes broadly triangular. Corolla in bud pale green, glabrous outside, 10–12 mm. Drupes 6–7 mm in diam. Fl. winter–spring, fr. Oct–Dec.

• Thickets or forests on hills; 700–900 m. Hubei, Hunan, Sichuan.

This species was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004).

**11. *Damnacanthus tsaii*** Hu, Bull. Fan Mem. Inst. Biol. 6: 178. 1935.

西南虎刺 xi nan hu ci

Shrubs, 1–3 m tall. Branches densely hirtellous, with spines 4–25 mm, persistent. Petiole of developed leaves 1–2 mm, glabrous or pilosulous; leaf blade drying papery, lanceolate or oblong-lanceolate, 3–7.5 × 0.9–2.4 cm, adaxially glabrous, abaxially glabrous or hirtellous along veins when young, base cuneate or rounded, margins entire to irregularly serrulate and thinly revolute, apex acuminate; midrib thinly prominent adaxially; secondary veins 5–8(–10) pairs; stipules quickly deciduous, interpetiolar, broadly triangular, usually aciculate. Pedicels ca. 2 mm. Calyx glabrous; hypanthium portion obconic, ca. 1 mm, lobed for ca. 1/2; lobes 4(or 5), triangular to subulate-triangular. Corolla white, ca. 12 mm, outside glabrous; lobes ovate-triangular. Drupes ca. 5 mm in diam. Fl. Apr, fr. winter–spring.

• Forests, forest margins, roadsides, rocky mountains; 1000–2500 m. Sichuan, Yunnan.

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported that all flowers of this species seen resemble the long-styled form of distylous species.

## 21. DENTELLA J. R. Forster & G. Forster, Char. Gen. Pl. 13. 1775.

小牙草属 xiao ya cao shu

Chen Tao (陈涛); Charlotte M. Taylor

Herbs, annual or perennial, prostrate, unarmed. Raphides present. Leaves opposite, usually relatively small, without domatia; stipules persistent, interpetiolar and frequently fused to petioles, triangular, entire to erose, often scarious. Inflorescences terminal or displaced to pseudoaxillary, 1-flowered, ebracteate, subsessile or pedunculate. Flowers bisexual, remarkably reduced. Calyx with ovary portion sometimes papillose-villous with distinctive flattened trichomes; limb tubular, 5-lobed or -toothed. Corolla white to pink, funnellform, inside frequently pubescent in throat; lobes 5, valvate in bud. Stamens 5, inserted at middle or perhaps base of corolla tube, included; filaments short; anthers basifixed or perhaps dorsifixed, included. Ovary 2-celled, ovules numerous in each cell inserted on axile subglobose placentas; stigmas 2, filiform, included. Fruit indehiscent, subglobose to ellipsoid, dry, papery, sometimes papillose-villous with distinctive flattened trichomes, with calyx limb persistent; seeds numerous, small, angled; testa granulate; endosperm fleshy; embryo minute.

About ten species: S Asia to Oceania, with one species apparently adventive in North America; one species in China.

The seeds and capsules of this species were described in detail by Terrell and Robinson (J. Bot. Res. Inst. Texas 1(1): 373–384. 2007).

**1. *Dentella repens*** (Linnaeus) J. R. Forster & G. Forster, Char. Gen. Pl. 13. 1775.

小牙草 xiao ya cao

*Oldenlandia repens* Linnaeus, Syst. Nat., ed. 12, 2: 126; Mant. Pl. 1: 40. 1767; *Dentella matsudae* Hayata; *D. repens* var. *grandis* Pierre ex Pitard.

Dwarf herbs, creeping, much branched, rather fleshy; branches flattened to angled, glabrous or puberulent, often rooting at nodes. Leaves subsessile to shortly petiolate; petiole to 1[–4] mm; blade drying stiffly papery, oblong-lanceolate, oblanceolate, or spatulate, 4–7[–10] × 1–2[–4] mm, glabrous or sparsely hirtellous at least along margins and principal veins, base cuneate to acute, margins flat, apex obtuse to acute; secondary veins not visible; stipules triangular, ca. 1 mm, entire to erose. Flowers solitary at forks of branchlets or rarely along stems, subsessile or with pedicel to 1[–2] mm. Calyx with ovary portion subglobose, ca. 1 × 1–1.5 mm, densely papillose-villous with flattened trichomes; limb 1–1.2 mm, deeply lobed; lobes narrowly triangular. Corolla white or pale yellow, 3–8[–12] mm, glabrous outside, sparsely villous inside throat; lobes triangular-ovate, 1–2 mm, acute. Fruit compressed globose, 3–5 × 3–5 mm, densely villous with multicellular, transparent, flat-

tened, bulbous-tipped trichomes; seeds 0.3–0.5 mm. Fl. winter, fr. summer.

Wet sites in fields; sea level or higher. Guangdong, Hainan, Taiwan, Yunnan (Xishuangbanna) [India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Oceania; adventive in North America (E United States, Mexico)].

The Fl. Taiwan (ed. 2, 4: 252, 1998) described markedly larger leaves, petioles, pedicels, and corollas than seen on specimens studied for this work or found in other descriptions; these measurements are included above provisionally in brackets. Two varieties were recognized by Xing and Wu (Fl. Nansha Islands, 200–201, 1996): *Dentella repens* var. *repens*, with flowers ca. 3 mm, and *D. repens* var. *grandis*, with flowers 6–8 mm; their description of the second variety corresponds to the larger flower measurements given in Fl. Taiwan. These varieties were subsequently synonymized by H. S. Lo (in FRPS 71(1): 21, 1999) and are provisionally synonymized here.

## 22. DIODIA Linnaeus, Sp. Pl. 1: 104. 1753.

双角草属 *shuang jiao cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

Herbs [or sometimes small shrubs], annual or perennial, unarmed. Raphides present. Leaves opposite or sometimes apparently verticillate due to clustered leaves on unexpanded axillary stems, sessile to shortly petiolate, without domatia; stipules persistent, interpetiolar and fused to petioles, sheath truncate to rounded and often membranous, setose. Inflorescences axillary and sometimes also terminal, glomerulate or capitate, few to several flowered, sessile, bracteate or bracts reduced. Flowers sessile, bisexual, monomorphic. Calyx limb deeply 2- or 4-lobed; lobes sometimes unequal in pairs. Corolla white, pink, or pale purple, funnelform or salverform, inside variously glabrous or pubescent; lobes 4, valvate in bud. Stamens 4, inserted in corolla throat, exserted; filaments developed; anthers dorsifixed. Ovary 2-celled, ovules 1 in each cell, axile and attached at middle of septum; stigmas 2, capitate to linear, exserted. Fruit schizocarpous or indehiscent, ellipsoid to obovoid, papery to cartilaginous, bony, or corky, with calyx limb persistent; mericarps (i.e., cocci) 2, indehiscent, with 1 seed, ellipsoid to plano-convex; seeds ellipsoid-oblong, medium-sized, often sulcate to convex on adaxial (i.e., ventral) surface; endosperm corneous; embryo straight; cotyledons broad; radicle hypogynous.

About 50 species: warm temperate and tropical America and Africa, with several American species naturalized in the Old World tropics; two species (both introduced) in China.

Measurements and characters in brackets below are found in plants of other regions and are included here to aid future identifications of these species, which may be introduced more than once in China and have more variation here than currently documented.

- 1a. Plants erect; fruit papery to bony, 3–3.5 mm, usually separating and dispersing as 2 indehiscent mericarps ..... 1. *D. teres*  
1b. Plants prostrate to weakly ascending; fruit corky, 6–9 mm, usually not separating into mericarps ..... 2. *D. virginiana*

### 1. *Diodia teres* Walter, Fl. Carol. 87. 1788.

山东丰花草 *shan dong feng hua cao*

*Borreria shandongensis* F. Z. Li & X. D. Chen; *Diodella teres* (Walter) Small; *Spermocoe shandongensis* (F. Z. Li & X. D. Chen) Govaerts.

Herbs, annual, erect, to 30[–50] cm tall; stems somewhat flattened to slightly [or sharply] 4-angled, pilosulous [and/or pilose to glabrescent]. Leaves sessile; blade drying papery, linear-lanceolate, [8–]20–40 × [1–]3–5[–7] mm, both surfaces hispidulous, base obtuse [to rounded or subcordate], margin weakly [to strongly] revolute, apex acute to acuminate; secondary veins indistinct; stipule sheaths truncate, 1–2.5 mm, pilosulous to glabrescent, with 5–9 setae 1–7 mm. Flowers 1[–3] per axil or 1[–6] per node; bracts reduced. Calyx pilosulous to glabrescent; ovary portion obovoid, 0.5–0.8 mm; limb deeply lobed; lobes lanceolate, ca. 1 mm, pilosulous to glabrescent. Corolla pink [to pale purple or blue], funnelform, hispidulous to

glabrescent outside; tube [1.5–]4[–7] mm, glabrescent inside; lobes elliptic-oblong, 0.5–2 mm. Fruit obovoid, [1.5–]3–3.5 mm, papery to bony, hispid to hispidulous, separating into 2 mericarps each with a Y-shaped sulcus on adaxial surface; seeds ca. 2.5 mm, yellowish brown when dry, longitudinally 1-grooved. Fl. and fr. Aug–Sep.

Disturbed, often degraded open ground. S Fujian (Jinmen), Shandong (Qingdao) [native to Antilles and North and South America; adventive in N Africa, Japan, Korea, and Madagascar].

*Diodia teres* has not been widely reported previously from Asia, but it is known from Japan (Honshu, 18 Oct 1995, S. Tsagaru & G. Murata 22898, MO!) at a similar latitude to its occurrence in China and probably should be expected elsewhere.

### 2. *Diodia virginiana* Linnaeus, Sp. Pl. 1: 104. 1753.

双角草 *shuang jiao cao*

Herbs, perennial, prostrate to weakly ascending, to 60 cm tall; stems 4-angled, retrorse pilose or -pilosulous along angles.

Leaves petiolate; petiole ca. 3 mm; blade drying papery, elliptic-lanceolate to oblanceolate, 20–32 × 4–8 mm, both surfaces glabrescent, base cuneate and sometimes oblique, apex acute; secondary veins 4 or 5 pairs; stipule sheaths truncate to rounded, 2–3 mm, glabrous, with 3–5 setae 1–4 mm. Flowers 1 or sometimes 2 or 3 per axil, 2 or sometimes 4–6 per node; bracts reduced. Calyx villous to pilose; ovary portion obconic, ca. 1 mm; lobes narrowly triangular-lanceolate, [2–]5–7[–10] mm, often unequal on an individual flower. Corolla white, glabrous inside and outside; tube 5.5–6 mm; lobes triangular, 4–5[–6] mm, sometimes pubescent adaxially. Fruit corky, ellipsoid, 6–9 × 4–6 mm, distinctly 8-ridged, pilose or villous to glabrescent, usually not separating into mericarps; seeds 5–6 × 2–3 mm, reticulate. Fl. and fr. Aug–Sep.

Bamboo forest sides. Naturalized in Taiwan [native to C and E

North America; perhaps naturalized in Mexico and Central America; adventive in Japan].

This species is rather widely but infrequently and locally naturalized in tropical and subtropical areas, especially near seaports (Taylor, Monogr. Syst. Bot. Missouri Bot. Gard. 85(3): 2206–2284. 2001), and probably should be expected elsewhere in Asia. The plants are usually found in microsites with moving water, and apparently the fruit are frequently water-dispersed.

Hsieh and Chaw (Bot. Bull. Acad. Sin. 28: 44–45. 1987) gave the number of calyx lobes as 2; this is the first report of this condition for *Diodia virginiana*, and their illustration of the flowers suggest that there may at least sometimes be 4 lobes. They also gave some unusual measurements for the corolla of their plant, with the tube said to be 15 mm and the limb to 18 mm wide; both of these are exceptionally large measurements that are unknown in other plants of this species.

## 23. DIPLOSPORA Candolle, Prodr. 4: 477. 1830.

狗骨柴属 *gou gu chai shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, sometimes polygamo-dioecious, unarmed; branches sometimes superaxillary. Raphides absent. Leaves opposite, sometimes with domatia; stipules persistent or deciduous, shortly united around stem, triangular. Inflorescences axillary or sometimes supra-axillary, cymose to fasciculate or glomerulate, few to many flowered, sessile to pedunculate, bracteate. Flowers subsessile to pedicellate, bisexual and monomorphic or unisexual. Calyx limb truncate to 4(or 5)-lobed or -denticulate. Corolla white, pale green, or pale yellow, salverform, inside pubescent in throat and sometimes on lower part of lobes; lobes 4(or 5), convolute in bud. Stamens 4(or 5), inserted in corolla throat, exserted; filaments short; anthers dorsifixed. Ovary 2-celled, ovules 1–3(–6) in each cell on axile placentas; stigma 2-lobed, shortly exserted. Fruiting pedicels often elongating notably. Fruit yellow, orange, or red, baccate, subglobose or ellipsoidal-globose, fleshy or leathery, with calyx limb usually persistent; seeds several, medium-sized, angled, subglobose, or somewhat flattened, embedded in pulp derived from placenta; hilum linear or comma-shaped; radicle hypogynous.

About 20 species: tropical and subtropical Asia; three species (one endemic) in China.

This genus was reviewed by Robbrecht and Puff (Bot. Jahrb. Syst. 108: 114–119. 1986), then in more detail by Ali and Robbrecht (Blumea 35: 279–305. 1991). The description of the sexuality of the plants and flowers here follows Ali and Robbrecht (loc. cit.) and Puff et al. (Rubiaceae of Thailand, 84. 2005).

- 1a. Leaves drying leathery or thickly papery, glabrous and rather shiny on both surfaces, abaxially with secondary veins plane or thinly prominulous, higher order venation hardly or not visible, without domatia; petioles glabrous ..... 1. *D. dubia*
- 1b. Leaves drying papery or thinly leathery, glabrescent, strigillose, puberulent, tomentulose, or hirtellous abaxially or on both surfaces, abaxially with secondary veins prominent, higher order venation well marked and usually thinly raised, usually with domatia; petioles glabrescent, strigillose, or tomentulose.
  - 2a. Leaves abaxially pubescent along principal veins but glabrescent or very sparsely pubescent on blade; stipules usually deciduous after distalmost 1 or 2 nodes ..... 2. *D. fruticosa*
  - 2b. Leaves densely tomentulose abaxially; stipules usually persistent ..... 3. *D. mollissima*

**1. *Diplospora dubia*** (Lindley) Masamune, Trans. Nat. Hist. Soc. Formosa 29: 269. 1939.

狗骨柴 *gou gu chai*

*Canthium dubium* Lindley, Bot. Reg. 12: t. 1026. 1826; *Diplospora buisanensis* Hayata; *D. tanakae* Hayata; *D. viridiflora* Candolle; *Tricalysia dubia* (Lindley) Ohwi; *T. lutea* Handel-Mazzetti; *T. viridiflora* (Candolle) Masamune; *T. viridiflora* var. *buisanensis* (Hayata) Yamamoto; *T. viridiflora* var. *tanakae* (Hayata) Yamamoto.

Shrubs or trees, 1–12 m; branches terete to somewhat flattened, glabrous. Petiole 4–15 mm, glabrous; leaf blade drying

leathery or rarely thickly papery, and yellowish green to brown, ovate-oblong, elliptic-oblong, elliptic, or lanceolate, 4–19.5 × 1.5–8 cm, both surfaces glabrous and rather shiny, base acute, cuneate, or obtuse, sometimes slightly oblique, margins often thinly revolute, apex acute to acuminate with tip often ultimately obtuse; secondary veins 5–11 pairs, without domatia; stipules persistent on distalmost 1 or 2(–4) nodes, ovate to triangular, 5–8 mm, glabrous, densely white sericeous inside, acute, keeled in upper part with keel often extending into an arista 1–4 mm. Inflorescences subcapitate to congested-fasciculate, 6–10 mm, puberulent to strigillose, tomentulose, or puberulent, sessile or subsessile; bracts triangular, ca. 1 mm, frequently fused in pairs, acute; pedicels 1–4 mm. Calyx strigillose

to glabrescent; ovary portion obconic to obovoid, 0.5–1 mm; limb ca. 1 mm, 4-denticulate, sometimes also irregularly splitting. Corolla white or yellow, glabrous outside or sometimes strigose on tube; tube 2–3 mm; lobes elliptic-oblong to narrowly elliptic, 3–4 mm, obtuse. Fruiting pedicels to 8 mm. Berry red, subglobose, 4–9 mm in diam., sparsely strigillose to glabrous; seeds dark red, subovoid, 3–6 × 3–4 mm. Fl. Apr–Aug, fr. May–Feb of following year.

Thickets or forests on hillsides, ravines, fields; near sea level to 1500 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Vietnam].

This is one of the most commonly collected Rubiaceae species in China.

**2. *Diplospora fruticosa*** Hemsley, J. Linn. Soc., Bot. 23: 383. 1888.

毛狗骨柴 mao gou gu chai

*Discospermum fruticosum* (Hemsley) Kuntze; *Tricalysia fruticosa* (Hemsley) K. Schumann ex E. Pritzel.

Shrubs or trees, 1–8(–15) m tall; branches compressed to terete, densely puberulent to pilosulous or strigillose sometimes becoming glabrescent. Petiole 3–13 mm, strigillose or pilosulous to glabrescent; leaf blade drying papery or thinly leathery, elliptic-oblong, oblong-lanceolate, obovate, oblanceolate, or narrowly elliptic, 5.5–22 × 2.5–8 cm, adaxially glabrous or along principal veins sometimes strigillose to puberulent, abaxially hirtellous to strigillose at least on principal veins, base acute, cuneate, or rarely rounded, sometimes slightly oblique, apex acuminate with tip sometimes curved; secondary veins 7–13 pairs, in abaxial axils usually with well-developed pilosulous domatia; stipules usually deciduous after distalmost 1 or 2 nodes, lanceolate to ovate, 4–8 mm, strigillose or puberulent to glabrescent, acute, keeled in upper part or with ridges in form of upside-down Y, keel extended into arista 0.5–2 mm. Inflorescences shortly cymose, 1–1.5 cm, subsessile, densely puberulent to strigillose; bracts ovate to triangular, 0.5–1 mm, mostly united in pairs; pedicels 0.5–3 mm. Calyx strigillose or puberulent to glabrous; ovary portion obconic to ellipsoid, ca. 1

mm; limb 0.5–1 mm, lobed shallowly or for up to 1/2 its length; lobes broadly triangular. Corolla white or seldom yellow, glabrous outside; tube 2–3.5 mm; lobes oblong-elliptic, ca. 3 mm, obtuse to rounded. Fruiting pedicels to 10 mm. Fruit red, subglobose, 5–7 mm in diam., strigillose to glabrescent; seeds ca. 3 mm. Fl. Mar–May, fr. Jun–Feb of following year.

Thickets or forests in ravines; 200–2000 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Xizang, Yunnan [Vietnam].

**3. *Diplospora mollissima*** Hutchinson in Sargent, Pl. Wilson. 3: 401. 1916.

云南狗骨柴 yun nan gou gu chai

*Tricalysia mollissima* (Hutchinson) Hu.

Shrubs or trees, 2–8 m tall; branches compressed to terete or angled, densely tomentulose or hirtellous. Petiole 4–10 mm, densely tomentulose to glabrescent; leaf blade drying papery or thinly papery, elliptic-oblong, lanceolate, elliptic, or oblong-lanceolate, 5–24 × 2–7.5 cm, adaxially glabrous except midrib and sometimes principal veins tomentulose, abaxially tomentulose or hirtellous on principal veins and hirtellous to glabrous on lamina, base cuneate, obtuse, or rounded, sometimes slightly oblique, apex acute or acuminate with tip often ultimately obtuse; secondary veins 7–10 pairs, in abaxial axils with pilosulous domatia; stipules persistent on distalmost 1–3 nodes, triangular to ovate, 8–10 mm, densely tomentulose to glabrescent, acute or acuminate, keeled in upper part with keel extending into arista 3–6 mm. Inflorescences congested-cymose to glomerulate, 1–1.5 cm in diam., densely strigillose to tomentulose, subsessile; bracts triangular, 0.5–1 mm, often united in pairs; pedicels 0.1–0.5 mm. Calyx strigillose to tomentulose; ovary portion turbinate to obconic, ca. 0.5 mm; limb 1–1.3 mm, undulate to shallowly lobed; lobes broadly triangular. Corolla white, glabrous outside; tube 2–3 mm; lobes oblong-elliptic, 3–3.5 × 1.5–2 mm, obtuse. Fruiting pedicels to 8 mm. Fruit red, subglobose, 5–7 mm in diam., strigillose to glabrescent; seeds 3–4 mm. Fl. May–Jun, fr. Jun–Dec.

• Forests on mountains or at streamsides; 700–1900 m. Yunnan.

## 24. *DUNNIA* Tutchet, J. Linn. Soc., Bot. 37: 69. 1905.

绣球茜属 xiu qiu qian shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs, unarmed; branches sometimes rather stout. Raphides present. Leaves opposite, without domatia; stipules persistent, interpetiolar, generally triangular, acute to bifid. Inflorescences terminal, corymbose-cymose, several to many flowered, pedunculate, with peduncles usually elongated and flexuous, bracteate, with some bracteoles on most inflorescences fused to base of hypanthium, expanded, and petaloid thus appearing to be a calycophyll. Flowers subsessile to shortly pedicellate, bisexual, distylous. Calyx limb 4- or 5-denticulate, sometimes 1 or a few flowers with 1 petaloid calycophyll. Corolla yellow, salverform or funnelform, villous inside; lobes 4 or 5, valvate in bud. Stamens 4 or 5, inserted in upper part of corolla tube, included or partially exerted; filaments short; anthers apparently dorsifixed. Ovary 2-celled, ovules numerous, position of placentas unknown; stigma 2-lobed, included. Fruit capsular, subglobose to obovoid, apically prolonged into a short beak, stiffly cartilaginous or leathery, septicidally dehiscent into 2 valves with each valve sometimes later splitting into 2 parts, with calyx limb, petaloid bracts, and calycophylls persistent; seeds small, flattened, with marginal wing membranous, irregular or lacerate; endosperm abundant; embryo minute.

Two species: China, India; one species (endemic) in China.

The stipitate petaloid structures on the inflorescence are similar to the petaloid calycophylls of other Rubiaceae genera; however, these appear to

comprise two different morphological structures. Most of these structures appear to be inserted at the base of the ovary and thus can be considered bracts, but some appear to be enlarged calyx lobes inserted above the ovary.

*Dunnia* was revised by Ridsdale (Blumea 24: 367–368. 1979).

**1. *Dunnia sinensis*** Tutcher, J. Linn. Soc., Bot. 37: 70. 1905.

绣球茜草 xiu qiu qian cao

Shrubs, 0.3–2.5 m tall; branches rather stout, subterete to angled, puberulent to pilosulous sometimes becoming glabrescent with age. Petiole 0.7–2.5 cm, pilosulous or puberulent; leaf blade drying papery to leathery, narrowly lanceolate, narrowly elliptic, or oblanceolate, 7–23 × 1–6 cm, both surfaces puberulent to strigillose with pubescence denser on principal veins, sometimes becoming glabrescent with age, abaxially epidermis often with apparently enlarged cells, base acute to cuneate, margins often thinly revolute, apex acuminate, acute, or rarely obtuse; secondary veins 11–17 pairs, extending to very close to margins, with intersecondary veins often very well developed; stipules ovate or triangular, 6–8 × 8–10 mm, strigillose to puberulent, acute or often bifid for up to 1/3. Inflorescences 8–12 × 3–5 cm, moderately to densely strigillose or pilosulous; peduncle 2–6 cm; branched portion 2–4 × 3–5 cm; bracts trian-

gular, 1–1.5 mm, petaloid bracts similar to calycophylls; pedicels to 3 mm. Calyx sparsely to densely puberulent or strigillose; ovary portion obconic, 1–1.5 mm; limb deeply lobed; lobes deltoid, 0.3–0.5 mm; petaloid calycophyll white to cream, elliptic-oblong to lanceolate, 2–5.5 × 1–2.3 cm, puberulent to glabrescent, obtuse to rounded, with 3 longitudinal veins and well-developed reticulate venation, with stipe 0.8–1.5 cm. Corolla outside sparsely to densely pilosulous or puberulent; tube 8–10 mm; lobes triangular-ovate, ca. 2 mm, acute to obtuse. Capsule 3–5 mm in diam. including beak ca. 1 mm, smooth, pilosulous to glabrescent; seeds 0.6–1 mm in diam. Fl. and fr. Apr–Nov.

• Thickets or forests in ravines; 200–900 m. Guangdong.

In conservation status, this species has been considered seriously threatened due primarily to habitat destruction (Ge et al., Conservation Genet. 3: 351–362. 2002; Chiang et al., Molec. Biol. Evol. 19: 1367–1375. 2002).

**25. *DUPERREA*** Pierre ex Pitard in Lecomte, Fl. Indo-Chine 3: 334. 1924.

长柱山丹属 chang zhu shan dan shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, unarmed. Raphides absent. Leaves opposite or sometimes markedly anisophyllous and apparently ternate due to reduced internodes grouping 2 leaves at 1 node and an apparently single leaf produced on a single very short axillary branch, without domatia or these few, pilosulous, and rudimentary; stipules persistent, interpetiolar or sometimes shortly united around stem, triangular, acuminate to aristate. Inflorescence terminal on principal branches or on reduced axillary branches, quickly becoming overtopped by growth of 1 or 2 axillary branches thus appearing axillary or sometimes with subtending leaf caducous and then appearing pseudoaxillary, corymbiform, many flowered, pedunculate, bracteate. Flowers pedicellate, bisexual, monomorphic. Calyx limb deeply 5(or 6)-lobed. Corolla white, salverform with tube slender, glabrous inside; lobes 5(or 6), convolute in bud. Stamens 5(or 6), inserted in corolla throat, partially exserted; filaments reduced; anthers dorsifixed, bifid at base, with connective prolonged apically into a short conical appendage. Ovary 2-celled, ovules 1 in each cell on peltate axile placentas; stigma subglobose to ellipsoid, long exserted. Fruit black, drupaceous but sometimes appearing baccate, compressed subglobose to somewhat didymous, fleshy, with calyx limb deciduous; pyrenes 2, 1-celled, with 1 seed, plano-convex to oblate, papery or cartilaginous; seeds medium-sized, oblate or concave on ventral face; endosperm corneous; embryo small; cotyledons ovate; radicle basiscopic.

Two species: Cambodia, China, India, Laos, Myanmar, Thailand, Vietnam; one species in China.

Puff et al. (Rubiaceae of Thailand, 88. 2005) observed that *Duperrea pavettifolia* is quite variable morphologically and suggested that this genus probably comprises only one variable species.

**1. *Duperrea pavettifolia*** (Kurz) Pitard in Lecomte, Fl. Indo-Chine 3: 334. 1924 [*“pavettaefolia”*].

长柱山丹 chang zhu shan dan

*Mussaenda pavettifolia* Kurz, Forest Fl. Burma 2: 57. 1877 [*“pavettaefolia”*]; *Ixora pavettifolia* (Kurz) Craib.

Erect shrubs to small trees, 1.5–6 m tall; branches slightly compressed, strigillose to strigose. Petiole 3–8 mm, strigillose; leaf blade drying membranous to papery, oblanceolate to obovate, elliptic, or elliptic-oblong, 7–25 × 3–8.5 cm, adaxially glabrous to puberulent, abaxially puberulent on blade and strigillose along veins, base cuneate to obtuse or rounded, apex acuminate; secondary veins 7–12 pairs; stipules ovate, 6–10

mm, strigillose to strigose, acuminate to shortly aristate. Inflorescence densely strigillose, hirsute, or strigose; peduncle 1–2.5 cm; branched portion 2–5 × 2.5–6 cm; bracts linear, 1.5–5 mm; pedicels 3–5 mm. Calyx densely hirsute to strigillose; ovary portion cylindrical to obconic, ca. 1 mm; limb with basal tubular portion 1–2 mm; lobes linear, 4–5 mm, acuminate. Corolla densely strigillose outside; tube 16–20 × 1.5–2 mm; lobes oblong-elliptic to elliptic or suborbicular, 4–5 mm, obtuse to rounded. Fruit 7–10 × 10–12 mm; pyrenes 5–6 × 5–6 mm, smooth to shallowly ridged. Fl. Apr–Jun, fr. Sep–Dec.

Broad-leaved forests at low to middle elevations; 100–1100 m. Guangxi, Hainan, Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

## 26. EMMENOPTERYS Oliver, Hooker's Icon. Pl. 19: t. 1823. 1889.

香果树属 *xiang guo shu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Trees, unarmed. Raphides absent. Leaves opposite, with domatia; stipules caducous, interpetiolar, triangular, acute. Inflorescences terminal, corymbose to panicleform, many flowered, pedunculate, bracteate with bracts reduced. Flowers pedicellate, bisexual, monomorphic, fragrant. Calyx limb 5-lobed nearly to base, with lobes imbricate in bud, some flowers of most inflorescences with 1 lobe expanded into a white petaloid calycophyll. Corolla white or yellow, funnellform with tube notably narrowed near base, glabrous inside; lobes 5, imbricate in bud. Stamens 5, inserted below corolla throat, included; filaments developed, tomentose; anthers dorsifixed, included. Ovary 2-celled, ovules numerous in each cell on peltate axile placentas; stigma capitate or shallowly 2-lobed, included. Fruit capsular, oblong-cylindrical to fusiform with disk portion shortly prolonged into a rounded beak, septicidally dehiscent from apex in apical half, woody, with calyx limb deciduous except with calycophyll sometimes persistent; seeds numerous, medium-sized, fusiform, flattened, winged; testa spongy, reticulate-areolate; albumen rich; embryo minute; cotyledons cylindric.

● One species: China.

*Emmenopterys* is currently known only from moist temperate E Asia, with its range wholly inside China, but fossils of the genus are known from W North America; Latham and Ricklefs (in Ricklefs & Schluter, Spec. Diversity Ecol. Communities, 294–314. 1993) discussed the biogeography and putative history of this distribution.

*Emmenopterys henryi* is considered a rare species of conservation concern in China. Its habitat, population status, and distribution were studied by Chen et al. (Acta Bot. Yunnan. 29: 461–466. 2007) in one site, where the population appears to be declining; additional studies are cited there, and its classification as a Grade II Chinese National Protected Wild Plant was reviewed by Liu (Gansu Sci. Technol. 19(10): 151–152. 2003).

**1. *Emmenopterys henryi* Oliver, Hooker's Icon. Pl. 19: t. 1823. 1889.**

香果树 *xiang guo shu*

*Mussaenda cavaleriei* H. Léveillé; *M. mairei* H. Léveillé.

Trees, deciduous, to 30 m tall, to 1 m d.b.h., with grayish brown bark; branches angled to terete, often lenticellate, rather stout, glabrous. Petiole 20–80 mm, glabrous to hirtellous or strigillose; leaf blade drying papery or leathery and paler below, broadly elliptic, broadly ovate, or ovate-oblong, 6–30 × 3.5–14.5 cm, adaxially glabrous or sparsely strigose, abaxially glabrous to strigillose or hirtellous throughout or only on principal veins, base acute to cuneate or obtuse, apex acute, abruptly acuminate, or rarely obtuse; secondary veins 5–9 pairs, in abaxial axils with pilosulous domatia; stipules triangular-ovate, 6–10

mm, acute. Inflorescences hirtellous to glabrous; peduncle 2.5–5.5 cm; branched portion 5–18 × 6–20 cm; bracts caducous, narrowly triangular, 1–8 mm, acute; pedicels 1.5–5 mm. Calyx puberulent to usually glabrous; ovary portion ellipsoid, 3–4 mm; lobes suborbicular, 2–2.2 mm, ciliate, rounded; calycophyll white, pink, or pale yellow, blade drying papery or leathery, spatulate to broadly elliptic or ovate, 1.5–8 × 1–6 cm, parallel veined, on stipe 1–3 cm. Corolla outside densely tomentulose; tube 13–23 mm, narrow at base then quickly dilated near middle; lobes suborbicular, 5–7 mm, densely ciliate, rounded. Capsules 3–5 × 1–1.5 cm, smooth or longitudinally weakly ribbed; seeds 6–8 × 1.5–2 mm, broadly winged. Fl. Jun–Aug, fr. Aug–Nov.

● Forests in valleys; 400–1600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shanxi, Sichuan, Yunnan, Zhejiang.

## 27. FOSBERGIA Tirvengadam & Sastre, Biogeographica (Paris) 73(2): 88. 1997.

大果茜属 *da guo qian shu*

Chen Tao (陈涛); Charlotte M. Taylor

Trees or shrubs, unarmed; bark gray or reddish brown and scaly. Raphides absent. Leaves opposite but sometimes crowded at stem apices, often with domatia; stipules generally persistent, interpetiolar or shortly united around stem, triangular. Inflorescences terminal or displaced to pseudoaxillary, 2–7-flowered and cymose or reduced to 1 flower, pedunculate, bracteate. Flowers subsessile to pedicellate, apparently bisexual and monomorphic. Calyx limb shallowly 5-lobed. Corolla white, salverform, fleshy to leathery, inside variously pubescent; lobes 5, convolute in bud. Stamens 5, inserted in corolla throat, included; filaments short; anthers perhaps dorsifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas; stigma fusiform to clavate, shallowly bilobed, partially exerted. Fruit baccate, thickly fleshy, globose to ellipsoid, smooth or infrequently ridged or tuberculate, color at maturity unknown, with calyx limb tardily deciduous; seeds numerous, medium-sized to large, broadly angled, ovoid, or compressed, embedded in pulp.

At least five species: China, Myanmar, Thailand, Vietnam; three species (one endemic) in China.

Tirvengadam and Sastre (loc. cit.: 87–94) implied without directly stating so that the flowers are hermaphroditic, and Puff et al. (Rubiaceae of Thailand, 62. 2005) reported this condition tentatively. The pollen is reportedly “simple, 3-porate”; the ovary wall contains “crystal sands present in small clusters in mesocarp”; and the testa cells have “tube-like trabecular thickenings, [with] inner wall irregularly thickened.”

- 1a. Stems strigillose at least when young; leaves elliptic to oblong-elliptic, lanceolate-oblong, or oblanceolate, 9.5–15 × 2–4.5 cm; stipules keeled or ornamented throughout their length, with a straight median keel or sometimes a ridge and/or line of pubescence in shape of an upside-down Y; calyx margins uniform, similar in texture to rest of limb; fruit ca. 11 × 9 cm ..... 2. *F. shweliensis*
- 1b. Stems glabrous; leaves oblanceolate to obovate or broadly obovate, 10–24 × 3.5–12 cm; stipules smooth or keeled only in upper half, glabrous in lower half; calyx margins uniform to hyaline; fruit 4–6 × 4–5 cm.
- 2a. Leaves obovate to oblanceolate, with domatia in abaxial vein axils; flowers 3–5 in cymes, with developing fruit solitary; calyx limb with margins hyaline and lobes aristate ..... 1. *F. petelotii*
- 2b. Leaves broadly obovate, without domatia; flowers solitary; calyx limb with margins uniform and lobes acute but tips not prolonged ..... 3. *F. thailandica*

**1. *Fosbergia petelotii*** Merrill ex Tirvengadam & Sastre, Biogeographica (Paris) 73(2): 89. 1997.

中越大果茜 zhong yue da guo qian

Trees, 6–10 m-tall; bark reddish brown; branches compressed to terete, glabrous. Petiole 5–10 mm, strigose; leaf blade drying papery, oblanceolate to obovate, 10–24 × 3.5–7 cm, adaxially glabrous, abaxially strigose at least on veins, base cuneate to acute, apex acuminate to long acuminate; secondary veins 8–11 pairs, in abaxial axils with pilosulous domatia; stipules triangular, 4–7 mm, glabrous, abaxially keeled in upper half, acute and aristate, arista 2–3 mm. Inflorescences 3–15-flowered, glabrous; peduncle 0.5–1 cm; bracts triangular to sub-orbicular, 1–3 mm; pedicels 8–15 mm. Calyx glabrous; ovary portion obovoid to ellipsoid, ca. 4 mm; limb 10–15 mm, lobed for ca. 1/2; lobes triangular to narrowly triangular, marginally hyaline, acute and aristate, arista 1–2 mm. Corolla white, outside apparently glabrous; tube 6–14 mm, inside glabrescent or sparsely hairy at base; lobes narrowly triangular, 13–17 mm. Stigmas ca. 3 mm. Berries solitary, globose to ovoid-globose, 4–6 × 4–5 cm, sparsely to rather densely tuberculate or perhaps smooth at least when young; seeds orbicular, laterally compressed, 6–8 × 5–6 × 2.5–3 mm, bony. Fl. Mar–Apr.

Evergreen forests on mountain slopes or in valleys; 1400–1900 m [as low as 1100–1200 m in Vietnam]. Yunnan (Jinping, Lüchun, Maguan) [Vietnam].

Zhang et al. (Acta Phytotax. Sin. 45: 90–93. 2007) noted that the Chinese plants differ from the Vietnamese plants in having leaf blades glabrous adaxially and hairy along the veins abaxially and corolla tubes 1–1.4 cm (vs. glabrous on both surfaces and corolla tube up to 6 mm in the Vietnamese plants).

**2. *Fosbergia shweliensis*** (J. Anthony) Tirvengadam & Sastre, Biogeographica (Paris) 73(2): 88. 1997.

瑞丽茜树 rui li qian shu

*Randia shweliensis* J. Anthony, Notes Roy. Bot. Gard. Edinburgh 18: 205. 1934; *Aidia shweliensis* (J. Anthony) W. C. Chen.

Trees, 8–20 m tall; branches angled to terete, strigillose becoming glabrescent. Petiole 5–10 mm, sparsely strigillose to glabrous; leaf blade drying papery, elliptic to oblong-elliptic, lanceolate-oblong, or oblanceolate, 9.5–15 × 2–4.5 cm, adaxially glabrous, abaxially sparsely strigillose or strigose along principal veins, base cuneate to acute and sometimes slightly inequilateral, apex shortly acuminate to acuminate; secondary

veins 8–11 pairs, usually with pilosulous domatia in abaxial axils; stipules triangular to ovate, 5–10 mm, keeled or with ridges in upside-down-Y pattern, strigillose, slenderly acute, sometimes with 1 or 2 aristae 1–3 mm. Inflorescences 2–10-flowered, strigillose to strigose or glabrescent; peduncle 1–1.5 cm; bracts linear-lanceolate, 2–4 mm, aristate; pedicels 6–18 mm. Calyx glabrous; ovary portion obovoid to ellipsoid, 3–4 mm; limb 8–13 mm, inside villosulous to tomentulose, lobed for ca. 1/3; lobes triangular to linear-lanceolate, acute and terminating in arista 1–2 mm. Corolla creamy white to pale green or pale yellow, outside glabrous; tube 20–25 mm, inside tomentose; lobes lanceolate, 15–26 mm, acuminate to subaristate, marginally hyaline. Fruiting peduncle to 3.5 m. Berry subglobose to ellipsoid, ca. 11 × 9 cm, smooth; seeds ovoid to oblong-angular, ca. 12 × 7 mm. Fl. May–Jun, fr. May.

• Open thickets or sparse moist primary broad-leaved forests in valleys; 1100–2200 m. W Yunnan.

Li et al. (Acta Phytotax. Sin. 44: 707–711. 2006) illustrated this species in their figure 1 and reported that the flower buds are formed nearly a year before the flowers open and that the fruit may take two years to mature. They also detailed errors in the localities of Chinese specimens given by Tirvengadam and Sastre in their protologue and excluded one of the specimens treated by them, *C. W. Wang 78281 (A)*, which they included instead in *Fosbergia thailandica*. Additionally, they reported that the Gaoligong Shan population of this species does not appear to be reproducing itself, although they stop short of considering this a species of conservation concern.

**3. *Fosbergia thailandica*** Tirvengadam & Sastre, Biogeographica (Paris) 73(2): 89. 1997.

泰国大果茜 tai guo da guo qian

Trees; bark thin, exfoliating in small pieces, grayish or brownish on older parts when dry; branches glabrous. Petiole to 2 cm, glabrous; leaf blade broadly obovate, 14–23 × 4–12 cm, both surfaces glabrous except abaxially strigose on principal veins, base acute to attenuate, apex acuminate to long acuminate; secondary veins 8–11 pairs, without domatia; stipules ovate, 5–10 mm, glabrous, smooth at base and keeled in upper part, obtuse to acute and aristate, arista ca. 2 mm. Flowers solitary. Calyx glabrous; ovary portion obovoid, ca. 1 cm; limb 3–5 mm, deeply lobed; lobes narrowly triangular. Corolla not seen. Fruiting peduncle ca. 2.5 cm. Immature berry globose, 4–5 cm in diam., glabrous, smooth.

Valleys, mixed woods, lower montane evergreen forests; 1500–1900 m. Yunnan (Jinghong) [N Thailand (Nan)].

## 28. *GALIUM* Linnaeus, Sp. Pl. 1: 105. 1753.

拉拉藤属 *la la teng shu*

Chen Tao (陈涛); Friedrich Ehrendorfer

Subshrubs to perennial or annual herbs. Stems often weak and clambering, often notably prickly or “sticky” (i.e., retrorsely aculeolate, “velcro-like”). Raphides present. Leaves opposite, mostly with leaflike stipules in whorls of 4, 6, or more, usually sessile or occasionally petiolate, without domatia, abaxial epidermis sometimes punctate- to striate-glandular, mostly with 1 main nerve, occasionally triplinerved or palmately veined; stipules interpetiolar and usually leaflike, sometimes reduced. Inflorescences mostly terminal and axillary (sometimes only axillary), thyrsoid to paniculiform or subcapitate, cymes several to many flowered or infrequently reduced to 1 flower, pedunculate to sessile, bracteate or bracts reduced especially on higher order axes [or bracts sometimes leaflike and involucral], bracteoles at pedicels lacking. Flowers mostly bisexual and monomorphic, hermaphroditic, sometimes unisexual, andromonoecious, occasionally polygamo-dioecious or dioecious, pedicellate to sessile, usually quite small. Calyx with limb nearly always reduced to absent; hypanthium portion fused with ovary. Corolla white, yellow, yellow-green, green, more rarely pink, red, dark red, or purple, rotate to occasionally campanulate or broadly funnelform; tube sometimes so reduced as to give appearance of free petals, glabrous inside; lobes (3 or)4(or occasionally 5), valvate in bud. Stamens (3 or)4(or occasionally 5), inserted on corolla tube near base, exserted; filaments developed to  $\pm$  reduced; anthers dorsifixed. Inferior ovary 2-celled,  $\pm$  didymous, ovoid, ellipsoid, or globose, smooth, papillose, tuberculate, or with hooked or rarely straight trichomes, 1 erect and axile ovule in each cell; stigmas 2-lobed, exserted. Fruit on pedicels sometimes elongating during development, green, gray, or infrequently white (to red, orange, or black), mostly dry to leathery schizocarps, infrequently spongy, rarely  $\pm$  fleshy and berrylike, ellipsoid to subglobose; schizocarps separating into 2 indehiscent mericarps, each with 1 seed, subglobose, ellipsoid-oblong, or reniform, smooth and glabrous to tuberculate and/or covered with trichomes often hooked and clinging; seeds small, grooved ventrally (i.e., adaxially); testa membranous; endosperm corneous; embryo curved; cotyledons leaflike; radicle terete, inferior.

More than 600 species: worldwide, mostly in meridional to temperate but also in alpine and arctic regions or in subtropical and tropical zones at higher elevations; 63 species (23 endemic, four of unconfirmed occurrence) in China.

*Galium* is by far the largest and most widespread genus within the tribe Rubieae (subfamily Rubioideae). According to the most recent contributions (Natali et al., Opera Bot. Belg. 7: 193–203. 1996; Ehrendorfer et al., Fl. Iranica 176: 1–287. 2005; Bremer & Eriksson, Int. J. Pl. Sci. 170: 766–793. 2009; Soza & Olmstead, Taxon 59: 755–771. 2010), this tribe is closest to Theligoneae, Putorieae, and Paederieae, and includes the following genera treated (or mentioned) in the present flora: *Asperula*, *Cruciata* Miller, *Galium*, *Kelloggia*, *Leptunis*, *Microphysa*, *Phuopsis*, *Rubia*, and *Sherardia* Linnaeus.

So far, the genera *Cruciata* and *Sherardia* have not been found in China yet but may be expected there because of their partly weedy character and widely adventive occurrence. They are included in the key below for future reference but not among the full generic presentations. *Sherardia arvensis* Linnaeus is widely distributed in warm temperate and high-elevation tropical regions and can be separated from *Asperula*, *Phuopsis*, *Leptunis*, or *Galium* by its terminal capitate inflorescences enclosed by leaflike bracts, its clearly developed calyx with 6 acute lobes, and its pink or violet corollas with well-developed funnelform tubes and 4 lobes.

Among the few *Cruciata* species, the W Eurasiatic *C. pedemontana* (Bellardi) Ehrendorfer appears occasionally as an adventive in warm temperate regions. It is common, e.g., in SE North America, and could be found in China too. *Cruciata* can be separated from *Galium* by its flowering stems with vegetative apices and the inflorescences consisting only of lateral axillary cymes on middle and lower stem nodes. These cymes are equal to or shorter than the subtending leaves when fully developed. In contrast, the inflorescences are mostly terminal and axillary and longer than the leaves in *Galium*.

The characters relevant for the taxonomy of *Galium* and other Rubieae deserve some comments. Life and growth forms are important, particularly with respect to the differentiation into half-shrubs, herbaceous perennials, and annuals. Stem and leaf posture, consistency, shape, and indumentum (e.g., pubescent or retrorsely aculeolate with recurved microhairs) are often quite diverse and may vary within species or even populations. The true leaves are always opposite and 2, but interpetiolar stipules may vary from inconspicuous and divided or simple to enlarged and leaflike, forming whorls of 4 or up to 6 and more. During seedling and shoot development all these taxa pass through the 2- and 4-whorl stage, but some taxa remain at this stage, while others continue to develop more numerous whorl elements toward the middle of their stems. This is a most informative differential character within Rubieae. Other relevant features relate to leaf shape, venation, texture, and particularly indumentum. Here, the presence of longer or shorter microhairs (use a lens) on surfaces and particularly margins as well as their forward or backward direction is of taxonomic importance.

Other morphological characters decisive for Rubieae taxonomy concern the inflorescences (e.g., the position and structure of the cymes). Flower shape is essential for the traditional separation of the genera *Asperula* (with salverform, funnelform, or cup-shaped corollas) and *Galium* (with  $\pm$  rotate corollas). It is now clear that there are transitions between these character states and that even closely related taxa may differ in this respect. So far, it has been possible to provisionally maintain *Asperula* and *Galium* by the transfer of obviously misplaced taxa and by using the presence or absence of bracts and bracteoles as a differential character for the two genera (see Ehrendorfer et al., loc. cit. 2005).

The indumentum of ovaries and fruit as well as fruit consistency also vary strongly within Rubieae. Informative are, for example,  $\pm$  fleshy berries (as in *Relbunium* Benth. & J. D. Hooker, *Rubia*, and certain *Galium* taxa) vs. dry schizocarps or the presence vs. absence of hairiness and whether the trichomes are hooked (i.e., the fruit disperse as “stick-tights” on animals) vs. straight. However, the distinction between all these structures is arbitrary, and there are even transitions between trichomes and tuberculate protuberances of various shapes as well as between hairy and glabrous.

All this is well illustrated by Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: f. 1. 1998). Furthermore, ovary and fruit indumentum and surface structures may change during development and sometimes vary genetically within species or even within populations, as in several *Galium* species. In general, authors in other regions have documented infraspecific variation from glabrous to densely hairy or tuberculate fruit but traditionally have only separated plants with hooked trichomes into different species. However, intrepid Chinese authors have easily combined these latter morphotypes, e.g., in *G. dahuricum* sensu W. C. Chen (in FRPS 71(2): 255. 1999), whereas Fl. Japan (3a: 238–239. 1993) distinguished *G. manshuricum* on the basis of this character. Only careful studies and field observations can clarify such cases, as in *G. spurium*, where the infraspecific variation of fruit, either smooth, tuberculate, or covered with hooked hairs, has been proven.

Further differential characters for the taxonomy of Rubieae come from the fields of palynology (e.g., number of colpi), karyology (e.g., deviations from the normal chromosome base number  $x = 11$  in *Asperula* sect. *Cynanchicae* (Candolle) Boissier with  $x = 10$  or in *Galium* sect. *Aparinoides* (Jordan) Grenier with  $x = 12$ ; common occurrence of polyploidy), and reproductive biology. Most of the perennial Rubieae taxa have conspicuous hermaphroditic or andromonoecious flowers and inflorescences and are insect-pollinated and self-incompatible outbreeders (e.g., *Phuopsis* or *G. boreale* and *G. verum*). Nevertheless, for several annuals with small and inconspicuous flower aggregates selfing and autogamy have been documented (e.g., *G. aparine*, *G. spurium*, and *Sherardia arvensis*). Furthermore, polygamodioecy and dioecy occur in some groups (e.g., *G. elegans*). Up to now, only few and insufficient data from all these fields are available for Asian Rubieae species and have not been mentioned in FRPS. Nevertheless, such data are significant and will have to be addressed in more detailed future systematic Rubieae studies from this region.

The  $\alpha$ -taxonomy of Rubieae in E Asia is still in a problematic state. A general survey of the collections at the herbaria KUN, MO, PE, W, and WU has revealed the existence of many very polymorphic, complex, and insufficiently understood species groups. Therefore, the present treatment has to be regarded as provisional.

A particularly critical case concerns several *Galium* species described by H. Léveillé from 1904–1917 (see Lauener & Ferguson, Notes Roy. Bot. Gard. Edinburgh 32: 103–115. 1973). These descriptions are most fragmentary and the relevant types are not yet studied sufficiently (but see Mill, Edinburgh J. Bot. 53: 193–213. 1996). Relevant taxa in alphabetical order are *G. blinii* (see under that name), *G. bodinieri* (see under *G. blinii* and *G. rebae*), *G. cavaleriei* (see under *G. asperifolium*), *G. comarii* (see under *G. dahuricum*), *G. esquirolii* (see under *G. asperifolium*), *G. hongnoense* (see under *G. spurium*), *G. mairei* (see under *G. elegans*), *G. martini* (see under *G. bungei*), *G. quinatum* (see under *G. blinii*), *G. remotiflorum* (see under *G. bungei*), and *G. venosum* (see under *G. bungei*).

The treatment of *Galium* for the *Flora of Taiwan* by Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 101–117. 1998; Fl. Taiwan, ed. 2, 4: 254–259. 1998) is not satisfactory in several aspects: keys and descriptions are rather idealized and lack carefully observed ranges of morphological variation for the taxa; species are circumscribed more narrowly and based on different characters than used by other authors in the region (e.g., presence vs. absence of leaf indumentum is considered variable within species by most other authors); the treatment is not well reconciled with continental *Galium* taxonomy (e.g., there are no references to the Russian floras, and names synonymized by others are used without explanation); and at least two names based on types from Taiwan are missing.

With respect to a more “natural” and general taxonomic classification of the Rubieae and *Galium*, a number of recent morphological, karyological, palynological, and particularly DNA-analytical studies (e.g., Natali et al., loc. cit.; Robbrecht & Manen, Syst. & Geogr. Pl. 76: 85–146. 2006; Bremer & Eriksson, loc. cit.; Soza & Olmstead, loc. cit.) are available. They show that *Theligonum* should be placed into a separate tribe (Theligoneae), that the tribe Rubieae is monophyletic, and that *Kelloggia* (as subtribe Kelloggiinae, still with normal Rubiaceae stipules, calyx teeth, and 3-colpate pollen, but already with hooked trichomes on the dry mericarps) occupies a basal position in Rubieae. The Central American genus *Didymaea* J. D. Hooker (still with normal stipules but with the calyx already lacking, 5-coplate pollen, and seeds separating from the fleshy pericarp) represents a link to the genus *Rubia* in the true Rubiinae. Their stipules are nearly always leaflike, the pollen is polycoplate, and the seeds never separate from the pericarp. *Rubia*, a well-circumscribed and certainly monophyletic genus, is always perennial, has 5-lobed corollas, and berrylike fruit.

The remaining Rubiinae are also monophyletic as a whole, but their traditional genera *Asperula*, *Bataprine* Nieuwland, *Callipeltis* Steven, *Crucianella* Linnaeus, *Cruciata*, *Galium*, *Leptunis*, *Mericalpaea* Boissier, *Microphysa*, *Phuopsis*, *Relbunium*, *Sherardia*, *Valantia* Linnaeus, and *Warburgina* Eig are all essentially interdigitated. They are difficult to separate and can hardly be brought into concordance with available phylogenetic data. These advanced Rubiinae tend to develop more and more apomorphic character profiles, i.e., change from perennial to annual, increase in numbers of leaflike stipules from 4 to numerous, loss of bracts and prophylls in the inflorescences, reduction from 5-lobed to (3 or) 4-lobed corollas, specialization of mericarps, etc. As shown by the most comprehensive phylogram available so far (Natali et al., loc. cit.: f. 2; Soza & Olmstead, loc. cit.: f. 1, 2) and new findings (unpubl.), these more apomorphic Rubiinae form a polytomy or a grade with seven parallel clades. The most basal clade (1) consists of the monotypic *Galium* sect. *Cymogalia* Pobedimova only. The following *Sherardia* clade (2) includes *Crucianella*, *Phuopsis*, *Sherardia*, and several sections of *Asperula* together with *Leptunis*. Separate clades are formed by *G.* sect. *Depauperata* Pobedimova (3), *A.* sect. *Glabella* Grisebach, including *G.* sect. *Aparinoides* (4), and *A.* sect. *Asperula* (5). The *Cruciata* clade (6) consists not only of the genera *Cruciata* and *Valantia* but also of all sections of *Galium* (including the traditional genera *Bataprine*, *Microphysa*, and *Relbunium*) that form whorls of 2 leaves and normally not more than 2 even-sized leaflike stipules. Finally, the *G.* sect. *Galium* clade (7) comprises this and various other sections of *Galium*, which regularly develop whorls of leaves and leaflike stipules with 5 to more elements.

From the above data and the fact that a number of major groups of Rubiinae have not been DNA-analyzed yet, it is obvious that it is still difficult and partly impossible to harmonize DNA-supported clades with the traditional genera and sections. Thus, extensive changes are expected for generic and sectional circumscriptions within Rubiinae in the future. Therefore, we refrain from taxonomic changes for the present flora, list taxa in alphabetical order, and only supplement phylogenetic comments. Thus, the present treatment in principle follows FRPS (71(2): 216–286. 1999), mainly based on Pobedimova et al. (Fl. URSS 23: 287–381. 1958), but also considers Ehrendorfer et al. (loc. cit. 2005). In order to make comparison with available phylogenetic data and present infrageneric classification easier, relevant information is inserted as a “Taxonomic Conspectus” before the individual species descriptions. It was not until this volume was ready for the press that the need for the nomen novum, *Galium glabriusculum*, was discovered; therefore, this species alone is outside of the alphabetical order.

Here the key to species of *Galium* is extensively revised from that of FRPS. It includes all of the Chinese *Galium* species with full ranges of differential character variation. Furthermore, it keys out all other Rubiaceae genera which are easily confused with *Galium* and are documented or can be expected in China. Details on the genera *Asperula*, *Leptunis*, *Microphysa*, *Phuopsis* and *Rubia* can be found where they are listed in alphabetical order, references to *Cruciata* and *Sherardia* appear in the comments above.

Several species are keyed out more than once in the present key because they are circumscribed by combinations of characters rather than by unique features. Furthermore, many *Galium* species are markedly variable because of genetic differentiation (e.g., *G. bungei*, *G. elegans*) but also because of phenetic plasticity due to different environmental conditions. References to the number of leaves and leaflike stipules in whorls as well as leaf measurements refer to middle stem regions. Measurements of organs with hairy surfaces (e.g., leaves, fruit, and mericarps) here apply to the solid surface of the structure and do not include the trichomes. The terms “leaf whorl,” “ovary,” and “uncinate trichome” follow common usage in *Galium*. Intraspecific taxa are adopted from FRPS in order to facilitate future and more detailed work on this group and comparison with other floras. They are not included in the following main key but are subordinated under the relevant species in alphabetical order and keyed out there.

### Taxonomic conspectus of the Rubieae (excluding Kelloggia and Rubia)

In FRPS (71(2): 216–286. 1999) the taxa of *Galium* were placed in the following sections (designated here by capital letters): *G. sect. Depauperata* (A), *G. sect. Aparine* (B), *G. sect. Pseudaparine* Lange (C), *G. sect. Cymogalia* (D), *G. sect. Trachygali* (E), *G. sect. Leptogali* Lange (F), *G. sect. Platygalium* (G), *G. sect. Galium* (H), *G. sect. Leiogali* (I), *G. sect. Trichocarpa* (Pobedimova) Pobedimova (J), *G. sect. Asperuloides* Pobedimova (K), and *G. sect. Brachyantha* (Boissier) Pobedimova (L). Some species of uncertain position were classified as dubious (M). Species accepted in the present treatment but lacking in FRPS are designated as (Z). For comparison, a current (e.g., Jelenovsky et al., Novosti Sist. Vyssh. Rast. 35: 174–187. 2003; Ehrendorfer et al., Fl. Iranica 176: 1–287. 2005), DNA-analytically supported (e.g., Natali et al., Opera Bot. Belg. 7: 193–203. 1996; Soza & Olmstead, Taxon 59: 755–771. 2010; Ehrendorfer, unpubl.) but still provisional taxonomic conspectus is presented below. It lists all species here accepted under their clades and sections. For the clades 1–6 one should compare the comments above, for the sections compare Ehrendorfer et al. (loc. cit.). The placement of *Galium* species into sections (or lack of placement) by FRPS is indicated by showing the relevant letters used above in parentheses after the species names.

#### Clade 1

*Galium* sect. *Cymogalia* Pobedimova s.s.

39. *Galium paradoxum* (D)

#### Clade 2

*Phuopsis stylosa*  
*Sherardia arvensis*  
*Leptunis trichodes*  
*Asperula oppositifolia*

#### Clade 3

*Galium* sect. *Depauperata* Pobedimova

16. *Galium exile* (A; incl. *G. songaricum* sensu FRPS)

#### Clade 4

*Galium* sect. *Aparinoides* (Jordan) Grenier

27. *Galium karakulense* (E)  
25. *Galium innocuum* (as *G. trifidum*: E; incl. “*G. palustre*”)

#### Clade 5

*Asperula* sect. *Asperula*  
*Asperula orientalis*

#### Clade 6

*Galium* sect. *Platygalium* W. D. J. Koch s.l.

9. *Galium bungei* (E; incl. *G. martini*: M)  
45. *Galium salwinense* (E)  
12. *Galium crassifolium* (A)  
31. *Galium linearifolium* (E)  
21. *Galium hirtiflorum* (Z)  
20. *Galium glandulosum* (A)  
18. *Galium forrestii* (D)  
44. *Galium rupifragum* (Z)  
35. *Galium morii* (D)  
54. *Galium tarokoense* (A)  
34. *Galium minutissimum* (M)

36. *Galium nankotaizanum* (M; incl. *G. maborasense*)

47. *Galium serpylloides* (A)

29. *Galium kinuta* (G)

24. *Galium hupehense* (M)

30. *Galium kunmingense* (Z)

17. *Galium formosense* (as *G. kwanzanense*: M)

15. *Galium elegans* (D)

63. *Galium yunnanense* (M)

26. *Galium kamtschaticum* (D)

10. *Galium chekiangense* (as *G. nakaii*: G)

*Microphysa elongata*

40. *Galium platygalium* (K)

32. *Galium maximoviczii* (K)

7. *Galium boreale* s.l. (G)

60. *Galium turkestanicum* (M)

#### Clade 7

[*Galium* s.s.]

*Galium* sect. *Hylaea* (Grisebach) Ehrendorfer s.l.

37. *Galium odoratum* (J)

4. *Galium asperuloides* (A)

22. *Galium hoffmeisteri* (as subsp. of *G. asperuloides*: A)

14. *Galium echinocarpum* (A)

53. *Galium takasagomontanum* (M)

59. *Galium triflorum* (A)

58. *Galium trifloriforme* (Z)

*Galium* sect. *Trachygali* K. Schumann s.l.

48. *Galium sichuanense* (Z)

13. *Galium dahuricum* (as “*G. davuricum*”: F; incl. *G. comarii*, *G. nietherthii*, *G. pseudoasprellum*)

56. *Galium tokyoense* (as var. of “*G. davuricum*”: F)

41. *Galium prattii* (M)

52. *Galium taiwanense* (M)

3. *Galium asperifolium* (I)

6. *Galium blinii* (as syn. of *G. asperifolium* var.: I; incl. *G. quinatum*: M)

51. *Galium sungpanense* (A)

42. *Galium pusillosetosum* (A)

1. *Galium acutum* (M)

43. *Galium rebae* (Z)

33. *Galium megacyttarion* (Z)

5. *Galium baldensiforme* (A)

49. *Galium glabriusculum* (A)

28. *Galium karataviense* (as *G. rivale* s.l.: K)

61. *Galium uliginosum* (F)

*Galium* sect. *Leiogali* Ledebour

38. *Galium paniculatum* (M; incl. *G. xinjiangense*: J)

*Galium* sect. *Orientigali* Ehrendorfer

8. *Galium bullatum* (I)

*Galium* sect. *Galium*

23. *Galium humifusum* (L)

62. *Galium verum* (H)

11. *Galium consanguineum* (as *G. majmechense*: H)

46. *Galium saurense* (M)

*Galium* sect. *Aparine* W. D. J. Koch s.s.

50. *Galium spurium* (as *G. aparine* var. *tenerum*: B)

2. *Galium aparine* (B)

*Galium* sect. *Kolgyda* Dumortier s.s.

57. *Galium tricornutum* (as *G. tricornis*: B)

*Galium* sect. *Microgali* Grisebach

19. *Galium ghilanicum* (Z)

55. *Galium tenuissimum* (C)

**Key to species of *Galium* and to related genera of the Rubieae**

- 1a. Interpetiolar stipules inconspicuous, multifid or fimbriate, not leaflike and not forming whorls with true leaves; corolla funnelform, (4 or) 5-lobed; ovary and dry mericarps with hooked trichomes ..... *Kelloggia* (see p. 183)
- 1b. Interpetiolar stipules mostly leaflike and in whorls with true leaves, rarely reduced.
  - 2a. Corolla lobes regularly 5; fruit fleshy, mericarps berrylike, 2(or 1, by non-development), often dispersed together ..... *Rubia* (see p. 305)
  - 2b. Corolla lobes usually 4 (rarely 3); fruit dry or leathery, mericarps mostly 2, nearly always separating for dispersal.
    - 3a. Leaves in middle stem region opposite, with stipules reduced or  $\pm$  leaflike and in whorls of 4 but then always clearly smaller than true leaves.
      - 4a. Corolla pink, funnelform, with well-developed tube longer than lobes; fruit smooth ..... *Asperula oppositifolia* (see p. 78)
      - 4b. Corolla white, rotate, with tube shorter than lobes; fruit with uncinat trichomes.
        - 5a. Perennial herbs; leaves  $5-30 \times 5-23$  mm, obtuse to truncate at base, on petioles  $1.5-10$  mm; flowers 3-11 in cymes; corolla with 4 lobes ..... 39. *G. paradoxum*
        - 5b. Annual herbs; leaves  $2-12 \times 1-4$  mm, acute to cuneate at base, sessile or on short petioles; flowers solitary at each node; corolla mostly with 3 lobes ..... 16. *G. exile*
    - 3b. Leaves in middle stem region opposite and with very similar leaflike stipules in whorls of 4-16.
      - 6a. Leaf apex rounded, obtuse, or  $\pm$  blunt, never acute or with a hyaline mucro; leaves in whorls of 4-6, linear to broadly oblong, 1-nerved, dried blackening; ripe mericarps globose, didymous and only with a short zone of contact, glabrous; corolla cup-shaped to slightly campanulate, 3- or 4-merous.
        - 7a. Inflorescences with many-flowered cymes; corolla 4-lobed, 2.5-4 mm in diam.; leaves mostly  $15-20 \times 5-8$  mm ..... 27. *G. karakulense*
        - 7b. Inflorescences with 1-3(or 4)-flowered cymes; corolla mostly 3-lobed, 1-1.8 mm in diam.; leaves mostly  $3-8 \times 1-2$  mm ..... 25. *G. innocuum*
      - 6b. Leaf apex mostly  $\pm$  acute, often with a hyaline mucro; leaves in whorls of 4-16, sometimes broader and with 3-5 palmate nerves; ripe mericarps ovoid to subglobose, with a longer zone of contact and with diverse surface structures; corolla diverse, but often rotate and always 4-merous.
      - 8a. Leaves and leaflike stipules in middle stem region never in whorls of more than 4 (if rarely in whorls of up to 6 then leaves with 3-5 palmate principal veins), from linear to broadly ovate.
        - 9a. Stem apex vegetative, with few- to several-flowered lateral cymes only in leaf axils and shorter than or  $\pm$  equal to subtending leaves, nodding in fruit ..... *Cruciata* (see comments above)
        - 9b. Stem apex usually floriferous, with terminal and axillary cymes, often longer than subtending leaves and mostly not nodding in fruit.
          - 10a. Condensed plants of rocks or high elevations; stems usually less than 10 cm tall, glabrous or with spreading (but never retrorse) hairs; leaves mostly  $\pm$  ovate,  $(1-3-8(-20) \times (0.8-2-4(-10)$  mm, with 1-3 main veins; corolla rotate, often only 1.5-2 mm in diam.; mericarps with spreading (rarely appressed) hooked or  $\pm$  straight trichomes.
            - 11a. Mericarps with  $\pm$  straight hairs, 2-2.5 mm in diam.; stems mostly pilose or hirtellous.
              - 12a. Fruiting pedicels straight; Xizang ..... 47. *G. serpylloides*
              - 12b. Fruiting pedicels nodding; Taiwan ..... 36. *G. nankotaizanum*
            - 11b. Mericarps with weakly to strongly curved and uncinat trichomes; stems partly glabrous.
              - 13a. Corolla ca. 3 mm in diam.; stems glabrous ..... 53. *G. takasagomontanum*
              - 13b. Corolla 1.2-2 mm in diam.; stems  $\pm$  hairy or glabrous.
                - 14a. Stems  $\pm$  hairy.
                  - 15a. Leaves ovate to broadly lanceolate, acute, up to 3.5 mm wide; Yunnan ..... 44. *G. rupifragum*
                  - 15b. Leaves broadly elliptic to obovate, obtuse and mucronate, up to 10 mm wide; Taiwan ..... 17. *G. formosense*
                - 14b. Stems glabrous; Taiwan.
                  - 16a. Leaves very small, only 0.8-1 mm wide, with 1 main vein only; fruit hairs spreading ..... 34. *G. minutissimum*
                  - 16b. Leaves wider, with 1 or 3 main veins; fruit hairs appressed.
                    - 17a. Leaves with 3 main veins; corolla only ca. 1.2 mm in diam. .... 35. *G. morii*
                    - 17b. Leaves with 1 main vein; corolla ca. 2 mm in diam. .... 54. *G. tarokoense*
        - 10b. Taller plants, usually of lower elevations with larger leaves (if plants  $\pm$  condensed then stem hairs retrorsely curved or fruit hairs appressed but not hooked).

- 18a. Leaves with 1 principal vein or 2 lateral veins only weakly visible and not extending past middle of blade.
- 19a. Open corollas funnelform, 2.5–3 mm, tube somewhat shorter than lobes; fruit with pericarp smooth to granular, becoming slightly inflated, enclosing both mericarps at dispersal ..... *Microphysa elongata* (see p. 216)
- 19b. Open corollas rotate, fused basal part much shorter than lobes; mericarps clearly separated.
- 20a. Stems  $\pm$  strigose-hirsute, with hairs  $\pm$  retrorse (but not retrorsely aculeolate); leaves ovate or elliptic to linear-lanceolate, broadest  $\pm$  in middle, at lower side usually with glandlike spots; flowers unisexual, usually yellowish,  $\pm$  greenish, or reddish; fruit normally with uncinat trichomes.
- 21a. Plants usually less than 15 cm tall, strongly branched from base; leaves often less than 8 mm, mostly glabrescent or glabrous, subleathery; inflorescences with few-flowered, bracteate cymes ..... 20. *G. glandulosum*
- 21b. Plants usually more than 15 cm tall, little branched; leaves usually longer than 8 mm, hairy on both sides; inflorescences paniculate to corymbiform, little bracteate.
- 22a. Leaves linear-elliptic to narrowly lanceolate, mostly 8–17  $\times$  1–2.5 mm, dried rather papery; inflorescence paniculate ..... 21. *G. hirtiflorum*
- 22b. Leaves ovate-elliptic, mostly 8–12  $\times$  3–5 mm, dried rather subleathery; inflorescence corymbiform ..... 18. *G. Forrestii*
- 20b. Stems glabrous or with indumentum, but not with retrorse hairs; leaves often broadest above middle and thinner, without glandlike spots; flowers usually bisexual.
- 23a. Leaves  $\pm$  linear, often longer than 20 mm, in addition to 1 principal, with 2 weaker lateral veins; corolla 4–5 mm in diam.
- 24a. Leaves linear-spatulate, 1–4 mm wide; inflorescences loose, broadly paniculiform; ovaries and fruit glabrous and smooth ..... 31. *G. linearifolium*
- 24b. Leaves linear-lanceolate, 3–9 mm wide; inflorescences dense, elongate-paniculate; ovaries and fruit with sparse hooked trichomes or glabrous ..... 60. *G. turkestanicum*
- 23b. Leaves not linear, mostly shorter than 20 mm; corolla smaller.
- 25a. Leaves ovate, length/breadth index 2 or less, in addition to 1 principal, with 2 weaker lateral veins; corolla larger; fruit with spreading hooked or straight hairs; Taiwan.
- 26a. Mericarps with straight trichomes; corolla 2–2.5 mm in diam.; stems pilose or glabrescent ..... 36. *G. nankotaizanum*
- 26b. Mericarps with hooked trichomes; corolla ca. 3 mm in diam.; stems glabrous ..... 53. *G. takasagomontanum*
- 25b. Leaves ovate-oblong to lanceolate, length/breadth index 2 or more, with only 1 principal vein; corolla 1.5–2 mm in diam.; ovaries and fruit glabrous or with various indumentum.
- 27a. Leaves dried subleathery; fruit with appressed,  $\pm$  curved (but not uncinat) hairs; Shanxi ..... 12. *G. crassifolium*
- 27b. Leaves dried papery; fruit with various indumentum.
- 28a. Plants ascending, weak, sparsely hairy or glabrous; inflorescence few flowered, peduncles and pedicels very thin and elongated, latter mostly 4–8 mm; fruit with spreading uncinat trichomes ..... 45. *G. salwinense*
- 28b. Plant erect, more robust, indumentum diverse; inflorescences  $\pm$  many flowered, peduncles and pedicels thicker and shorter, latter mostly 2–4 mm; fruit tuberculate, with appressed or spreading hooked trichomes, or more rarely smooth ..... 9. *G. bungei*
- 18b. Leaves with 3–5 palmate principal veins, lateral veins well marked and extending for more than half of blade length.
- 29a. Corolla funnelform or cup-shaped, 2–5 mm in diam., with fused lower part  $\pm$  as long as lobes; ovaries and fruit glabrous.
- 30a. Corolla cup-shaped or campanulate, 2–2.7 mm in diam.; cauline leaves broadly lanceolate, always in whorls of 4 ..... 30. *G. kunmingense*
- 30b. Corolla funnelform or campanulate, 2.5–5 mm in diam.; middle stem leaves ovate to elliptic, in whorls of 4–6.
- 31a. Open corollas 3.5–5 mm in diam.; cauline leaves usually in whorls of 4, 12–28 mm ..... 40. *G. platygaliun*

- 31b. Open corollas 2.5–3.5 mm in diam.; cauline leaves in whorls of 4–6(–8),  
23–53 mm ..... 32. *G. maximoviczii*
- 29b. Corolla rotate, (1–)2–5 mm in diam., with fused base much shorter than lobes.
- 32a. Leaves linear to linear-lanceolate, 27–40 × 3–9 mm, in addition to 1 principal, with  
2 weaker lateral veins; corolla 4–5 mm in diam.; ovaries and fruit with sparse  
uncinate trichomes or glabrous ..... 60. *G. turkestanicum*
- 32b. Leaves lanceolate to ovate, shorter, 3 principal veins mostly readily visible.
- 33a. Fruit glabrous, smooth to granular-papillose, or with appressed and ± hooked or with  
spreading and straight (but never with spreading and hooked) trichomes.
- 34a. Open corollas 3–4 mm in diam.; stems (except nodes) mostly glabrous and smooth.
- 35a. Leaves ovate-lanceolate to ovate, papillose, length/breadth index mostly 2.5 or  
less; cymes rather few flowered; ovaries and fruit with ± appressed, apically  
somewhat bent trichomes ..... 10. *G. chekiangense*
- 35b. Leaves mostly rather narrowly lanceolate, smooth or ± hairy, length/breadth  
index mostly 3 or more; cymes many flowered; ovaries and fruit glabrous or  
with various indumentum ..... 7. *G. boreale*
- 34b. Open corollas (1–)2–2.5 mm in diam.; stems glabrous or ± hairy.
- 36a. Cauline leaves broadly to narrowly lanceolate, length/breadth index often  
3.5 or more.
- 37a. Stems hairy throughout; leaves lanceolate; fruit with straight hairs or rarely  
glabrous ..... 24. *G. hupehense*
- 37b. Stems (except nodes) glabrous; leaves ovate-lanceolate (sometimes also broader),  
apex subacute to acuminate, striate-punctate glandular below; fruit glabrous  
and smooth ..... 29. *G. kinuta*
- 36b. Cauline leaves narrowly to broadly ovate-lanceolate, length/breadth index usually  
3 or less.
- 38a. Leaves 6–30 × 3–20 mm; fruiting pedicels straight; fruit glabrous or scaberulous;  
mainland ..... 15. *G. elegans*
- 38b. Leaves 4–10 × 2–5 mm; fruiting pedicels nodding; fruit with ± straight  
trichomes; Taiwan ..... 36. *G. nankotaizanum*
- 33b. Fruit with ± spreading and uncinat trichomes.
- 39a. Open corollas 3 mm or more in diam.; stems (except nodes) often glabrous and smooth.
- 40a. Leaves lanceolate to ovate-lanceolate or elliptic, length/breadth index 3.5 or more,  
apex acute to acuminate ..... 7. *G. boreale*
- 40b. Leaves ovate, length/breadth index less than 3.
- 41a. Leaf apex obtuse to rounded, usually mucronate; mainland ..... 26. *G. kamtschaticum*
- 41b. Leaf apex acuminate; Taiwan ..... 53. *G. takasagomontanum*
- 39b. Open corollas 2.5 mm or less in diam.; stems often ± hairy.
- 42a. Leaves ovate-lanceolate to narrowly elliptic, with acute apex, length/breadth  
index normally more than 2.5 ..... 63. *G. yunnanense*
- 42b. Leaves ovate to broadly elliptic, with obtuse to rounded apex, entire or shortly  
mucronate, length/breadth index normally less than 2.5.
- 43a. Leaves up to 20 mm wide; plants slender to usually rather robust; mainland ..... 15. *G. elegans*
- 43b. Leaves up to 10 mm wide; slender low plants; Taiwan ..... 17. *G. formosense*
- 8b. Leaves and leaflike stipules in middle stem region regularly in whorls of more than 4, i.e., in  
whorls of 5–16, with only 1 principal vein, linear to broadly lanceolate or elliptic, but never  
ovate or with a length/breadth index of less than 2.5.
- 44a. Inflorescences capitate and enclosed by leaflike bracts; corolla funnelform or salverform,  
4–15 mm, with 4 or 5 lobes.
- 45a. Plants perennial, 20–70 cm tall; calyx limb obsolete; corolla 5-lobed, 12–14 mm ..... *Phuopsis stylosa* (see p. 291)
- 45b. Plants annual; corolla 4-lobed, shorter.
- 46a. Calyx teeth well developed; corolla pink, tube 4–5 mm ..... *Sherardia arvensis* (see comments above)
- 46b. Calyx lacking; corolla bluish, tube 7–13(–15) mm ..... *Asperula orientalis* (see p. 78)
- 44b. Inflorescences branched, not enclosed by bracts; corolla rotate, campanulate,  
or funnelform, 0.5–13 mm, mostly with 4 (rarely 3) lobes.
- 47a. Medium stem leaves marginally (and often on upper side) with microhairs directed forward  
(use 20× lens), thus antrorsely ciliolate or aculeolate; stems mostly not retrorsely aculeolate.
- 48a. Ovaries and fruit densely covered with uncinat trichomes; plants perennial with smooth stems.

- 49a. Corolla funnelform, with tube  $\pm$  as long as lobes ..... 37. *G. odoratum*
- 49b. Corolla rotate, with tube markedly shorter than lobes.
- 50a. Robust, procumbent to ascending plants often longer than 50 cm; inflorescences terminal and lateral with cymes in upper 2–4 nodes ..... 59. *G. triflorum*
- 50b. Slender erect plants, less than 50 cm tall; inflorescences predominantly terminal.
- 51a. Leaves 6–25  $\times$  2–7 mm; open corollas ca. 2 mm in diam.; Taiwan (cf. also 53. *G. takasagomontanum*) ..... 14. *G. echinocarpum*
- 51b. Leaves often larger; open corollas 1.5–3.5 mm in diam.; mainland.
- 52a. Leaves mostly in whorls of 7 or 8, (ob)lanceolate, length/breadth index mostly 3.5–4.5, subpetiolate; fruit with uncinat trichomes 0.6–0.8 mm; expected in Xizang ..... 4. *G. asperuloides*
- 52b. Leaves mostly in whorls of 6, narrowly obovate to broadly oblanceolate, length/breadth index mostly 2.5–3.5, clearly petiolate; fruit with uncinat trichomes 0.8–1.2 mm or longer; widespread ..... 22. *G. hoffmeisteri*
- 48b. Ovaries and fruit glabrous or hairy, but never with uncinat trichomes; plants perennial or annual.
- 53a. Plants annual, slender; flowers on pedicels and peduncles often longer than 5 mm and in lax, diffuse inflorescences.
- 54a. Leaves filiform, 20–30 mm, ascending; corolla funnelform, pink to red; ovary and mericarps with dense, short and curved hairs ..... *Leptunis trichodes* (see p. 213)
- 54b. Leaves linear to oblanceolate, 4–20 mm, spreading to reflexed; corolla  $\pm$  rotate, whitish, yellowish, or greenish; ovary and fruit glabrous or slightly tuberculate.
- 55a. Inflorescences broadly ovate, diffuse and intricate, with fruiting pedicels elongated to 20 mm ..... 55. *G. tenuissimum*
- 55b. Inflorescences rather narrowly thyrsoid, not diffuse and intricate, with fruiting pedicels only up to 4 mm ..... 19. *G. ghilanicum*
- 53b. Plants perennial, slender to robust; flowers on pedicels and peduncles 0.5–5 mm, in lax to  $\pm$  congested inflorescences.
- 56a. Corolla funnelform, lobed for 1/2–2/3, white.
- 57a. Inflorescences lax,  $\pm$  ebracteate; stems erect, smooth; main stem leaves 15–65  $\times$  3–12 mm ..... 38. *G. paniculatum*
- 57b. Inflorescences congested, strongly bracteate; stems procumbent, mostly  $\pm$  hairy; main stem leaves 5–23  $\times$  1–2(–5) mm ..... 23. *G. humifusum*
- 56b. Corolla rotate, lobed for 3/4 or more, often yellowish; plants erect to ascending.
- 58a. Leaves in middle stem region in whorls of not more than 6; plants of (sub)alpine region, not taller than 30 cm ..... 46. *G. saurense*
- 58b. Leaves in middle stem region in whorls of more than 6 and up to 12.
- 59a. Open corollas 3.5–5 mm in diam., white; fruit somewhat spongy or fleshy, 3–3.5 mm, with a dry pericarp separating from rest of fruit ..... 8. *G. bullatum*
- 59b. Open corollas ca. 3 mm in diam., yellow to whitish; fruit with dry mericarps, 1.5–2 mm, with pericarp dark and firmly attached to rest of fruit.
- 60a. Leaves mostly 2.5–5 mm wide, glabrous abaxially; fruit ca. 1.5 mm ..... 11. *G. consanguineum*
- 60b. Leaves 1–2.5 mm wide, glabrous to densely pubescent abaxially; fruit 1.5–2 mm ..... 62. *G. verum*
- 47b. Medium stem leaves marginally (not on leaf surface) with microhairs directed backward (use 20 $\times$  lens), thus retrorsely aculeolate or completely glabrous and smooth; stems often retrorsely aculeolate.
- 61a. Annuals, often in  $\pm$  disturbed, weedy habitats; stems and leaf margins retrorsely aculeolate; fully developed mericarps subspherical, 2–6 mm; open corollas 1–2 mm in diam.
- 62a. Fruit becoming pendulous on arching peduncles and pedicels, verrucose to spinulose; leaves glabrescent above ..... 57. *G. tricornutum*
- 62b. Fruit on divaricate straight peduncles and pedicels (only latter sometimes bent just beneath fruit), mostly with uncinat trichomes; leaves  $\pm$  hairy above.
- 63a. Open corollas 1.5–2 mm in diam.; individual mature mericarps 2.5–5 mm in diam., with trichomes arising from tuberculate bases ..... 2. *G. aparine*
- 63b. Open corollas 1–1.5 mm in diam.; individual mature mericarps 1–3 mm in diam., with trichomes straight from base ..... 50. *G. spurium*
- 61b. Perennials, in  $\pm$  natural habitats; fully developed mericarps ellipsoid, 1.5–3 mm; open corollas 1–4 mm in diam.

- 64a. Middle stem leaves narrowly obovate to oblanceolate, mostly  $18-28 \times 5-10$  mm; stems slightly retrorsely aculeolate; inflorescences of medium size, with terminal and lateral, few- to several-flowered, rather loose cymes with small bracts, in fruit stiffly divaricate; corolla rotate, 1.5–2 mm in diam.; fruit with hooked trichomes ..... 58. *G. trifloriforme*
- 64b. Middle stem leaves mostly smaller; inflorescences different, usually more bracteate; fruit smooth, verrucose, or with hooked trichomes.
- 65a. Corolla funnelform to subcampanulate, with tube  $\pm$  as long as or slightly shorter than lobes, whitish; ovaries and fruit glabrous, smooth or verrucose; leaves papery to subleathery and glossy; stems rough, retrorsely aculeolate, procumbent to clambering.
- 66a. Corolla funnelform; plants robust, 0.6–1.2 m, often forming mats; main stem leaves  $8-50 \times 2-8$  mm ..... 28. *G. karataviense*
- 66b. Corolla subcampanulate; plants slender and  $\pm$  erect, 10–60 cm tall; main stem leaves  $3-16 \times 1-3$  mm ..... 61. *G. uliginosum*
- 65b. Corolla rotate, fused basal part much shorter than lobes; ovaries and fruit with hooked trichomes, tuberculate, or glabrous; stems glabrous, rough, or hairy.
- 67a. Middle stem leaves larger,  $(5-10-35(-50) \times (1-2.5-10)$  mm, mostly  $\pm$  hairy, at least margins retrorsely aculeolate; cymes lateral and terminal, many flowered; ovaries and fruit glabrous or with diverse indumentum; plants from lower elevations, relatively robust, erect or clambering, stems up to 0.7 m tall.
- 68a. Stems branched from base; cymes leafy, with bracts to last branches; stems and leaves (nodes and margins excepted) glabrous and smooth; mericarps with spreading uncinat trichomes ..... 48. *G. sichuanense*
- 68b. Stems normally branched from middle; cymes usually less leafy; stems and leaves mostly with more indumentum; fruit glabrous, papillose, tuberculate, or with uncinat trichomes.
- 69a. Peduncles and pedicels slender, filiform and often  $\pm$  flexuose, with inconspicuous bracts; pedicels up to 5 mm, in fruit elongated to 10 mm or more; flowers never reddish; plants usually clambering; ovary and fruit surfaces diverse.
- 70a. Fruit often with uncinat trichomes; mainland ..... 13. *G. dahuricum*
- 70b. Fruit glabrous; Taiwan ..... 52. *G. taiwanense*
- 69b. Peduncles and pedicels rather stiff and often divaricate and  $\pm$  bracteate; pedicels shorter than 5 mm and hardly elongated in fruit; ovary and fruit surfaces diverse, but often glabrous.
- 71a. Corolla red to purple (very rarely maroon or white), 1.5–2.5 mm in diam. .... 6. *G. blinii*
- 71b. Corolla whitish, yellowish, or greenish.
- 72a. Corolla small, 1.5–2 mm in diam., yellow to greenish white, lobes aristate; inflorescences divaricate and regularly bracteate with bracts similar to but smaller than leaves, giving a diffuse miniature aspect; ovary and fruit surface variable; plants often clambering ..... 3. *G. asperifolium*
- 72b. Corolla larger, mostly more than 2 mm in diam.; inflorescences ebracteate or with bracts  $\pm$  reduced and irregularly distributed; ovary and fruit surface smooth to tuberculate; plants erect, hardly clambering.
- 73a. Leaves lanceolate, gradually narrowed into acute apex ..... 41. *G. prattii*
- 73b. Leaves subspatulate to obovate, apex rounded and abruptly narrowed into a mucro ..... 56. *G. tokyoense*
- 67b. Middle stem leaves uniformly small,  $2-12(-15) \times 0.3-3.5$  mm, glabrous and smooth to  $\pm$  hairy; cymes lateral and terminal, few flowered; ovaries and fruit with uncinat (very rarely  $\pm$  straight) trichomes or glabrous; plants from high elevations, usually reduced and weak, caespitose to procumbent, stems only up to 0.3 m.
- 74a. Ovaries and fruit with uncinat (very rarely  $\pm$  straight) trichomes.
- 75a. Leaves and stems  $\pm$  densely hispid and often retrorsely aculeolate; stems with 4 conspicuous whitish angles ..... 42. *G. pusillosetosum*
- 75b. Leaves completely glabrous and smooth or only slightly hairy and/or retrorsely aculeolate; stems with 4 inconspicuous angles.
- 76a. Leaves dried blackening, papery and thin, oblanceolate to narrowly obovate, with flat margins, hardly longer than 7 mm ..... 5. *G. baldensiforme*
- 76b. Leaves dried greenish-brownish, with  $\pm$  revolute margins, often longer than 7 mm.
- 77a. Plants nearly always smooth; leaves  $\pm$  subleathery; ovary in flower ca. 1 mm ..... 49. *G. glabriusculum*

- 77b. Plants retrorsely aculeolate at least on margins and lower side of papery leaves; ovary in flower 0.5–0.8 mm ..... 51. *G. sungpanense*
- 74b. Ovaries and fruit glabrous, smooth, papillose, or verrucose; Himalaya.
- 78a. Plants weak to procumbent but not mat-forming; cells of adaxial leaf surface relatively large, readily visible individually with 20× lens; corolla mostly whitish ..... 33. *G. megacyttarion*
- 78b. Plants procumbent and often mat-forming; cells of adaxial leaf surface small, not or hardly visible individually with 20× lens.
- 79a. Stems ± densely hairy and/or retrorsely aculeolate, with 4 conspicuous whitish angles ..... 42. *G. pusillosetosum*
- 79b. Stems glabrous or only slightly retrorsely aculeolate, with inconspicuous angles.
- 80a. Leaves on main stems 2–8.5 mm; inflorescence cymes 1- to few flowered, fascicled; corolla white, pale green, or pale yellow, with upper surface of lobes papillose ..... 1. *G. acutum*
- 80b. Leaves on main stems 5–10.5 mm; inflorescence cymes 1–6-flowered; corolla nearly always red or purple, with upper surface of lobes glabrous and smooth except ± puberulent on margins and central vein ..... 43. *G. rebae*

**1. *Galium acutum*** Edgeworth, Trans. Linn. Soc. London 20: 61. 1846.

尖瓣拉拉藤 jian ban la la teng

Herbs, perennial, procumbent, much branched, mat-forming. Stems up to 30 cm, 4(or 6)-angled, glabrous, smooth or sometimes with scattered (very rarely more dense) short and straight hairs. Leaves in whorls of up to 6, sessile; blade drying papery and blackish, linear-oblongate to narrowly elliptic-oblongate, 2–8.5 × 0.3–1.5 mm, glabrous and smooth, occasionally with straight hairs, base cuneate, margins flat to thinly revolute, very rarely antrorsely aculeolate, apex acute, ± contracted and mucronate; vein 1. Inflorescences with terminal and axillary cymes, 1- to few flowered; peduncles (1.5–)3–8(–10) mm; pedicels (0.1–)0.5–2(–3) mm, glabrous, smooth. Ovary ellipsoid-obovoid, ca. 0.5 mm, didymous, glabrous. Corolla white, pale greenish, or yellowish, rotate, 1.2–3.5 mm in diam., glabrous to puberulent, lobed for 2/3 or more; lobes 4, lanceolate-spatulate, inside (i.e., adaxially) papillose, shortly acuminate. Mericarps ellipsoid, ca. 1 × 0.4–0.6 mm, glabrous, smooth or granular-verruculose, often on elongating pedicels. Fl. and fr. Jul–Oct.

Mountain rocks and slopes; 2000–4100 m. ?Sichuan, Xizang, ?Yunnan [India, Nepal, Pakistan].

*Galium acutum* is a (sub)alpine Himalayan member of the *G. asperifolium* group (see under that species). This group of taxa can be divided into subgroups: (1) from lower elevations and (2) from higher elevations. The latter subgroup is represented in the W Himalaya of Pakistan by *G. acutum* alone (Nazimuddin & Ehrendorfer, Pl. Syst. Evol. 155: 71–75. 1987). Mill (Edinburgh J. Bot. 53: 193–213. 1996; Fl. Bhutan 2(2): 825–834. 1999) has analyzed both subgroups in detail with emphasis on their E Himalayan members. Among subgroup (2) he recognized three species: *G. acutum* and the newly described *G. rebae* and *G. megacyttarion*. The only material from China incorporated in Mill's study are specimens of *G. rebae* from Xizang deposited at E and BM. Additional species from subgroup (2) from the C and E Himalaya and adjacent China treated here are *G. baldensiforme*, *G. pusillosetosum*, *G. glabriusculum*, and *G. sungpanense*. They appear well separable from *G. acutum*.

*Galium acutum* and *G. rebae* are very closely related taxa. Mill (loc. cit. 1996: 199) presented a differential table which has been incor-

porated into the present descriptions. Nevertheless, from the material available now, it appears that only flower color (white or greenish white in *G. acutum* and reddish crimson in *G. rebae*) is really decisive for their separation. Furthermore, at lower elevations, *G. acutum* appears linked to *G. asperifolium* var. *sikkimense*. Cufodontis (Oesterr. Bot. Z. 89: 239. 1940) has described such transitional forms with longer and ± retrorsely aculeolate stems and hairy corolla lobes from the Indian Himalaya as *G. acutum* var. *trichanthum* Cufodontis.

Mill (loc. cit. 1996: 194–198) considered *Galium acutum* to be restricted to the NW Himalaya except for one provisionally identified specimen from Sikkim. In contrast, specimens studied by us from the herbaria PE, KUN, and WU clearly show that *G. acutum* extends much further to the east, reaching Yunnan and Sichuan.

*Galium himalayense* was regarded as a synonym of *G. acutum* by Cufodontis (loc. cit.: 239–243). Mill (loc. cit. 1996: 195; loc. cit. 1999: 831–832) agreed but maintained the taxon as *G. acutum* var. *himalayense* and described its sympatric occurrence with *G. acutum* var. *acutum* throughout the NW Himalaya. As Mill did not consider the possible occurrence of flower dimorphism in *G. acutum*, it remains uncertain whether the flower and stigma size differences listed are possibly correlated with male and female plants or simply correspond to hermaphroditic variants within the morphological amplitude of the species. In order to stimulate such studies and to clarify the distribution of the two taxa in China, a key and descriptions (according to Mill, loc. cit. 1996) follow:

- 1a. Open corollas 2.3–3.5 mm in diam.; stigmas united to near middle, in total length subequal to stamens ..... 1a. var. *acutum*
- 1b. Open corollas 1.2–2.3 mm in diam.; stigmas united only shortly at base, in total length shorter than stamens ..... 1b. var. *himalayense*

#### 1a. *Galium acutum* var. *acutum*

尖瓣拉拉藤(原变种) jian ban la la teng (yuan bian zhong)

*Galium asperifolium* Wallich var. *setosum* Cufodontis.

Leaves of main stems with blades mucronate at apex, mucro 0.2–0.45 mm. Corolla 2.3–3.5 mm in diam.; lobes 1.9–4 × as long as wide, mucronate with mucro 0.15–0.3 mm. Stigmas united to near middle, in total length subequal to stamens. Fl. and fr. Jul–Oct.

Mountain rocks and slopes; 2000–4100 m. ?Sichuan, Xizang, ?Yunnan [India, Nepal, Pakistan].

**1b. *Galium acutum* var. *himalayense*** (Klotzsch & Garcke) R. Mill, Edinburgh J. Bot. 53: 195. 1996.

喜马拉雅尖瓣拉拉藤 xi ma la ya jian ban la la teng

*Galium himalayense* Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar, 88. 1862.

Leaves of main stems with blade submucronate at apex, mucro 0.15–0.2 mm. Corolla 1.2–2.3 mm in diam.; lobes 1.4–2.75 × as long as wide, acute or submucronate with mucro to 0.1 mm. Stigmas united only shortly at base, in total length shorter than stamens. Fl. and fr. Jul–Oct.

Mountain rocks and slopes; 2000–4100 m. ?Sichuan, Xizang, ?Yunnan [India, Nepal];

**2. *Galium aparine*** Linnaeus, Sp. Pl. 1: 108. 1753, s.s.

原拉拉藤 yuan la la teng

Herbs, annual, procumbent or clambering. Stems 30–90 cm high, 4-angled, 1–4 mm in diam., branched from base, retrorsely aculeate along angles, glabrescent to pilose at nodes. Leaves at middle stem region in whorls of 6–10, subsessile; blade drying papery, narrowly oblanceolate to narrowly oblong-oblanceolate, 10–60 × 3–10 mm, usually somewhat pilosulous or hispidulous adaxially, retrorsely aculeolate along midrib abaxially, base acute, margins flat to thinly revolute, retrorsely aculeolate, apex acute and shortly mucronate; vein 1. Inflorescences terminal and axillary, cymes 2- to several flowered; axes glabrous to aculeolate; bracts ± leaflike or none, 1–5 mm; peduncles 1–5 cm; pedicels 1–30 mm, finally elongating and sometimes curved directly under fruit. Ovary subglobose, 0.3–0.5 mm, with uncinat trichomes. Flowers hermaphroditic. Corolla yellowish green or white, rotate, 1.5–2 mm in diam.; lobes 4, triangular to ovate, acute. Mericarps subglobose to kidney-shaped, 2.5–5 mm, with a dense cover of uncinat trichomes 0.4–1.2 mm from swollen base. Fl. Mar–Jul, fr. Apr–Nov.

Forest margins, riversides, meadows, open fields, farmlands; near sea level to 2500 m. Evidently rare in China and possibly only introduced [originally in W Eurasia and the Mediterranean, but today nearly worldwide as an adventive].

The *Galium aparine* group (*G.* sect. *Aparine*, formally part of *G.* sect. *Kolgyda* s.l.) forms an annual, extremely polymorphic, and predominantly autogamous polyploid complex, also called *G. aparine* s.l. or *G. aparine* agg. One has to consider as possible perennial ancestors the morphologically very close E Asiatic taxa (e.g., *G. sungpanense*: see there) and other annuals, such as the Aegean endemic *G. monachinii* Boissier & Heldreich (2x, 2n = 22) and the Eurasian and African *G. spurium* (2x and 4x, 2n = 20, 40). By allopolyploidy they apparently have contributed in the Mediterranean and W Eurasia to *G. aparine* s.s. (4x, 6x, and 8x with ± euploid and slightly oscillating aneuploid chromosome numbers), which today has become a nearly worldwide weed (Ehrendorfer et al., Fl. Iranica 176: 239. 2005).

Many authorities, including Cufodontis (Oesterr. Bot. Z. 89: 245–247. 1940) and W. C. Chen (in FRPS 71(2): 234–237. 1999), have treated all these plants under *Galium aparine* s.l. and recognized four varieties: var. *aparine*, var. *echinospermum*, var. *leiospermum*, and var. *tenerum*. Whereas the first refers to *G. aparine* s.s. described above, the

latter three should be assigned to *G. spurium* (see there). Here, we follow the narrow circumscription of *G. aparine* s.s. and the specific separation of *G. spurium* outlined above, in spite of occasional difficulties in separating the two taxa on the basis of flower and mericarp size. A relevant survey of extensive Chinese material at the herbaria PE and KUN has clearly shown the common and wide occurrence of *G. spurium* in comparison with the rare and only occasional documentation of *G. aparine* s.s. Only future karyosystematic studies on the group in E Asia will clarify their distribution and ecological position. With respect to the common confusion of members of the *G. aparine* group with other annual and perennial taxa of *Galium* see *G. spurium*.

**3. *Galium asperifolium*** Wallich in Roxburgh, Fl. Ind. 1: 381. 1820.

楔叶律 xie ye lu

?*Galium cavaleriei* H. Léveillé; ?*G. esquirolii* H. Léveillé.

Herbs, perennial, weak to climbing or trailing, usually much branched. Stems 20–70 cm, 4-angled to 4-winged, villosulous to hirtellous and/or sparsely aculeolate to smooth. Leaves on main stems in whorls of up to 6(–8), sessile or with very short (ca. 1 mm) petiole; blade drying papery to leathery, adaxially dark green and shiny, abaxially paler, oblanceolate-oblong, oblanceolate, or obovate, (5–)10–20(–25) × (1–)1.5–4(–6) mm, adaxially scaberulous, hirtellous to glabrous, abaxially densely villosulous, hirsute, pilose to glabrous, base acute to cuneate, margins retrorsely aculeolate and ± hairy, flat to thinly revolute, apex obtuse, rounded, truncate, or emarginate and shortly mucronate; vein 1. Inflorescences ± paniculate, up to 18 cm, expanding through growing season, with terminal and axillary, several- to many-flowered cymes; peduncles glabrous to rarely villosulous, regularly spreading to divaricate, with a dichasial branching pattern, at most nodes with leaflike bracts (1–4 mm); pedicels 0.2–2.5 mm. Ovary obovoid, 0.2–0.3 mm, mostly glabrous or smooth, but sometimes also verrucose, hirtellous, or with undeveloped uncinat trichomes. Corolla greenish white or yellow, rotate, 1.5–2 mm in diam., glabrous, lobed for 2/3 or more; lobes 4, triangular-ovate, filamentous-aristate (rarely only acute). Mericarps ellipsoid, 1–2 mm, glabrous and smooth or rarely granular-tuberculate, hirtellous, or with appressed to spreading hooked trichomes, on pedicels often slightly elongating to 4 mm. Fl. and fr. (May–)Jun–Sep(–Oct).

Mountain slopes, farmland sides, riversides and beaches, grasslands, forests, thickets, ditch sides, open fields, meadows; 400–3500 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Xizang, Yunnan [Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Thailand].

*Galium asperifolium* is an exceedingly variable and widespread species and was the first described from a larger assembly of taxa, here called *G. asperifolium* group and provisionally placed into *G.* sect. *Trachygalium* (but certainly not into *G.* sect. *Leptogalium* as in Yamazaki, Fl. Japan 3a: 238–239. 1993, or into *G.* sect. *Leiogalium* as in W. C. Chen, FRPS 71(2): 271. 1999). According to Cufodontis (Oesterr. Bot. Z. 211–251. 1940), Nazimuddin and Ehrendorfer (Pl. Syst. Evol. 155: 71–75. 1987), Mill (Edinburgh J. Bot. 53: 193–213. 1996; Fl. Bhutan 2(2): 825–834. 1999), Ehrendorfer et al. (Fl. Iranica 176: 194. 2005), and the present treatment, the center of diversity of the *G. asperifolium* group lies in the E Himalaya and SW China. Within this area, two subgroups of taxa can be recognized, one with larger plants, longer than 10 mm middle stem leaves, and many-flowered cymes from lower eleva-

tions (1), the other with more condensed growth, shorter middle stem leaves, and 1- to few-flowered cymes from higher elevations (2). Both subgroups include taxa with whitish, yellowish to greenish, and others with reddish, purplish, or brownish flower color. The (sub)alpine subgroup (2) is briefly surveyed under *G. acutum*. Subgroup (1), discussed here, is represented by taxa with  $\pm$  whitish flowers: *G. subfalcatum* Nazimuddin & Ehrendorfer and *G. campylotrichum* Nazimuddin & Ehrendorfer in the W Himalaya of Pakistan and the widespread *G. asperifolium* with its var. *sikkimense* (= *G. sikkimense*) in the C and E Himalaya (including Bhutan). In addition, subgroup (1) includes taxa with a more easterly distribution, extending from China into the remaining parts of E Asia (including Japan): *G. dahuricum* (including *G. comarii*, *G. manshuricum*, *G. newerthii*, and *G. pseudoasprellum*), *G. prattii*, *G. taiwanense*, and *G. tokyoense*. Subgroup (1) taxa with reddish flowers are *G. blinii* in SW China and the newly described Bhutan endemic *G. craticulatum* R. R. Mill (see also Mill, loc. cit. 1996; loc. cit. 1999).

Because of its great variability with respect to habit and the indumentum of stems, leaves, and fruit, *Galium asperifolium* is often not easily separable from its closest relatives, and transitional forms occur. Its best differential characters are the many-flowered, divaricate, distally dichasial branching, and strongly bracteate cymes and the small yellowish-greenish flowers with aristate corolla lobes. *Galium blinii* mainly deviates by larger, reddish flowers and non-aristate corolla lobes. The filiform and flexuose peduncles and pedicels separate *G. dahuricum*, and the less bracteate inflorescences and larger flowers separate *G. prattii*, *G. taiwanense*, and *G. tokyoense*. To the taxa of the (sub)alpine subgroup (2, e.g., *G. acutum*) *G. asperifolium* is linked particularly through its var. *sikkimense*.

In addition to its natural complexity, the taxonomy of the *Galium asperifolium* group is rendered difficult by a number of badly described and insufficiently documented species created by H. Léveillé. On the basis of the studies by Cufodontis (loc. cit.), Lauener and Ferguson (Notes Roy. Bot. Gard. Edinburgh 32: 103–115. 1973), Mill (loc. cit. 1996), and our own judgment, we suggest to dispose of them in the following way: *Galium blinii* is maintained as a separate species (possibly with *G. bodinieri* and *G. quinatum* as synonyms), whereas *G. cavaleriei* and *G. esquirolii* (and “*G. cuneatum* H. Léveillé,” though a nomen nudum) are provisionally assigned as synonyms to *G. asperifolium* s.l. (including var. *sikkimense*); *G. comarii* and *G. newerthii* are treated as synonyms of *G. dahuricum*.

The following schematic key to the varieties of *Galium asperifolium* corresponds to W. C. Chen (loc. cit.: 271–274) who mainly followed Cufodontis (loc. cit.: 239–240). Only *G. asperifolium* var. *setosum* has been eliminated because it clearly is a synonym of *G. acutum*. Individuals with uncinat trichomes on ovaries and fruit, but otherwise identical to typical *G. asperifolium*, are reported here for the first time. They still lack a varietal name and are provisionally accommodated under var. *asperifolium*. In contrast to Mill (loc. cit. 1996; loc. cit. 1999), *G. sikkimense* is here again reduced to varietal status under *G. asperifolium*, following Cufodontis (loc. cit.: 241). Forms of this species with  $\pm$  glabrescent stems dominate to the east of its wide distribution area, but intraspecific and local variation of stem indumentum is so extensive and continuous as to make this character useless as a basis for specific separation. Mill (loc. cit. 1996: 201–212) assumed *G. asperifolium* var. *asperifolium* to be most common in C and W Nepal and to be replaced by var. *sikkimense* toward the east. This statement is in conflict with the data on distribution in China from Chen (loc. cit.) and our own observations presented below. In view of the taxonomical complexity of the *G. asperifolium* group and the common misinterpretation of its members, further careful studies are obligatory.

- 1a. Plants stout, often clambering; stems usually villosulous to hirtellous and  $\pm$  densely

retrorsely aculeolate; leaf blade relatively large, often oblanceolate-oblong,  $\pm$  hairy and marginally retrorsely aculeolate; inflorescence large, many flowered; corolla lobes aristate.

2a. Ovary and fruit glabrous, smooth, granular-tuberculate, or with uncinat trichomes ..... 3a. var. *asperifolium*

2b. Ovary and fruit hirtellous ..... 3b. var. *lasiocarpum*

- 1b. Plants often  $\pm$  smaller; stems with  $\pm$  reduced indumentum; leaf blade smaller, often more lanceolate, more weakly retrorsely aculeolate to smooth along margins; inflorescence with fewer flowers; corolla lobes apiculate to acute.

3a. Mericarps smooth ..... 3c. var. *sikkimense*

3b. Mericarps granular-tuberculate ..... 3d. var. *verrucifructum*

### 3a. *Galium asperifolium* var. *asperifolium*

楔叶律(原变种) xie ye lü (yuan bian zhong)

*Galium pseudohirtiflorum* H. Li.

Plants stout, often clambering. Stems 20–70 cm, much branched, villosulous or hirtellous,  $\pm$  retrorsely aculeolate. Leaf blade often larger, oblanceolate-oblong, mostly  $\pm$  hirsute and with margins retrorsely aculeolate. Inflorescences large, with many-flowered cymes. Corolla lobes filamentous-aristate. Ovary and fruit glabrous and smooth, verrucose, or rarely with uncinat trichomes. Fl. and fr. Jun–Sep.

Mountain slopes; 1200–3000 m. Guizhou, Sichuan, Xizang, Yunnan [Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Thailand].

**3b. *Galium asperifolium* var. *lasiocarpum*** W. C. Chen, Acta Phytotax. Sin. 28: 303. 1990.

毛果楔叶律 mao guo xie ye lü

Ovary and fruit hirtellous. Fl. and fr. May–Oct.

• Mountain slopes, farmland sides, riversides, forests; 1400–3200 m. Guangxi, Guizhou, Yunnan.

Mill (loc. cit. 1996) commented on the extensive indument variation on all organs of *Galium asperifolium* throughout most of its range but did not mention any occurrence of straight hairs on fruit in this species group, nor has anyone else besides W. C. Chen. Therefore, this variety is only provisionally included here. Its densely hirsute ovary and fruit suggests that it may belong to another species, possibly *G. pusillosetosum*.

**3c. *Galium asperifolium* var. *sikkimense*** (Gandoger) Cufodontis, Oesterr. Bot. Z. 89: 241. 1940.

小叶律 xiao ye lü

*Galium sikkimense* Gandoger, Bull. Soc. Bot. France 66: 307. 1920.

Herbs, perennial, weak to clambering or trailing. Stems 20–60 cm, usually much branched, sparsely hairy and retrorsely aculeolate to smooth. Leaves often smaller and narrower, less

hairy and retrorsely aculeate to  $\pm$  glabrous and smooth. Inflorescences large to medium sized with many- to several-flowered cymes. Corolla lobes apiculate to acute. Ovary and fruit glabrous and smooth. Fl. Jun–Sep, fr. Jul–Oct.

Mountain slopes, river beaches, ditch sides, open fields, grasslands, meadows, thickets, forests; 400–3200 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

**3d. *Galium asperifolium* var. *verrucifructum*** Cufodontis, Oesterr. Bot. Z. 89: 241. 1940.

滇小叶律 dian xiao ye lü

Similar to *Galium asperifolium* var. *sikkimense* but with granular-tuberculate fruit. Fl. and fr. Aug–Oct.

• Mountain slopes, grasslands, thickets; 2300–3500 m. Sichuan, Xizang, NW Yunnan.

The type material of this variety from Yunnan (particularly *Handel-Mazzetti* 9697, WU) consists of transitional forms toward *Galium acutum*.

**4. *Galium asperuloides*** Edgeworth, Trans. Linn. Soc. London 20: 61. 1846.

车叶律 che ye lü

Herbs, perennial, emerging from filiform reddish rhizomes. Stems weak but generally erect, 10–45 cm tall, 4-angled, glabrous and smooth, except hispidulous at nodes. Middle stem leaves and leaflike stipules in whorls of (6 or) 7 or 8, subsessile to very shortly petiolate; blade drying papery or membranous, remaining green, elliptic to narrowly oblong-ob lanceolate or lanceolate, (10–)20–50(–60)  $\times$  3–13 mm, length/breadth index mostly 3.5–4.5, glabrescent, base acute or cuneate, midrib smooth or rarely retrorsely aculeolate, margins and upper leaf side with antrorse microhairs, apex obtuse or rounded and abruptly apiculate; vein 1. Inflorescences terminal and sometimes in axils of upper leaves with few- to several-flowered cymes; axes glabrous, smooth; bracts none or few, 1–2 mm; pedicels 0.5–5 mm. Ovary ovoid, 0.5–0.8 mm, with uncinat trichomes. Corolla white or light greenish, rotate, 2.5–3.8 mm in diam., lobed for 3/4 or more; lobes 4, ovate, acute. Mericarps ellipsoid, 1.8–2.5 mm, with dense uncinat trichomes 0.6–0.8 mm, on fruiting pedicels elongating to 10 mm. Fl. Apr–Aug, fr. May–Sep.

Forests on mountain slopes, thickets, ditch sides, along rivers, meadows; 1500–2800 m. Expected in Xizang [Afghanistan, India, Kashmir, Pakistan].

*Galium asperuloides* was previously circumscribed more broadly to include as subspecies plants treated here as *G. hoffmeisteri*. The specific status of the latter is well justified (Ehrendorfer et al., Fl. Iranica 176: 193–194. 2005; see comments and differential characters under that species). When the two taxa are classified as one species, the “typical” plants have to be called *G. asperuloides* subsp. *asperuloides*. Vegetative plants are very similar to *G. odoratum*. Together with *G. echinocarpum* from Taiwan and others they constitute *G. sect. Hylaea*.

**5. *Galium baldensiforme*** Handel-Mazzetti, Symb. Sin. 7: 1029. 1936.

玉龙拉拉藤 yu long la la teng

Herbs, perennial, tender, caespitose. Stems ascending, 3–12(–25) cm tall, 4-angled, glabrous and smooth or rarely slightly retrorsely aculeolate. Leaves in whorls of up to 5 or 6, sessile; blade drying papery and blackish, oblanceolate to narrowly obovate, 2–7  $\times$  1–3 mm, mostly glabrous and smooth, but occasionally with straight hairs abaxially or marginally slightly retrorsely aculeolate, base cuneate, margin flat, apex acute and often shortly mucronate; vein 1. Inflorescences with cymes terminal and in axils of upper leaves, 1- or usually 2- or 3-flowered; peduncles up to 18 mm and pedicels 2–5 mm, glabrous and smooth, elongating during fruit development. Ovary subglobose, ca. 0.7 mm, densely covered by undeveloped trichomes. Corolla pale green, rotate, ca. 2 mm in diam., glabrous; lobes 4, triangular, acute. Mericarps ellipsoid, ca. 2 mm, with dense brownish yellow uncinat trichomes ca. 0.7 mm. Fl. Aug, fr. Aug–Oct.

• Rocky slopes, meadows, frost heave sites, river floodplains in mountains; 2800–4300 m. Qinghai, Sichuan, Xizang, Yunnan (Lijiang).

*Galium baldensiforme* belongs to the alpine subgroup (2) of the *G. asperifolium* complex within *G. sect. Trachygaleum* s.l. (see under *G. acutum* and *G. asperifolium*). It has been widely misidentified with related taxa, e.g., with *G. glabriusculum* from which it differs in its more oblanceolate, thinner leaves, blackening when dried, and a slight tendency toward more indumentum.

Two collections from Xizang (*H. Li* 1978-07-22 and *Y. T. Chang & Lang, Nie-La-Mu*, 1966-06-25, both from PE) differ from typical *Galium baldensiforme* by purple flowers (reminiscent of *G. rebae*),  $\pm$  straight whitish hairs on its (still young) ovaries, and scattered straight hairs on the upper and lower leaf sides (mainly midvein, but glabrous along leaf margins). After closer inspection and field studies, these populations may very well deserve species rank.

A specimen from Sichuan (Dege Co., anonymous collector 7029, PE) with stronger indumentum, subleathery, broadly lanceolate leaves with retrorsely aculeolate margins, and aristate corolla lobes apparently links *Galium baldensiforme* with *G. asperifolium* var. *sikkimense*.

**6. *Galium blinii*** H. Léveillé, Bull. Acad. Int. Géogr. Bot. 25: 48. 1915.

五叶拉拉藤 wu ye la la teng

?*Galium bodinieri* H. Léveillé; ?*G. quinatum* H. Léveillé & Vaniot.

Herbs, perennial, weak to climbing, trailing, or matted. Stems usually much branched, 20–70 cm, 4-angled, retrorsely aculeolate to glabrescent. Middle stem leaves in whorls of 6–8, subsessile; blade drying papery or leathery, often blackening, linear-oblong to broadly (ob)lanceolate, (5–)10–22(–30)  $\times$  (1–)2–4.5(–5.5) mm, adaxially and particularly abaxially  $\pm$  rough, base acute to cuneate, margin flat to thinly revolute, densely retrorsely aculeolate,  $\pm$  gradually narrowed into acute apex; vein 1. Inflorescences with terminal and axillary, several-flowered cymes 2–5 cm; axes  $\pm$  glabrous, often slightly divaricate, with small bracts on lower branches only; pedicels (0.2–)1–3(–5) mm. Ovary obovoid, 0.2–0.3 mm, glabrous or with undeveloped trichomes. Corolla red to purple or violet (only very rarely white), rotate, 1.5–2.5(–3) mm in diam., glabrous; lobes 4, triangular-ovate, acute. Mericarps ovoid, 1–2 mm, glabrous, smooth to verrucose, or sometimes with appressed or spreading uncinat trichomes. Fl. Jun–Sep, fr. Jul–Oct.

• Mountain slopes, river beaches, ditch sides, open fields, grasslands, meadows, thickets, forests; 800–3000 m. Guizhou, Hubei, Shaanxi, Sichuan, Xizang, Yunnan.

*Galium blinii* is a critical taxon that belongs to the lower elevation subgroup (1) of the *G. asperifolium* group (see there). It was considered a synonym of *G. asperifolium* var. *sikkimense* by Cufodontis (Oesterr. Bot. Z. 89: 241. 1940), Lauener and Ferguson (Notes Roy. Bot. Gard. Edinburgh 32: 106. 1973), and W. C. Chen (in FRPS 71(2): 273. 1999). Only Mill (Edinburgh J. Bot. 53: 204. 1996) commented on its reddish purple flowers and other differential characters, regarded it as a distinct species, and proposed to use its old but so far neglected name. Up to now, specimens of this rather widespread taxon were named as *G. asperifolium* var. *sikkimense*, *G. pseudoasprellum* var. *densiflorum*, etc. Analyses of a considerable number of relevant specimens from PE, KUN, and WU support Mill's interpretation and led to the above, more elaborate description. It shows that *G. blinii* is quite variable with respect to leaf shape and ovary/fruit indumentum but relatively well characterized not only by its reddish purple flowers but also by height, leaf size, retrorsely aculeolate stems and leaf margins, and the usually medium-sized and only small-bracteate cymes, relatively short and firm post-floral peduncles and pedicels, and larger flowers with acute (but not aristate) lobes. This allows separation from its closest relatives, *G. prattii* and *G. asperifolium* (where transitional forms occur), but also from *G. dahuricum* and *G. tokyoense*.

Further studies will have to show to what extent the following, also reddish purplish flowering taxa from SW China can be separated from *Galium blinii*: *G. craticulatum* was described as an endemic from the high mountains of Bhutan (Mill, loc. cit.: 202) and said to differ from *G. blinii* in its present circumscription by completely glabrous stems with conspicuous, vein-marked wings, less retrorsely aculeolate leaves, larger flowers, and longer filaments; *G. bodinieri*, also with reddish flowers, according to Mill (loc. cit.: 204–205) is reminiscent of *G. craticulatum* (particularly in its broadly winged stems) and may represent a link between *G. blinii* and the alpine, more condensed and shorter leaved *G. rebae*; the purple-flowered *G. quinatum* (not mentioned by Mill) was very poorly described and is listed above as a possible synonym of *G. blinii*, but types have neither been seen by Lauener and Ferguson (loc. cit.: 107) nor by us.

## 7. *Galium boreale* Linnaeus, Sp. Pl. 1: 108. 1753, s.l.

北方拉拉藤 bei fang la la teng

Herbs, perennial, erect, 20–65 cm tall. Stems 4-angled, usually glabrous, rarely shortly hairy, hispidulous at nodes, angles thickened. Leaves in whorls of 4, sessile or subsessile; blade drying papery or thinly leathery, linear-lanceolate or lanceolate to ovate, (10–)15–40(–80) × (1–)3–15 mm, glabrous or sparsely puberulent to hispidulous and/or pilose, abaxially never with striate to punctate glandular idioblasts, base cuneate to subrounded, margins usually revolute and antrorsely scaberulous to hispidulous, apex acute or usually narrowly tapered then obtuse to rounded at very tip; principal veins palmate, 3. Inflorescences terminal, elongate or broadly paniculiform, 2–15 cm, with several- to many-flowered cymes in axils of uppermost leaves and terminal; peduncles glabrous or puberulent at nodes, smooth or scaberulous; bracts ligulate, lanceolate, or elliptic, 1–4 mm; pedicels 0.5–2 mm elongating in fruit to 3.5 mm. Ovary subglobose, 0.8–1 mm, glabrous or sparsely to densely strigillose to pilosulous. Corolla white or pale yellow, rotate, 3–4 mm in diam., glabrescent, lobed for 3/4 or more; lobes 4, ovate-lanceolate, acute. Mericarps subglobose, 1–2 mm, pericarp firmly attached but sometimes ± inflated, glabrous or ± densely hairy

with ± appressed, ascending, or spreading, straight or curved, but hardly truly uncinat trichomes 0.3–0.5 mm. Fl. May–Aug(–Sep), fr. (May–)Jun–Oct.

Open forests and thickets, mountain slopes, grasslands, meadows, open fields, ditch sides, river valleys and beaches, swamps, farmland sides, wastelands; 200–4600 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, India, Japan, Kashmir, Korea, Mongolia, Pakistan, Russia; SW Asia (Armenia, Iran), Europe, North America].

The name *Galium boreale*, as used here in a wide sense, corresponds to a widespread and polymorphic, still insufficiently studied N Hemisphere polyploid complex (Ehrendorfer et al., Fl. Iranica 176: 179–181. 2005) within *G. sect. Platygaleum* s.l. In China, another species of this section with much smaller flowers, *G. kinuta*, can be separated from this *G. boreale* aggregate only with difficulties, because the two are linked by intermediate (and possibly hybrid) populations (see under *G. kinuta*).

Within the *Galium boreale* aggregate and the flora of China, W. C. Chen (in FRPS 71(2): 260–263, 285. 1999) recognized only *G. boreale* Linnaeus s.l. with numerous infraspecific taxa and *G. turkestanicum*, whereas 11 species in three series were listed for the flora of the former Soviet Union by Pobedimova et al. (Fl. URSS 23: 345–354. 1958). From these only *G. turkestanicum* is fully accepted here (*G. ussuriense* and *G. rubioides* are cited as synonyms under *G. boreale* var. *lanceolatum* and *G. boreale* var. *rubioides*). Furthermore, and according to Pobedimova et al. (loc. cit.), *G. amblyophyllum* Schrenk, *G. amurense* Pobedimova, and *G. septentrionale* Roemer & Schultes can be expected to occur in China. With the exception of the briefly mentioned *G. septentrionale*, they were not considered by W. C. Chen in FRPS and are only mentioned here. As a competent treatment of the *G. boreale* aggregate is not yet possible, we follow the schematic taxonomic differentiation proposed by Cufodontis (Oesterr. Bot. Z. 89: 225–228. 1940) and accepted by W. C. Chen (loc. cit.). This scheme defines numerous varieties according to leaf shape and the density, type, and distribution of indumentum on leaves, ovaries, and fruit. These varieties form a morphologically ± continuous series, linking the extremes: *G. boreale* var. *rubioides* with large ovate leaves and a broadly paniculate inflorescence and *G. boreale* var. *intermedium* with much smaller lanceolate leaves and an elongated narrow inflorescence. The following key and short descriptions are presented here for reference, to facilitate comparison, and to stimulate future studies.

- 1a. Ovary and fruit glabrous.
  - 2a. Leaf blade pilose or scabrous abaxially at least along veins.
    - 3a. Leaf blade linear-lanceolate or narrowly lanceolate ..... 7h. var. *lancilimbum*
    - 3b. Leaf blade ovate-lanceolate or ovate ..... 7k. var. *rubioides*
  - 2b. Leaf blade glabrous abaxially.
    - 4a. Leaf blade linear-lanceolate or narrowly lanceolate .... 7d. var. *hyssopifolium*
    - 4b. Leaf blade broadly lanceolate or ovate-lanceolate ..... 7g. var. *lanceolatum*
- 1b. Ovary and fruit ± hairy.
  - 5a. Ovary and fruit sparsely hirtellous or scabrous.
    - 6a. Leaf blade linear-lanceolate or narrowly lanceolate ..... 7e. var. *intermedium*
    - 6b. Leaf blade broadly lanceolate or ovate-lanceolate ..... 7j. var. *pseudorubioides*

5b. Ovary and fruit densely hirsute or tomentose.

7a. Leaf blade sparsely pubescent or scabrous at least along veins abaxially.

8a. Leaf blade linear-lanceolate or narrowly lanceolate .... 7c. var. *ciliatum*

8b. Leaf blade broadly lanceolate or ovate-lanceolate .... 7f. var. *kamtschaticum*

7b. Leaf blade glabrous abaxially.

9a. Leaf blade less than 4 mm wide ..... 7b. var. *boreale*

9b. Leaf blade 4–15 mm wide.

10a. Leaf blade 4–6 mm wide ..... 7a. var. *angustifolium*

10b. Leaf blade wider than 6 mm ..... 7i. var. *latifolium*

**7a. *Galium boreale* var. *angustifolium*** (Freyn) Cufodontis, Oesterr. Bot. Z. 89: 226. 1940.

狭叶砧草 xia ye zhen cao

*Galium rubioides* Linnaeus var. *angustifolium* Freyn, Oesterr. Bot. Z. 45: 341. 1895.

Leaf blade narrowly lanceolate, 4–6 mm wide, abaxially glabrous. Ovary and mericarps densely hirsute or tomentose. Fl. Jun–Aug, fr. Jul–Sep.

Mountain slopes, river valleys, swamps, grasslands, meadows; 500–3900 m. Hebei, Heilongjiang, Nei Mongol, Sichuan, Xinjiang, Xizang [Japan, Kashmir, Russia; NE Europe].

**7b. *Galium boreale* var. *boreale***

北方拉拉藤(原变种) bei fang la la teng (yuan bian zhong)

*Galium boreale* var. *vulgare* Turczaninow.

Leaf blade narrowly lanceolate or linear-lanceolate, 1–3.9 mm wide, glabrous. Ovary and mericarps densely hirsute or tomentose with slightly curved, white trichomes. Fl. May–Aug, fr. Jun–Oct.

Forests, thickets, or tussocks on mountain slopes, ditch sides, grasslands, meadows; 700–3900 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Sichuan, Xinjiang, Xizang [India, Korea, Pakistan, Russia; Europe, North America].

**7c. *Galium boreale* var. *ciliatum*** Nakai, J. Jap. Bot. 15: 340. 1939.

硬毛拉拉藤 ying mao la la teng

Leaf blade linear-lanceolate or narrowly lanceolate, 1–6 mm wide, abaxially sparsely hairy or scabrous at least along veins. Ovary and mericarps densely hirsute or tomentose. Fl. Jun–Sep, fr. Jul–Oct.

Mountain slopes, river beaches, ditch sides, open fields, meadows; 200–4600 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Russia; Europe (Finland, Romania), North America].

**7d. *Galium boreale* var. *hyssopifolium*** (Hoffmann) Candolle, Prodr. 4: 600. 1830.

斐梭浦砧草 fei suo pu zhen cao

*Galium hyssopifolium* Hoffmann, Deutschl. Fl., Dritter Jahrgang, 71. 1800; *G. boreale* f. *hyssopifolium* (Hoffmann) B. Boivin; *G. boreale* subsp. *hyssopifolium* (Hoffmann) Schübler & G. Martens; *G. rubioides* var. *hyssopifolium* (Hoffmann) Persoon.

Leaf blade linear-lanceolate or narrowly lanceolate, 1–6 mm wide, glabrous abaxially. Ovary and mericarps glabrous. Fl. and fr. Jun–Aug.

Mountain slopes, grasslands; 1800–2300 m. Sichuan, Xinjiang [Europe].

This variety probably has a wider geographic range.

**7e. *Galium boreale* var. *intermedium*** Candolle, Prodr. 4: 601. 1830.

新砧草 xin zhen cao

Leaf blade linear-lanceolate or narrowly lanceolate, 1–6 mm wide, sparsely pubescent to glabrescent. Ovary and mericarps sparsely hirtellous or scabrous. Fl. Jun–Jul, fr. Jul–Oct.

Mountain slopes, wastelands, forests, grasslands, meadows; 1500–1800 m. Gansu, Heilongjiang, Xinjiang [Russia; Europe].

**7f. *Galium boreale* var. *kamtschaticum*** (Maximowicz) Nakai, Bot. Mag. (Tokyo) 23: 103. 1909.

堪察加拉拉藤 kan cha jia la la teng

*Galium boreale* f. *kamtschaticum* Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 141. 1859; *G. boreale* var. *koreanum* Nakai.

Leaf blade broadly lanceolate or ovate-lanceolate, 6–10 mm wide, abaxially sparsely hairy or scabrous at least along veins. Ovary and mericarps densely hirsute or tomentose. Fl. and fr. Jun–Sep.

Mountain slopes, farmland sides, riversides, river valleys, grasslands, meadows; 800–2400 m. Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang [Kashmir, Korea, Mongolia, Russia; C Asia (“Turkestan”), NE Europe].

Nakai (Bot. Mag. (Tokyo) 23: 103. 1909) commented on Japanese plants and presented a key to *Galium*, including “*Galium boreale* var. *kamtschaticum* Maximowicz” with no further information. Some authors have considered this a validly published combination (e.g., in Go-vaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 16 Nov 2007), whereas others have not (e.g., W. C. Chen, loc. cit.: 263) and have instead cited J. Coll. Sci. Imp. Univ. Tokyo 31: 498. 1911 (sometimes called Fl. Koreana 2) as the place of publication. Nakai’s new combination was indeed validly published in 1909 because, before 1953, merely citing an author’s name could constitute indication of a basionym (*Vienna Code*, Art. 33.2). Pobedimova et al. (loc. cit.: 419) erroneously attributed this varietal name to Maximowicz, 1859; it was published as a “forma” there.

**7g. *Galium boreale* var. *lanceolatum*** Nakai, J. Jap. Bot. 15: 341. 1939.

光果砧草 guang guo zhen cao

*Galium boreale* var. *leiocarpum* Nakai; *G. ussuriense* Pobedimova.

Leaf blade broadly lanceolate or ovate-lanceolate, 6–12 mm wide, glabrous abaxially. Ovary and mericarps glabrous. Fl. and fr. May–Sep.

Mountain slopes, open fields, grasslands; 900–1900 m. Heilongjiang, Jilin, Xinjiang [Korea, Russia; C Asia (“Turkestan”)].

Nakai's two varieties were published simultaneously; the choice of epithet was apparently made by Cufodontis (Oesterr. Bot. Z. 89: 227. 1940).

**7h. *Galium boreale* var. *lancilimbium*** W. C. Chen, Acta Phytotax. Sin. 28: 302. 1990.

披针叶砧草 pi zhen ye zhen cao

Leaf blade linear-lanceolate or narrowly lanceolate, 1–6 mm wide, abaxially pilosulous or scabrous at least along veins. Ovary and mericarps glabrous. Fl. and fr. summer and autumn.

• Mountain slopes, grasslands, meadows, ditch sides, wastelands; 1800–3000 m. Gansu, Heilongjiang, Sichuan, Xinjiang.

**7i. *Galium boreale* var. *latifolium*** Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 18: 315. 1845.

宽叶拉拉藤 kuan ye la la teng

Leaf blade ovate-lanceolate, 6–15 mm wide, glabrous abaxially. Ovary and mericarps densely hirsute or tomentose. Fl. and fr. Jun–Sep.

Mountain slopes, grasslands, meadows, farmland sides, river beaches; 700–2700 m. Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Shanxi, Xinjiang [Kashmir, Korea, Russia; C Asia (“Turkestan”)].

**7j. *Galium boreale* var. *pseudorubioides*** Schur, Enum. Pl. Transsilv. 280. 1866.

假茜砧草 jia qian zhen cao

*Galium boreale* subsp. *pseudorubioides* (Schur) Soó.

Leaf blade broadly lanceolate or ovate-lanceolate, 5–12 mm wide, sparsely pubescent to glabrescent abaxially. Ovary and mericarps sparsely hirtellous or scabrous. Fl. and fr. Jun–Jul.

Mountain slopes, meadows; ca. 1400 m. Heilongjiang, Jilin, Xinjiang [Russia; C Asia (“Turkestan”), Europe].

**7k. *Galium boreale* var. *rubioides*** (Linnaeus) Čelakovský, Prodr. Fl. Böhmen 2: 281. 1872.

茜砧草 qian zhen cao

*Galium rubioides* Linnaeus, Sp. Pl. 1: 105. 1753.

Leaf blade ovate-lanceolate or ovate, 4–6 mm wide, abaxially pilosulous or scabrous at least along veins. Ovary and mericarps glabrous. Fl. and fr. Jun–Sep.

Mountain slopes, grasslands; 1100–1400 m. Hebei, Heilongjiang, Henan, Jilin, Liaoning, Xinjiang [Russia; Europe].

This broad- and large-leaved taxon is quite distinct from *Galium boreale* s.s. in Europe and is usually treated there as a separate species. Contrary to the above distribution data given by W. C. Chen (loc. cit.: 261) and according to Pobedimova et al. (loc. cit.: 420) it does not extend into Asia.

**8. *Galium bullatum*** Lipsky, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 300. 1894.

泡果拉拉藤 pao guo la la teng

Subshrubs, perennial, erect or ascending, sometimes caespitose, 5–40 cm tall. Rootstock stout, woody. Stems 4-angled, very shortly pilose at base, glabrous and smooth above. Leaves in whorls of 5–8, drying blackish, linear to linear-ob lanceolate, 12–27 × 1–2 mm, glabrous or sparsely ciliate toward acute apex; vein 1. Inflorescences terminal on main and short lateral branches, cymose to corymbiform, lax, few to several flowered; axes glabrous and smooth; bracts reduced or none; pedicels 1–4 mm. Ovary ovoid, ca. 1.5 mm, glabrous. Corolla white, cup-shaped to subrotate, 3.5–5 mm in diam., glabrous; lobes 4, lanceolate-oblong, slightly mucronulate. Fruit usually from 1 mericarp only, subglobose, 3–3.5 mm in diam., glabrous, smooth, white, with pericarp inflated, spongy to ± fleshy. Fl. Jun–Jul, fr. Jul–Aug.

Grasslands, meadows; ca. 500 m. ?Xinjiang [SW Asia (Armenia, ?Iran, Nakhichevan)].

*Galium bullatum* is a member of *G* sect. *Orientigalium* centered in SW Asia and characterized by slightly cup-shaped corollas, never retrorsely aculeolate stems, etc. The above diagnosis is taken from the original description and a collection by Szovits in W (“in Persia borealis”). We have not seen a specimen from China. The description by W. C. Chen (in FRPS 71(2): 274. 1999), evidently based on plants from Xinjiang, deviates from the authentic material in W by describing the stems as retrorsely hispidulous along angles and the corolla as rotate. Species of *G* sect. *Orientigalium* usually are rather locally distributed (Ehrendorfer et al., Fl. Iranica 176: 205–231. 2005), and the distance between Nakhichevan and Xinjiang is enormous. All this makes it quite unlikely that *G. bullatum* (or even other related members of *G* sect. *Orientigalium*) really occurs in China. A definite decision has to wait until voucher specimens become available for comparison.

**9. *Galium bungei*** Steudel, Nomencl. Bot., ed. 2, 1: 657. 1840.

四叶律 si ye lü

Herbs, perennial, 5–50 cm tall, erect from tender reddish rootstock or filiform rhizome. Stems often caespitose, 4-angled, unbranched or little branched, smooth, glabrous and smooth or pilosulous to pilose, rarely retrorsely aculeolate, at nodes ± hispidulous. Leaves in whorls of 4, subsessile; blade drying papery, ovate-oblong, ovate-lanceolate, lanceolate-oblong, elliptic-oblong, or narrowly oblanceolate, (6–)8–20(–34) × (2–)3–7(–10) mm, length/breadth index usually 3–5, glabrous and sometimes antrorsely aculeolate on midrib and near margins, to pilosulous or pilose throughout, lower side sometimes glandular-punctate or striate, base cuneate, apex acute or slightly obtuse; 1 principal vein, 2 lateral veins usually inconspicuous. Inflorescences terminal and/or axillary, cymose to paniculate, congested to lax, cymes few to several flowered, 1–5 cm; peduncles glabrous, smooth; bracts none or few, spatulate to narrowly elliptic, 1–5 mm; pedicels (1–)2–4(–7) mm. Ovary subglobose to ellipsoid, laterally somewhat flattened, 0.4–0.8 mm, glabrous to strigillose, smooth to tuberculate. Corolla yellowish green or white, rotate, 1.5–2.5 mm in diam., glabrescent; lobes 4, ovate or oblong, acute to acuminate. Mericarps ellipsoid, 1–2 mm, tuberculate, aculeolate or with appressed and curved to spreading and uncinat trichomes ca. 0.3 mm, rarely glabrous and smooth. Fl. Apr–Sep, fr. May–Jan.

Forests, thickets, or meadows on mountains, hills, open fields, farmlands, ditch sides, riversides and beaches, streamsides; near sea level to 3600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

*Galium bungei* designates a group of tender perennial herbs from *G. sect. Platygali*, widespread and common at low to middle elevations throughout China. *Galium bungei* is also used medicinally there. The group is very variable with respect to habit and inflorescence, as well as stem, leaf, and fruit indumentum (the latter from tuberculate to spreading hooked trichomes). The small and inconspicuous flowers suggest autogamous reproduction. All this has caused the recognition of several "species." In view of the gradual nature of this variation and the partly simple genetic basis of the underlying differences, we give them less taxonomic weight, follow Cufodontis (Oesterr. Bot. Z. 89: 219–223. 1940) and the Key Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010), and include them all as synonyms under *G. bungei* s.l. Only the closely related *G. salwinense*, endemic in Sichuan and Yunnan, is maintained on the basis of its elongated and slender pedicels and the constant hooked fruit trichomes.

Forms of *Galium bungei* with broader leaves in Sichuan (e.g., var. *punduanoides*) develop, in addition to the principal vein, stronger side veins somewhat approaching the larger *G. yunnanense*, typically with 3-veined leaves, which occurs in the same area.

To bring some schematic order into the extreme variation of a broadly circumscribed *Galium bungei* s.l., Cufodontis (loc. cit.: 221–222) created six varieties, without giving much weight to differences in fruit surface. These varieties were taken up by W. C. Chen in FRPS (71(2): 247–250. 1999) and are also presented here. In contrast to this approach, Yamazaki (J. Jap. Bot. 61: 51. 1991; Fl. Japan 3a: 236–237. 1993) recognized several of these varieties as species for the *Flora of Japan*: *G. pogonanthum* (corresponding to *G. bungei* var. *setuliflorum*), separated by having appressed upcurved short hairs on its fruit rather than spreading hooked trichomes as *G. bungei* s.s.; *G. gracilens* (corresponding to *G. bungei* var. *bungei*), characterized by short appressed punctate fruit hairs and slender inflorescences; and *G. trachyspermum* (corresponding to *G. bungei* var. *trachyspermum*), with short appressed hooked fruit hairs and more condensed inflorescences. For each of these segregate species Yamazaki (loc. cit. 1991; loc. cit. 1993) also created several new additional varieties not considered here. For their treatment of Taiwanese members of *G. bungei* s.l. Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 105–106. 1998; Fl. Taiwan, ed. 2, 4: 255–256. 1998) accepted two species: *G. gracilens* with tuberculate fruit and *G. fukuyamae* with appressed uncinat fruit hairs. Below, we present the schematic infraspecific classification of W. C. Chen in FRPS. Descriptions are sketchy due to the limited material available. Nevertheless, this may help as a reference and basis for urgently needed future studies on this polymorphic and phylogenetically important group.

- 1a. Stems pubescent.
  - 2a. Pubescence with trichomes shorter than diam. of stems ..... 9c. var. *hispidum*
  - 2b. Pubescence with trichomes longer than diam. of stems ..... 9d. var. *punduanoides*
- 1b. Stems glabrous, hairy only at nodes.
  - 3a. Corolla lobes sparsely pubescent at least in bud ..... 9e. var. *setuliflorum*
  - 3b. Corolla lobes glabrous.
    - 4a. Leaf blade broadly elliptic, obovate, or broadly lanceolate;

inflorescences crowded, congested to subcapitate

- ..... 9f. var. *trachyspermum*
- 4b. Leaf blade narrowly lanceolate, linear-lanceolate, or ovate-lanceolate; inflorescences lax.
  - 5a. All leaves narrowly lanceolate or linear-lanceolate, to 3 cm ..... 9a. var. *angustifolium*
  - 5b. Lower stem leaves ovate-lanceolate, upper stem leaves narrower, often less than 2 cm ..... 9b. var. *bungei*

**9a. *Galium bungei* var. *angustifolium*** (Loesener) Cufodontis, Oesterr. Bot. Z. 89: 221. 1940.

狭叶四叶律 xia ye si ye lü

*Galium gracile* f. *angustifolium* Loesener, Beih. Bot. Centralbl., Abt. 2, 37: 182. 1920.

Leaf blade narrowly lanceolate or linear-lanceolate, to 3 cm. Fl. Jun–Jul, fr. Aug–Oct.

• Anhui, Fujian, Gansu, Hebei, Henan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Zhejiang.

**9b. *Galium bungei* var. *bungei***

四叶律(原变种) si ye lü (yuan bian zhong)

*Galium fukuyamae* Masamune; *G. gracile* Bunge (1833), not Wallroth (1822); *G. gracile* var. *miltorrhizum* (Hance) Loesener; *G. gracilens* (A. Gray) Makino; *G. hutchuense* Nakai; *G. miltorrhizum* Hance; *G. remotiflorum* H. Léveillé & Vaniot; *G. trachyspermum* A. Gray var. *gracilens* A. Gray.

Stems glabrous. Leaf blade ovate-lanceolate at lower part, attenuate at upper part. Inflorescence paniculate and lax. Corolla glabrous. Fl. Apr–Sep, fr. May–Jan.

Forests or meadows on hills or mountains, open fields, farmlands, ditch sides; below 100–2600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**9c. *Galium bungei* var. *hispidum*** (Matsuda) Cufodontis, Oesterr. Bot. Z. 89: 222. 1940.

硬毛四叶律 ying mao si ye lü

*Galium gracile* f. *hispidum* Matsuda, Bot. Mag. (Tokyo) 26: 130. 1912; ?*G. martini* H. Léveillé & Vaniot; *G. trachyspermum* var. *hispidum* (Matsuda) Kitagawa.

Stems soft pubescent, trichomes shorter than diam. of stem. Fl. Apr–Jun, fr. May–Sep.

• Forests or meadows on mountain slopes, river beaches, open fields; 100–3400 m. Anhui, Fujian, Gansu, Henan, Hubei, Jiangsu, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang.

In the protologue Cufodontis correctly cited the basionym of his variety but incorrectly gave his varietal name as “var. *hispidum* (Kitag.) Cufodontis” when the basionym author was actually Matsuda.

*Galium martini* was accepted as a dubious species by W. C. Chen in FRPS (loc. cit.: 282). The protologue (Bull. Soc. Bot. France 55: 58. 1908) is quite incomplete but probably refers to a strongly hairy plant of *G. bungei* s.l. from Guizhou. Therefore, the name is provisionally placed here as a possible synonym of var. *hispidum* or var. *punduanoides* until a detailed study of the type (E) will clarify the matter.

**9d. *Galium bungei* var. *punduanoides*** Cufodontis, Oesterr. Bot. Z. 89: 222. 1940.

毛四叶律 mao si ye lü

?*Galium martini* H. Léveillé & Vaniot.

Stem soft to stiffly pubescent, trichomes longer than diam. of stems. Inflorescence often more congested and terminal. Fl. Jun–Jul, fr. Jul–Aug.

• Forests, thickets, or meadows on mountains, open fields, riversides; 900–3600 m. Gansu, Jiangsu, Sichuan, Yunnan.

**9e. *Galium bungei* var. *setuliflorum*** (A. Gray) Cufodontis, Oesterr. Bot. Z. 89: 221. 1940.

毛冠四叶律 mao guan si ye lü

*Galium trachyspermum* var. *setuliflorum* A. Gray, Mem. Amer. Acad. Arts, n.s., 6: 393. 1859; *G. pogonanthum* Franchet & Savatier; *G. pogonanthum* var. *setuliflorum* (A. Gray) H. Hara; *G. setuliflorum* (A. Gray) Makino.

Corolla lobes sparsely pubescent at least in bud.

Jiangsu, Shanxi [Japan, Korea].

**9f. *Galium bungei* var. *trachyspermum*** (A. Gray) Cufodontis, Oesterr. Bot. Z. 89: 221. 1940.

阔叶四叶律 kuo ye si ye lü

*Galium trachyspermum* A. Gray in Perry, Narr. Exped. China Japan 2: 313. 1856; *G. venosum* H. Léveillé.

Leaf blade broadly elliptic, obovate, or broadly lanceolate. Inflorescences congested to subcapitate. Fl. Apr–May, fr. Apr–Jul.

Forests or meadows on hills, open fields, streamsides; near sea level to 800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Zhejiang [Japan, Korea].

**10. *Galium chekiangense*** Ehrendorfer, Novon 20: 270. 2010.

浙江拉拉藤 zhe jiang la la teng

Herbs, perennial, with thin rhizomes. Stems 2–4 from a common base, erect, usually unbranched, 20–30(–40) cm tall, with only 4 or 5 internodes from base to first inflorescence node, with 4 prominent, rounded, and whitish angles, glabrous and smooth except for short and stiff hairs at nodes. Leaves and leaflike stipules in whorls of 4, subsessile; blade drying somewhat leathery and light brownish green, broadly elliptic to ovate, (15–)23–30(–50) × (8–)11–15(–25) mm, length/breadth index 2.5 or less, gradually narrowed into base, broadest near middle, gradually narrowed into apex, mostly

shortly apiculate but without a hyaline point, glabrous except for antrorse microhairs (0.1–0.2 mm) along 3 main veins, mostly on lower but also on upper side and along slightly revolute margins, papillose on upper side under a strong lens (20×), lower side clearly marked by numerous darker and linear idioblasts. Inflorescences loosely thyrsoid and elongate, from uppermost 2 or 3 nodes, clearly longer than subtending leaves, cymes lateral and terminal, somewhat divaricate, 1–4 cm, with few and inconspicuous linear bracts and rather few flowered; peduncles 1–2 cm and pedicels 0.1–1 cm. Ovary obovoid, 0.8–1 mm. Corolla greenish white, rotate, ca. 3 mm in diam., glabrous; lobes 4, acuminate. Ripe mericarps ovoid, 1.5–2(–3) mm, densely covered by stiff and appressed to slightly divergent microhairs, 0.15–0.25 mm and with an acute and ± bent apex. Fl. Jul, fr. Aug.

• Lower montane forests; ca. 1400 m. Fujian, Zhejiang.

Specimens of *Galium chekiangense* from the province of Fujian were included and described in FRPS (71(2): 265. 1999) under the name of *G. nakaii* Kudô ex H. Hara (J. Jap. Bot. 9: 517. 1933). These Fujian vouchers were not available, but two fruiting specimens from the adjacent province of Zhejiang (formerly Chekiang: Xi ming shan) in the herbarium PE could be studied. They were determined as “*G. kamtschaticum*” and closely correspond to the description of *G. nakaii* in FRPS. These PE specimens deviate clearly from authentic Japanese specimens of *G. nakaii* as well as from *G. kamtschaticum* and *G. oreganum* Britton. This has justified the description of *G. chekiangense* as a new and endemic Chinese species and makes *G. nakaii* an endemic of Japan.

*Galium chekiangense* clearly belongs to *G.* sect. *Platygalium* s.l. (Ehrendorfer et al., Fl. Iranica 176: 175. 2005) and apparently is a member of the *G. kamtschaticum* species group, which includes the amphi-Beringian *G. kamtschaticum* (in China limited to elevations of 1500–2300 m in the NE provinces of Heilongjiang and Jilin), the Japanese *G. nakaii* from Hokkaido and N Honshu, and the W North American *G. oreganum*. These three latter species differ from *G. chekiangense* by their leaf blades drying dark brownish (not light brownish green), thin, membranous and smooth, neither papillose above nor with glandular-striate idioblasts below, and by their ripe mericarps with much longer uncinat trichomes (0.8–1 mm, not 0.15–0.25 mm). In addition, *G. nakaii* has inflorescence cymes mostly shorter (not clearly longer) than the subtending leaves.

For further and more detailed studies of the *Galium kamtschaticum* group, one should refer to the wide circumscription of *G. kamtschaticum* (with three varieties) and the confused, partly contradictory description of the fruit indumentum of *G. nakaii* in Yamazaki (Fl. Japan 3a: 234–235. 1999).

**11. *Galium consanguineum*** Boissier, Diagn. Pl. Orient., ser. 1, 6: 69. 1846.

卷边拉拉藤 juan bian la la teng

*Galium consanguineum* subsp. *majmechense* (Bordzilowski) A. D. Mikheev; *G. majmechense* Bordzilowski; *G. verum* Linnaeus var. *consanguineum* (Boissier) Boissier.

Herbs, perennial, often caespitose from a stout and woody rootstock with rhizomes. Stems erect, to 1 m tall, 4-angled, glabrous to puberulent at least at nodes, smooth. Leaves in whorls of 6–12, sessile; blade drying papery, linear-oblancoate to linear, 20–28 × 1–3 mm, glabrous, more rarely ± hairy,

base acute to straight, margin shortly to strongly revolute and usually antrorsely aculeolate, apex acute and mucronate; vein 1. Inflorescences narrowly paniculate with main stems and short lateral and terminal, few- to several- or many-flowered, rather congested cymes; peduncles glabrous, smooth; pedicels 0.5–3 mm, subtended by leaflike bracts. Ovary subglobose to obovoid, 0.5–0.8 mm, smooth, glabrous or  $\pm$  hispidulous with straight hairs. Corolla yellow, rotate, ca. 3 mm in diam., glabrous, lobed for 3/4 or more; lobes 4(or 5), lanceolate-oblong, acute to acuminate. Mericarps ellipsoid to obovoid, ca.  $1.5 \times 1$  mm, glabrous or  $\pm$  hispidulous with straight trichomes. Fl. Jul–Aug, fr. Aug–Sep.

Thickets; [1300–]1700[–2800] m. Xinjiang [SW Asia (Armenia, Azerbaijan, Iran, Iraq, Lebanon, E Turkey)].

*Galium consanguineum* was treated as *G. majmechense* (a younger synonym) by W. C. Chen (FRPS 71(2): 269. 1999). It belongs to the polymorphic *G. verum* group or complex (see additional comments under that species) and apparently links it (as a hybrid taxon?) to more broadly leaved and glabrous members of *G.* sect. *Orientigalium* (Ehrendorfer et al., Fl. Iranica 176: 205–207. 2005). *Galium consanguineum* can be separated from *G. verum* by its broader (more than 2.5 mm),  $\pm$  glabrous leaves, but intermediates occur.

**12. *Galium crassifolium*** W. C. Chen, Acta Phytotax. Sin. 28: 299. 1990.

厚叶拉拉藤 *hou ye la la teng*

Herbs, perhaps perennial, ascending, ca. 10 cm tall. Stems 4-angled, caespitose, glabrous and smooth or sparsely puberulent. Leaves in whorls of 4, sessile or subsessile; blade drying leathery, elliptic or ovate,  $3-8 \times 2-4$  mm, scabrous with microhairs, base cuneate or subobtusate, margins antrorsely ciliate, apex obtuse and mucronate; vein 1. Inflorescences terminal and/or axillary, cymose, few flowered, up to 1 cm; axes glabrous and smooth, somewhat bracteate; pedicels ca. 1 mm. Flowers unknown. Mericarps ovoid, 0.5–1 mm, with appressed, slightly curved microhairs, ca. 0.3 mm. Fl. Aug–Sep, fr. Oct.

• Valleys, open habitat; ca. 800 m. Shanxi (Zhenba).

We have seen no authentic material of *Galium crassifolium*, but the original description is accompanied by a good drawing. In the protologue similarities with the Taiwanese *G. tarokoense* are suggested. Both species are distantly related, but apparently *G. crassifolium* falls within the morphological amplitude of the polymorphic *G. bungei*. Its distinctness with respect to reduced plants from dry habitats should be checked in the future.

**13. *Galium dahuricum*** Turczaninow ex Ledebour, Fl. Ross. 2: 409. 1844.

大叶猪殃殃 *da ye zhu yang yang*

Herbs, perennial, from a slender reddish rootstock. Stems erect to ascending, weak to procumbent and often climbing, sometimes up to 2.5 m, 4-angled, sparsely to densely retrorsely aculeolate along angles and at nodes, rarely  $\pm$  glabrescent. Leaves on main stems in whorls of 5 or 6, subsessile; blade drying papery, of very variable shape, from obovate and elliptic-oblong to narrowly oblanceolate,  $(11-15-40(-55) \times (2-3-10(-14))$ , sparsely to densely retrorsely aculeolate adaxially along midrib, abaxially, and along flat to thinly reflexed mar-

gins, base acute to cuneate, apex acute to obtuse and mucronate; vein 1. Inflorescences paniculate, with axillary and terminal, several- to many-flowered, usually very lax and up to 7 cm long cymes; axes filiform and often flexuose, sparsely aculeolate to glabrous; bracts few, lanceolate; pedicels slender, in flower 2–5 mm. Ovary obovoid, ca. 0.8 mm, with dense spreading or appressed undeveloped trichomes, or glabrous. Corolla white or pale green, rotate, of quite different sizes,  $(1-1.5-3(-4))$  mm in diam., glabrous; lobes 4, triangular, obtuse to acute or minutely apiculate. Mericarps ellipsoid, ca. 2 mm, with appressed or spreading and uncinat trichomes (0.3–0.5 mm), tuberculate to completely glabrous and smooth, on pedicels elongating to 10 mm or more. Fl. Jun–Sep, fr. Jul–Nov.

Humid forests, thickets, ditch sides, grasslands, meadows; 200–3400 m. Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Korea, Russia].

Within *Galium* sect. *Trachygaleum* and the extremely polymorphic species group of *G. asperifolium* (see there) Cufodontis (Oesterr. Bot. Z. 89: 239–243. 1940), Yamazaki (Fl. Japan 3a: 206–240. 1993), and W. C. Chen (in FRPS 71(2): 255–258. 1999) differentiated the closely related taxa *G. dahuricum* (in FRPS as “*G. davuricum*,” the spelling used in the protologue by Ledebour), *G. tokyoense*, *G. pseudoasprellum*, and *G. manshuricum* mainly according to the lack (in the two former) and the presence (in the two latter) of appressed or spreading uncinat trichomes on the mericarps. As this character apparently often varies within populations of these taxa, the present treatment relies on the much more stable feature of slender, filiform, and  $\pm$  flexuose vs. more stiff and divaricate peduncles and pedicels. The former state characterizes *G. dahuricum* (including *G. manshuricum* and *G. pseudoasprellum*), the latter *G. tokyoense*. This species assembly has its distribution center in E Asia but extends with *G. asprellum* Michaux s.s. into E North America.

*Galium pseudoasprellum* was accepted as a species by Cufodontis (loc. cit.: 237–238), W. C. Chen (loc. cit.: 254–255), and Yamazaki (loc. cit.: 238), and the latter two also maintained *G. niewerthii*. In our opinion and because of their similar inflorescences, both taxa should be regarded as synonyms of *G. dahuricum*, the former under var. *lasiocarpum*, the latter under var. *dahuricum*. Even if we have not seen authentic specimens of *G. niewerthii*, all of its characters listed fall within the limits of *G. dahuricum*; thus, we regard it as a glabrous-fruited form of that variable species. So far, *G. comarii* has been a badly understood taxon (see Cufodontis, loc. cit.: 241; Lauener, Notes Roy. Bot. Gard. Edinburgh 32: 107. 1972; Mill, Edinburgh J. Bot. 53: 193–213. 1996). Because of its slender inflorescence, extremely long pedicels, and rugose fruit mentioned in the protologue, it can now be safely assigned as another synonym of *G. dahuricum* var. *dahuricum*.

The following infraspecific taxa of *Galium dahuricum* (and *G. pseudoasprellum*), accepted by Cufodontis (loc. cit.: 237–238, 243–244) and W. C. Chen (loc. cit.), are keyed and listed here for comparison.

- 1a. Ovary and mericarps glabrous or tuberculate ..... 13a. var. *dahuricum*
- 1b. Ovary and mericarps with spreading or appressed uncinat trichomes.
  - 2a. Inflorescences with loosely branched cymes, with filiform and  $\pm$  flexuose pedicels of up to 5 mm, in fruit up to 10 mm ..... 13b. var. *lasiocarpum*

- 2b. Inflorescences more congested, pedicels shorter than 5 mm ..... 13c. var. *densiflorum*

**13a. *Galium dahuricum* var. *dahuricum***

大叶猪殃殃(原变种) *da ye zhu yang yang* (yuan bian zhong)

*Galium asprellum* Michaux var. *dahuricum* (Turczaninow ex Ledebour) Maximowicz; *G. comarii* H. Léveillé & Vaniot; *G. dahuricum* var. *leiocarpum* Nakai; *G. niewerthii* Franchet & Savatier.

Stems and nodes often  $\pm$  glabrescent. Leaf blade with margins  $\pm$  retrorsely aculeolate. Inflorescences lax; peduncles and pedicels strongly elongated. Ovary and mericarps glabrous or tuberculate. Fl. Jun–Jul, fr. Aug–Oct.

Forests, grasslands; 700–1000 m. Fujian, Guizhou, Hebei, Heilongjiang, Hubei, Hunan, Jilin, Liaoning, Nei Mongol, Sichuan, Xinjiang, Yunnan [Korea, Russia].

This variety was listed as *Galium niewerthii* for the *Flora of Japan* (Yamazaki, loc. cit.: 238). Forms with many-flowered inflorescences, somewhat shorter pedicels, and glabrous ovaries and fruit have been seen from Yunnan; they apparently tend toward *G. asperifolium* and/or *G. prattii*. *Galium taiwanense* (see there) is very close to *G. dahuricum* var. *dahuricum* and evidently replaces it on Taiwan.

**13b. *Galium dahuricum* var. *lasiocarpum* (Makino) Nakai, J. Coll. Sci. Imp. Univ. Tokyo 31: 498. 1911.**

东北猪殃殃 *dong bei zhu yang yang*

*Galium asprellum* var. *lasiocarpum* Makino, Bot. Mag. (Tokyo) 17: 76. 1903; *G. dahuricum* var. *manshuricum* (Kitagawa) H. Hara; *G. manshuricum* Kitagawa; *G. pseudoasprellum* Makino.

Stem nodes and leaf blade retrorsely aculeolate. Inflorescences lax; peduncles and pedicels elongated. Ovary and mericarps with dense appressed or spreading uncinat trichomes. Fl. Jun–Jul, fr. Aug–Oct.

Forests, meadows, ditch sides; 300–1100 m. Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan [Japan, Korea].

**13c. *Galium dahuricum* var. *densiflorum* (Cufodontis) Ehren-dorfer, Novon 20: 277. 2010.**

密花拉拉藤 *mi hua la la teng*

*Galium pseudoasprellum* var. *densiflorum* Cufodontis, Oesterr. Bot. Z. 89: 237. 1940.

Stems often lower and leaf blade smaller. Inflorescences shorter and more congested; pedicels rarely longer than 5 mm; bracts larger, similar to leaves. Ovary and mericarps with dense spreading uncinat trichomes. Fl. Jul–Aug, fr. Aug–Nov.

• Forests, thickets, meadows on mountains; 700–3400 m. Gansu, Guizhou, Hebei, Henan, Jiangxi, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

The above geographic indications for this variety are uncertain because of confusion with *Galium tokyoense*, etc. At least in part, *G. dahuricum* var. *densiflorum* may refer to transitional (?hybrid) forms of *G. dahuricum* var. *lasiocarpum* with *G. asperifolium*, *G. blinii*, *G. prattii*, and/or *G. sungpanense*.

**14. *Galium echinocarpum* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 147. 1911.**

刺果猪殃殃 *ci guo zhu yang yang*

Herbs, perennial, emerging from reddish, filiform rhizomes. Stems ascending to erect, 10–40 cm tall, 4-angled, glabrous and smooth. Leaves in whorls of (4 or) 5 or 6, subsessile; blade drying papery, oblanceolate, obovate, narrowly elliptic, or narrowly oblanceolate, 6–25  $\times$  2–7 mm, glabrous or sometimes sparsely hispid to strigillose, base acute, margins flat, smooth or antrorsely aculeolate, apex acute to obtuse or rounded and abruptly mucronate; vein 1. Inflorescences terminal and in axils of upper leaves, with lax, few- to several-flowered cymes; axes glabrous, smooth; bracts none or leaflike, 2–6 mm; pedicels 0.5–2 mm. Ovary subglobose, 0.5–0.7 mm, densely strigillose with undeveloped trichomes. Corolla white, rotate, ca. 2 mm in diam., glabrous, lobed for 3/4 or more; lobes 4, triangular, apex obtuse. Mericarps subglobose to ellipsoid, ca. 2 mm, with dense uncinat trichomes ca. 1 mm, on pedicels elongating to 10 mm. Fl. May, fr. May–Dec.

• Montane forest regions, grassy fields, along drainage ditches; 900–3500 m. Taiwan.

*Galium echinocarpum* is very similar to *G. hoffmeisteri* and replaces it on Taiwan. *Galium takasagomontanum* may belong here as a synonym (see there).

**15. *Galium elegans* Wallich in Roxburgh, Fl. Ind. 1: 382. 1820.**

小红参 *xiao hong shen*

Herbs, perennial, climbing or procumbent to usually erect, 0.1–1 m tall, from a slender rootstock with purplish rhizomes. Stems somewhat stout, 4-angled, smooth, sparsely to densely hirsute, villous, or villosulous and often densely puberulent at nodes, angles thickened. Leaves in whorls of 4, subsessile or petiole to 1.5 mm; blade drying papery to leathery, green to gray, or dark brown, ovate to broadly elliptic, 6–30  $\times$  3–20 mm, length/breadth index mostly 2 or less, sparsely to densely hirtellous, villosulous, or hispidulous to scaberulous at least on principal veins, abaxially often glandular-punctate and/or -striate, base rounded to acute, margins antrorsely ciliate to ciliate and flat to thinly revolute, apex rounded to obtuse; principal veins palmate, 3(or 5). Inflorescences thyrsoid to paniculiform, with several- to many-flowered, 2–10 cm long cymes in uppermost leaf axils and terminal; peduncles glabrescent to sparsely scaberulous, hirtellous, puberulent, or villosulous; bracts narrowly spatulate to narrowly elliptic, 1–3 mm; pedicels 0.5–2.5 mm. Flowers dioecious, polygamo-dioecious, or sometimes ?hermaphroditic. Ovary obovoid, in staminate flowers ca. 0.5 mm and glabrous to scaberulous or sparsely strigillose, in pistillate and bisexual flowers 0.8–1 mm and usually moderately to densely strigillose, particularly on their lateral side. Corolla white or pale yellow, rotate, 2–2.5 mm in diam., glabrous; lobes 4, ovate-triangular, acute to rounded. Mericarps ellipsoid, 1–1.5 mm, with sparse to dense and spreading uncinat trichomes 0.5–0.8 mm, rarely scaberulous or glabrous. Fl. Apr–Aug(–Oct), fr. May–Dec.

Forests, thickets, meadows on mountain slopes, streamsides, open fields, on rocks; 200–3500 m. Anhui, Fujian, Gansu, Guangxi, Guizhou,

Hunan, Qinghai, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan, Thailand].

*Galium elegans* is a widely ranging, polymorphic species that may not be completely distinct from several other related taxa. It is here circumscribed more narrowly than by Cufodontis (Oesterr. Bot. Z. 89: 228–232. 1940) and W. C. Chen (in FRPS 71(2): 242–245. 1999), which reduces its variation a bit. These aspects are discussed below.

Plants with narrower leaves are separated here as *Galium yunnanense*. This species comprises two of the varieties included by Cufodontis in *G. elegans*, i.e., *G. elegans* var. *angustifolium* and *G. elegans* var. *nemorosum*. Separation of the two taxa is not always easy, as transitional specimens occasionally occur.

Plants of *Galium elegans* with shortened pedicels and more congested cymes (e.g., from Sichuan, Shimian Xian) may approach the Himalayan *G. confertum* Royle ex J. D. Hooker.

*Galium nephrostigmaticum* was described as a species by Diels, an opinion still maintained by some authors. Here, it is treated as a variety of *G. elegans*, following W. C. Chen (Acta Phytotax. Sin. 28: 301. 1990) who referred to its glabrous to scaberrulous ovaries and fruit, as noted in Diels's protologue. In contrast to this, Cufodontis (loc. cit.) synonymized *G. nephrostigmaticum* with *G. elegans* var. *elegans*. In an extensive discussion he demonstrated that *G. elegans* is dioecious and that *G. nephrostigmaticum* was based on a male plant with staminate flowers and reduced glabrous to smooth ovaries and sessile stigmas. In contrast, pistillate flowers of *G. elegans* have hairy ovaries and fruit, well-developed styles, and reduced stamens. Thus, according to Cufodontis, *G. nephrostigmaticum* does not merit taxonomic recognition. Ehrendorfer et al. (Fl. Iranica 176: 177. 2005) did not contradict the conclusions of Cufodontis but noted that some plants of *G. elegans* are monoecious or have bisexual flowers. This shows that the reproductive biology of this species apparently is more complex than thought before. Provisionally, *G. nephrostigmaticum* is treated here as a variety, pending more detailed studies of this critical group.

The still uncertain relationships between *Galium elegans* on the Chinese mainland and *G. formosense* on Taiwan are discussed under the latter taxon. In the present treatment their separation is maintained provisionally.

The traditional varieties of *Galium elegans* are separated schematically by the density, type, and distribution of the indumentum on the vegetative organs and have doubtful taxonomic value. W. C. Chen in FRPS (loc. cit.) also used leaf size and apex shape as characters to differentiate these varieties. For reference and to facilitate comparison with other works, we present a key to these infraspecific taxa below.

- 1a. Ovary (and fruit?) glabrous to scaberrulous ..... 15c. var. *nephrostigmaticum*
- 1b. Ovary and fruit with  $\pm$  uncinat trichomes.
  - 2a. Leaf blades in middle stem region ovate-lanceolate, length/breadth index 2–2.5, apex acute or obtuse and shortly acuminate, with a dense and fine indumentum ..... 15d. var. *velutinum*
  - 2b. Leaf blade ovate to ovate-lanceolate or broadly elliptic, length/breadth index usually less than 2, apex usually obtuse or slightly acuminate.
    - 3a. Stems sparsely or densely hirsute; leaf blade small and

thickly textured, not black

when dry ..... 15a. var. *elegans*

- 3b. Stems pilose or glabrescent at least on upper parts; leaf blade often large and thinly textured, blackish brown when dry ..... 15b. var. *glabriusculum*

#### 15a. *Galium elegans* var. *elegans*

小红参(原变种) xiao hong shen (yuan bian zhong)

*Galium petiolatum* Geddes.

Stems sparsely or densely hirsute. Leaf blade drying thickly textured, not black, ovate to ovate-lanceolate or broadly elliptic, length/breadth index usually less than 2, apex obtuse or slightly acuminate. Mericarps with spreading uncinat trichomes. Fl. Apr–Aug, fr. May–Dec.

Forests, thickets, meadows on mountain slopes, streamsides, open fields, on rocks; 600–3500 m. Anhui, Gansu, Guizhou, Hunan, Qinghai, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan, Thailand].

15b. *Galium elegans* var. *glabriusculum* Requier ex Candolle, Prodr. 4: 600. 1830.

广西拉拉藤 guang xi la la teng

*Galium elegans* f. *glabriusculum* (Requier ex Candolle) H. Hara ex H. Ohba.

Stems pilose or glabrescent at least on upper parts. Leaf blade drying  $\pm$  blackish brown, often thinly textured, ovate, ovate-lanceolate, or elliptic, 10–33  $\times$  5–18 mm, length/breadth index usually 2 or less, apex mostly obtuse. Mericarps with spreading uncinat trichomes. Fl. Jul–Aug, fr. Jul–Oct.

Forests or meadows on mountains and at streamsides; 1100–2900 m. Guangxi, Guizhou, Sichuan, Xizang, Yunnan [India, Nepal].

We have not seen authentic material of this taxon.

15c. *Galium elegans* var. *nephrostigmaticum* (Diels) W. C. Chen, Acta Phytotax. Sin. 28: 301. 1990.

肾柱拉拉藤 shen zhu la la teng

*Galium nephrostigmaticum* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 279. 1912.

Similar to *Galium elegans* var. *elegans*, but ovary (and fruit?) glabrous to scaberrulous. Fl. Apr–Oct, fr. Aug–Dec.

• Forests, meadows; 200–3000 m. Gansu, Guizhou, Sichuan, Yunnan.

This taxon apparently refers to male plants only (see above).

15d. *Galium elegans* var. *velutinum* Cufodontis, Oesterr. Bot. Z. 89: 230. 1940.

毛拉拉藤 mao la la teng

*Galium mairei* H. Léveillé.

Plants densely and finely pubescent, trichomes slender, spreading. Leaf blade lanceolate or ovate-lanceolate, 7–15  $\times$  ca.

3 mm, length/breadth index 2–2.5, apex acute or obtuse and shortly acuminate. Mericarps with spreading uncinat trichomes. Fl. and fr. Jul.

● Meadows or on rocks on mountain slopes; 2100–2300 m. Sichuan, Yunnan.

**16. *Galium exile*** J. D. Hooker, Fl. Brit. India 3: 207. 1881.

单花拉拉藤 dan hua la la teng

*Galium handelii* Cufodontis (1940), non Nábělek (1923).

Herbs, annual, slender, procumbent to weak, 4–20 cm tall. Roots slender, reddish when dry. Stems slender, 4-angled, somewhat branched, sparsely retrorsely aculeolate to glabrous. Middle stem leaves opposite with clearly smaller, leaflike stipules in whorls of 4; blades drying papery, obovate or oblanceolate to linear-elliptic, (2–)3.5–10(–12) × 1–3.5(–5) mm, adaxially with sparse appressed hairs or glabrous, margins mostly antrorsely ciliolate, otherwise glabrous, base acute, cuneate, or shortly petiolate, apex obtuse to acute but not mucronate; principal vein 1, with inconspicuous pinnate-reticulate lateral veins. Flowers mostly solitary; pedicels 1–3 mm, glabrous. Ovary subglobose, ca. 1 mm, densely covered with undeveloped trichomes. Corolla white, rotate, 1–1.5 mm in diam.; lobes 3(or 4), ovate, obtuse. Mericarps ovoid to elongated, 2–2.5 mm, with dense, white to yellowish brown, uncinat trichomes 0.2–0.5 mm, on pedicels elongating to 10 mm and curved near apex. Fl. Jun–Jul, fr. Aug–Sep.

Rock crevices on mountain slopes, sand and gravel drifts on grassy plains; 1200–4800 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [India, Nepal].

In his description of *Galium handelii* Cufodontis (Oesterr. Bot. Z. 89: 234–235. 1940) referred to the close *G. songaricum* Schrenk (in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 57. 1841) but overlooked the older homonym by Nábělek and the Himalayan *G. exile*. This latter annual has a much wider distribution than thought before and is quite variable in China with respect to leaf shape and hairiness, length of pedicels, shape of mericarps, etc. In view of its remarkably small flowers and high fruit set, it very likely is autogamous.

Within the morphologically and DNA-analytically very isolated *Galium* sect. *Depauperata* (Ehrendorfer et al., Fl. Iranica 176: 231–232. 2005) *G. exile* is morphologically very close to the W North American *G. bifolium* S. Watson and particularly to *G. songaricum*, described from the C Asiatic mountain system of Alatau. This latter species, treated in FRPS as “*G. soongoricum*,” is assumed to differ by its 1- or 2(or 3)-flowered cymes, the 4-lobed flowers, and the strongly elongating fruiting pedicels. In FRPS (71(2): 224–227. 1999) both taxa are accepted and indicated for very much the same area in China. Nevertheless, a first analysis of all Chinese specimens in PE, KUN, MO, and WU has not revealed reliable differential characters. Even the inflorescence character and the corolla lobe number varies in some specimens. All these findings do not exclude the possibility that further and more detailed studies will allow to separate the populations from the mountains of C and N Asia as typical *G. songaricum*. But for the Chinese flora and the present treatment we recognize only one species, *G. exile*. In case that the two taxa cannot be separated as species in the future *G. songaricum* will have to replace *G. exile* for priority reasons.

As noted already by Cufodontis (loc. cit.), both *Galium exile* and *G. songaricum* have sometimes been misidentified as *G. pauciflorum*, a synonym of *G. spurium* from the *G. aparine* group. In contrast to *G.*

*exile*, the latter always has more than 4 leaf whorl elements, retrorsely aculeolate leaf margins, and more than 1-flowered cymes.

**17. *Galium formosense*** Ohwi, Repert. Spec. Nov. Regni Veg. 36: 55. 1934.

关山猪殃殃 guan shan zhu yang yang

*Galium kwanzanense* Ohwi.

Herbs, perennial, procumbent to erect, (5–)8–20(–30) cm tall. Stems 4-angled, sparsely to rather densely pilose, angles thickened. Leaves in whorls of 4, sessile; blade drying submembranous, blackish green, broadly elliptic to obovate, 4–20 × 3–10 mm, length/breadth index 2 or less, both surfaces sparsely to densely pilose at least along veins, base cuneate to obtuse, apex obtuse to rounded and mucronate; principal veins 3, palmate. Inflorescences with terminal and axillary, few- to many-flowered, 1–3 cm long cymes; peduncles sparsely pilose to glabrous and smooth; bracts spatulate to ovate, 1.5–3 mm; pedicels 1–4 mm. Flowers ?hermaphroditic. Ovary obovoid, ca. 0.5 mm, densely pubescent with uncinat trichomes. Corolla yellowish white, rotate, 1–2 mm in diam., glabrous; lobes 4, ovate, 0.4–0.8 mm, acute. Mericarps ovoid, ca. 1 mm, with dense white to yellowish uncinat trichomes 0.4–0.5 mm. Fl. Jun–Sep, fr. Jun–Nov.

● Mountains, along trails and roads, fields, open ditches; 600–3000 m. Taiwan (Gaoxiong).

Ohwi described the relatively tall (“20–30 cm”) *Galium formosense* from lower elevations and the condensed *G. kwanzanense* (“5–10 cm”) from an exposed higher peak of Taiwan. The technical differences indicated mainly relate to flower diameter (1 mm in the former, 2 mm in the latter). In their study of Taiwanese *Galium* Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 101–117. 1998; Fl. Taiwan, ed. 2, 4: 254–259. 1998) formally synonymized the taxa and demonstrate a considerable ecological amplitude of *G. formosense* s.l. Furthermore, the specific separation of *G. formosense* from two other Taiwan mountain endemics, with glabrous stems, *G. morii* and *G. tarokoense*, needs better documentation.

In FRPS (71(2): 243. 1999), W. C. Chen treated *Galium formosense* as a synonym of *G. elegans*. He referred to Cufodontis (Oesterr. Bot. Z. 89: 228. 1940) who supported the occurrence of *G. elegans* in Taiwan based on Hayata’s report of *G. rotundifolium* Linnaeus (in J. Coll. Sci. Tokyo 30(1): 148. 1911) and to J. M. Chao (in Fl. Taiwan 4: 261. 1978) who considered *G. elegans* to be the same as *G. formosense*. In their study of Taiwanese *Galium* Yang and Li (loc. cit. 1998; loc. cit. 1999) did not mention *G. elegans* nor compare *G. formosense* to it. This rather suggests that they were unaware of Cufodontis’s work than that they concluded the two species to be distinct. Similarly, Cufodontis (loc. cit.: 211–251), studying only mainland material, did not mention *G. formosense*, already described in 1934. The Taiwanese specimens at MO (studied by C. M. Taylor) appear to represent a distinct species but fall within *G. elegans* as more broadly circumscribed by Cufodontis (loc. cit.: 228–232). Thus, *G. formosense* is here provisionally separated and regarded as replacing *G. elegans* on Taiwan. In future studies, it will be of particular importance to clarify whether the dioecy or polygamodioecy found in *G. elegans* (see there) also occurs in *G. formosense*.

**18. *Galium forrestii*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 279. 1912.

丽江拉拉藤 li jiang la la teng

Herbs, perennial, 15–25 cm tall. Stems little branched, 4-

angled,  $\pm$  retrorsely strigose hairy. Leaves in whorls of 4, sessile or shortly petiolate; blade rather subleathery, pale abaxially, ovate-elliptic,  $8-12 \times 3-5$  mm, strigose to hirsute, abaxially yellowish brown glandular-punctate or striate, base cuneate, apex acute or apiculate; principal vein 1, 2 lateral veins weak. Inflorescences terminal, corymbiform, with terminal and axillary several-flowered and somewhat bracteate cymes; pedicels ca. 1.5 mm. Ovary obovoid, hispidulous. Flowers ca. 2.8 mm in diam., probably sexually differentiated (dioecious or polygamo-dioecious?). Corolla yellowish green, dark brown when dry, rotate, lobed for 3/4 or more; lobes 4, subovate, apiculate at apex. Fruit unknown, but probably with uncinat trichomes. Fl. Jun–Aug.

• Meadows on mountain slopes; 3000–3200 m. Sichuan (Yajiang), Yunnan (Lijiang).

Because of its uncertain fruit indumentum, *Galium forrestii* is in need of further studies. We have not seen authentic material but agree with Cufodontis (Oesterr. Bot. Z. 89: 232. 1940) that it is obviously close (or even identical?) with *G. glandulosum* and/or *G. hirtiflorum*. Their characteristic stem indumentum and other similarities link these taxa as members of the *G. hirtiflorum* group within *G. sect. Platygali* s.l. (see under *G. hirtiflorum*).

**19. *Galium ghilanicum*** Stapf, Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 50: 53. 1886.

姬兰拉拉藤 ji lan la la teng

*Galium parisiense* Linnaeus var. *brachypodium* Boissier; *G. transcaucasicum* Stapf.

Herbs, annual, ascending, branching from base. Stems (4)8–30(–40) cm tall, tender, 4-angled, with retrorsely aculeolate angles and numerous, rather short internodes. Leaves at middle stem region in whorls of (5 or)6–8(or 9),  $\pm$  sessile; blade drying papery, linear-elliptic to narrowly oblanceolate, mostly glabrous but margins and sometimes abaxial vein sparsely to densely antrorsely aculeolate, base acute, apex acute-acuminate. Inflorescences narrowly thyrsoid, with axillary and terminal cymes mostly 2–6-flowered; peduncles as long or  $2-4 \times$  as long as subtending leaves, slightly divaricate, with 1 or 2 bracts,  $\pm$  smooth; pedicels thin, 0.5–4 mm, reflexed and hardly elongated in fruit. Flowers hermaphroditic. Ovary obovoid to ellipsoid, ca. 0.8 mm, glabrous. Corolla white or greenish white, slightly cup-shaped, 0.8–1.2 mm in diam.; lobes ovate, acute to shortly apiculate. Mericarps subglobose to kidney-shaped, 0.8–1.5 mm, colliculate, glabrous.

Open habitats; ca. 700 m. Xinjiang (Yining) [Afghanistan, Nepal, N Pakistan, Tajikistan; SW Asia].

*Galium ghilanicum* belongs to the annual *G. sect. Microgali* and is a taxon widespread in SW Asia. It is here recorded for the first time for China. In FRPS (71(2): 237. 1999) it was misidentified as *G. aparine* var. *leiospermum* (= *G. aparine* f. *leiocarpum*, *G. spurium*), from which it is clearly separable by its antrorsely (and not retrorsely) aculeolate leaf margins. The other Chinese representative of *G. sect. Microgali*, *G. tenuissimum*, differs from *G. ghilanicum* mainly by its strongly elongated peduncles and pedicels.

**20. *Galium glandulosum*** Handel-Mazzetti, Symb. Sin. 7: 1028. 1936.

腺叶拉拉藤 xian ye la la teng

Herbs, perennial, caespitose, procumbent or erect, 5–15 cm tall. Stems numerous from reddish rhizomes and roots, usually strongly branched, 4-angled, densely retrorsely strigose hairy, hispidulous at nodes. Leaves in whorls of 4, sessile or subsessile; blade drying subleathery, quite variable in shape, ovate to oblong or lanceolate,  $(2.5-4-10(-14) \times (0.6-1-3(-4.5))$  mm, sometimes with scattered hairs adaxially, on margins and on midrib abaxially, or mostly glabrescent, adaxially slightly shiny and papillose, abaxially matte and usually minutely glandular-punctate or -striate, base cuneate, margins revolute, apex acute or subobtuse; principal vein 1, lateral veins 2, weak. Inflorescences terminal and in axils of upper leaves, with few- to several-flowered and up to 2 cm long cymes; peduncles  $\pm$  hairy, bracteate,  $\pm$  divaricate in fruit; pedicels 1–2(–5) mm. Flowers usually sexually differentiated (dioecious or polygamo-dioecious?). Ovary obovoid, ca. 0.8 mm, with  $\pm$  curved trichomes. Corolla yellowish, greenish, or  $\pm$  brownish-reddish, rotate, 1.8–2.7 mm in diam.; lobes 4, ovate, obtuse or slightly acute. Mericarps reniform, 1.5–2 mm, mostly with  $\pm$  uncinat trichomes of ca. 0.3 mm (very rarely also glabrous?), on straight or  $\pm$  curved, up to 4 mm long pedicels. Fl. Jun–Aug, fr. Aug–Sep.

• Mountain slopes, river beaches, open shrublands and forests, grasslands, on rocks; 2300–3900 m. Sichuan, Xizang, Yunnan.

*Galium glandulosum* is mainly characterized by condensed habit, short and predominantly retrorse stem hairs, subleathery leaves, often with glandlike idioblasts on abaxial leaf sides, strongly bracteate cymes, sexual differentiation of flowers, and hooked trichomes on fruit. Glabrous-fruited specimens included by W. C. Chen in FRPS (71(2): 228. 1999) may belong to other species. *Galium glandulosum* and *G. forrestii* are members of the *G. hirtiflorum* group (see there) within *G. sect. Platygali* s.l.

**21. *Galium hirtiflorum*** Reuquen ex Candolle, Prodr. 4: 600. 1830.

毛花拉拉藤 mao hua la la teng

Herbs, perennial, weak, procumbent or suberect, 10–60 cm tall. Rhizome and roots red, filiform. Stems numerous, 4-angled, with retrorse and/or spreading hairs to glabrescent. Leaves and leaflike stipules in whorls of 4; blade drying papery or membranous, linear-elliptic to narrowly lanceolate,  $(3-8-17(-25) \times (0.5-1-2.5(-3.5))$  mm, both surfaces hirsute or only midrib and margins with straight or slightly curved hairs, base gradually and shortly attenuate, apex obtuse to subacute or shortly acuminate; vein 1. Inflorescences terminal and axillary, with several- to many-flowered cymes on peduncles longer than leaves; pedicels 1–6 mm. Flowers evidently sexually differentiated (dioecious or polygamo-dioecious?). Ovary obovoid, ca. 0.5 mm, hairy. Corolla light greenish, marked with reddish, rotate, 2–2.5 mm in diam.; lobes 4, ovate, cuspidate, sparsely hirsute toward apex. Mericarps ellipsoid, 1–1.5 mm, with dense uncinat trichomes 0.5–0.7 mm. Fl. Jul–Aug, fr. Sep–Oct.

Among shrubs and stones; 1700–3000 m or higher. Expected in Xizang [Bhutan, India, Nepal].

*Galium hirtiflorum* was not included in the Chinese flora by W. C. Chen but is likely to occur in Xizang. According to Ehrendorfer et al.

(Fl. Iranica 176: 179. 2005) the group of *G. hirtiflorum* s.l. includes a series of vicarious Himalayan taxa: *G. subtrinervium* Ehrendorfer & Schönbeck-Temesy in Pakistan (Swat) and Kashmir, *G. hirtiflorum* s.s. extending eastward to Bhutan and possibly adjacent China, and finally *G. glandulosum* and *G. forrestii* reaching Yunnan and Sichuan. Their common group characters are short and retrorse stem hairs, subleathery leaves with glandlike idioblasts abaxially, strongly bracteate cymes, sexual differentiation of flowers, and fruit with uncinat trichomes.

**22. *Galium hoffmeisteri*** (Klotzsch) Ehrendorfer & Schönbeck-Temesy ex R. R. Mill, Edinburgh J. Bot. 53: 95. 1996.

六叶律 liu ye lü

*Asperula hoffmeisteri* Klotzsch, Bot. Ergebn. Reise Walde-mar, 87. 1862; *Galium asperuloides* Edgeworth subsp. *hoffmeisteri* (Klotzsch) H. Hara; *G. asperuloides* var. *hoffmeisteri* (Klotzsch) Handel-Mazzetti; *G. asperulopsis* H. J. P. Winkler; *G. japonicum* Makino (1895), not (Maximowicz) Makino & Nakai (1908); *G. triflorum* Michaux var. *hoffmeisteri* (Klotzsch) J. D. Hooker.

Herbs, perennial, from filiform reddish rhizomes. Stems generally erect, (10–)15–30(–40) cm tall, 4-angled, glabrous and smooth, sometimes hispidulous at nodes. Middle stem leaves and leaflike stipules in whorls of up to 6 (in weak plants rarely only up to 4), with petioles up to 3 mm; blade drying papery or membranous, narrowly elliptic-oblong to broadly oblanceolate, (10–)15–30(–40) × (4–)5–10(–12) mm, length/breadth index mostly 2.5–3.5, glabrescent, smooth or rarely retrorsely aculeolate on abaxial midrib, base acute to obtuse, margins antrorsely aculeolate, apex obtuse to rounded and abruptly apiculate; vein 1. Inflorescences terminal and sometimes in axils of upper leaves, with few- to several-flowered cymes; peduncles glabrous, smooth; bracts none or few, 1–2 mm; pedicels 0.3–3 mm. Ovary obovoid to subglobose, 0.5–0.8 mm, strigillose with undeveloped trichomes. Corolla white or light green, rotate, 2.5–3 mm in diam., glabrescent, lobed for 3/4 or more; lobes 4, ovate, acute. Mericarps ellipsoid, 1.2–2 mm, with dense uncinat trichomes 0.8–1.2 mm, on pedicels elongating and up to 10 mm. Fl. Apr–Aug, fr. May–Sep.

Forests on mountain slopes, thickets, along rivers, ditch sides, meadows; 400–4000 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, ?Japan, Kashmir, Korea, Myanmar, Nepal, Pakistan].

*Galium hoffmeisteri*, together with *G. bungei*, *G. spurium*, and *G. verum*, is one of the most commonly collected species of *Galium* in China. Previous authors usually have included it as a subspecies under *G. asperuloides*. Only recently, the two taxa were discussed and re-established on the species level by Ehrendorfer et al. (Fl. Iranica 176: 183–185. 2005) and by Mill (loc. cit.). All specimens seen so far from China belong to *G. hoffmeisteri*. Nevertheless, as *G. asperuloides* s.s. ranges in the W Himalaya from Afghanistan to N Pakistan and N India, it can also be expected in SW China (in particular, Xizang). Accordingly, it is included in the present treatment for reference.

In Japan *Galium hoffmeisteri* is replaced by *G. nipponicum* Makino (*G. trifloriforme* var. *nipponicum* (Makino) Nakai), but some of the Japanese specimens greatly approach *G. hoffmeisteri*. Another very similar vicariant is *G. echinocarpum* from Taiwan. Further relatives are the Eurasian disjunct *G. odoratum* and the circumboreal *G. triflorum*.

Together with *G. asperuloides*, all these taxa belong to *G. sect. Hylaea* as shown by Ehrendorfer et al. (loc. cit.: 181–185). *Galium triflorum* is rare in China and closely related to *G. trifloriforme* (see under these species). The latter may be a hybridogenous taxon linking *G. sect. Hylaea* and *G. sect. Trachygalium*. But to synonymize *G. trifloriforme* with *G. hoffmeisteri* (e.g., W. C. Chen in FRPS 71(2): 230. 1999; Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) is certainly not correct.

Slender plants of *Galium hoffmeisteri* are distantly reminiscent of *G. kikumugura* Ohwi (= *G. brachypodum* Maximowicz (1874), not Jordan (1846)) from Japan (see also under *G. sichuanense*). Yamazaki (Fl. Japan 3a: 236. 1993) described *G. kikumugura* as having leaf whorls of 4. In reality, it always develops whorls of up to 5 or 6 in the middle stem region. These leaves are quite similar to those of *G. hoffmeisteri* and have margins slightly antrorsely aculeolate or smooth. Nevertheless, *G. kikumugura* strongly deviates from *G. hoffmeisteri* and other members of *G. sect. Hylaea* by its cymes nearly exclusively lateral in leaf axils, usually consisting only of a filiform peduncle, a single bract, and 2 small flowers (ca. 1.5 mm in diam.) or sometimes a single flower. Furthermore, its kidney-shaped (not ellipsoid) mericarps (1.8–2 × 0.9–1 mm) differ by having scattered short and hooked hairs only ca. 0.1 mm. These latter characters are reminiscent of *G. sect. Trachygalium* and particularly of *G. bungei* (in *G. sect. Platygalium* s.l., where leaf whorls have only 4 elements). Thus, *G. kikumugura* is an isolated and aberrant species of the genus, possibly better placed into a separate monotypic section.

**23. *Galium humifusum*** M. Bieberstein, Fl. Taur.-Caucas. 1: 104. 1808.

蔓生拉拉藤 man sheng la la teng

*Asperula humifusa* (M. Bieberstein) Besser.

Herbs, perennial, sometimes slightly woody at base, clambering to procumbent, from a thick rootstock with slender, trailing reddish rhizomes. Stems up to 1 m tall, 4-angled to subterete, often caespitose, glabrescent to white pilosulous, hirtellous, and/or pilose often with mixed trichome types, smooth or sparsely scaberulous. Leaves in whorls of 6–10, sessile, frequently reflexed; blade drying papery, from linear and narrowly oblong-oblanceolate to oblong-elliptic or ligulate, (5–)10–28(–32) × (1–)1.5–3(–6) mm, adaxially glabrous and scaberulous, abaxially glabrous to densely white pilosulous or -pilose, base straight to cuneate, margin antrorsely aculeolate and usually markedly revolute, apex obtuse to acute and mucronate with tip to 2 mm; vein 1. Inflorescences with numerous terminal and axillary, congested to fasciculate, leaflike and many-flowered cymes; peduncles glabrous to hirtellous and/or pilosulous, with reduced leaves and leaflike bracts, 1.5–3 mm; pedicels 1–4 mm. Ovary ellipsoid, 0.8–1 mm, glabrous to hispidulous with straight trichomes. Corolla yellowish white to white, funnel-form, 1.5–2.5 × 2.5–3 mm, glabrous to sometimes hairy on outside; lobes 4, ca. 1/2 as long as tube, triangular-ovate, acute to apiculate. Mericarps ellipsoid to reniform, 1–1.5 × 1.5–2 mm, glabrous and smooth, granulate or hispidulous, becoming separated in middle as fruit expand but remaining attached at top and bottom. Fl. and fr. May–Oct.

Riversides and beaches, forests, grasslands, farmland sides, wastelands, meadows, mountain slopes; 400–2200 m. Xinjiang [Afghanistan, Kazakhstan, Mongolia, Pakistan, Russia, Turkistan; SW Asia (Armenia, Azerbaijan, Georgia, Iran, Iraq), E Europe (Balkan Peninsula, Ukraine)].

This species has often been included in *Asperula* (e.g., Pobedimova et al., Fl. URSS 23: 276. 1958) because of its funnelliform, relatively large, white corollas, but its affinities are clearly with members of *Galium*, particularly *G. verum*, though the flowers are distinct. Rarely the two species form a hybrid, which has been called *G. ×himmelbauerianum* (Ronniger) Soó, and both should be placed into *G. sect. Galium*.

*Galium humifusum* is “a widespread diploid species, very variable due to modificational plasticity and genetic diversity” (Ehrendorfer et al., Fl. Iranica 176: 197. 2005), but at present it does not appear possible to recognize infraspecific taxa.

**24. *Galium hupehense*** Pampanini, Nuovo Giorn. Bot. Ital. 17: 719. 1910.

湖北拉拉藤 hu bei la la teng

*Galium boreale* Linnaeus var. *molle* Hemsley; *G. hemsleyanum* Beauverd; *G. hupehense* var. *molle* (Hemsley) Cufodontis.

Herbs, perennial, erect, with slender rhizome. Stems 4-angled, pilosulous. Leaves in whorls of 4, subsessile; blade lanceolate, 30–50 × 6–12 mm, length/breadth index above 4, adaxially hispidulous to scaberulous, abaxially pilose at least on principal veins, apex acuminate to subacute; principal veins 3, palmate. Inflorescence terminal, panicleform, 15–20 × 4–8 cm, with many-flowered cymes; peduncles and pedicels hairy to glabrescent. Ovary ovoid, densely hairy. Corolla yellowish white, rotate, ca. 2 mm in diam., glabrous or pilose; lobes 4, ovate, hairy outside, acute. Mericarps with straight trichomes (and/or ?glabrous). Fl. Jul, fr. Aug–Sep.

• Mountains; ca. 2000 m. Hubei (Yichang), Jiangsu (Kunshan).

*Galium hupehense*, possibly endemic to EC China, is evidently related to the also small-flowered *G. kinuta* (Cufodontis, Oesterr. Bot. Z. 89: 223–224. 1940) but has hairy stems, whereas *G. chekiangense* and *G. boreale* differ i.a. by their larger flowers (3–4 mm in diam.). As we have seen no authentic material of *G. hupehense*, the above description is based on available literature sources only. Its original description gives no information on ovary and fruit indumentum, whereas straight (and ?multicellular) hairs are indicated for the certainly synonymous *G. hemsleyanum*. Possibly by mistake, W. C. Chen (in FRPS 71(2): 281–282. 1999) reported plants with glabrous (var. *hupehense*) and with densely hairy ovaries (var. *molle*). Both are recorded from Yichang, only the latter from more condensed plants in Kunshan. These uncertainties and the status of *G. hupehense* with its varieties need to be clarified in the future.

**25. *Galium innocuum*** Miquel, Fl. Ned. Ind. 2: 341. 1857.

小豬殃殃 xiao zhu yang yang

*Galium modestum* Diels; *G. trifidum* Linnaeus var. *modestum* (Diels) Cufodontis.

Herbs, perennial, weak to procumbent, from slender rhizomes. Stems (7–)10–40(–60) cm, 4-angled, caespitose, glabrous and smooth to sparsely retrorsely aculeolate on angles. Leaves in whorls of 4(–6), subsessile; blade drying papery, blackish or green, linear-lanceolate to oblanceolate, 3–8(–10) × 1–2 mm, glabrous and smooth to sparsely retrorsely aculeolate on margins and midrib, base acute to attenuate, apex rounded or obtuse; vein 1. Inflorescences terminal and axillary, cymes 1–

3.5 cm, with 1–3(or 4) flowers; peduncles glabrous and smooth; bracts oblanceolate to narrowly elliptic; fruiting pedicels (3–)5–8(–10) mm, straight and ± divaricate. Ovary didymous, glabrous, smooth. Corolla white, cup-shaped to slightly campanulate, 1–1.8 mm in diam.; lobed to 1/2 or slightly more; lobes 3(or 4), ovate and rounded at tip. Fruit markedly didymous, mericarps (sub)globose, 2–2.8 mm, glabrous, smooth to slightly tuberculate. Fl. and fr. Mar–Aug.

Swampy or wet localities at lower to upper montane elevations. Fujian, Sichuan, Taiwan, Yunnan, and ?elsewhere [India, Indochina, Indonesia (Java, Sumatra), New Guinea].

In the available floras of China and Taiwan, W. C. Chen (in FRPS 71(2): 252–253. 1999) and Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 101–117. 1998; Fl. Taiwan, ed. 2, 4: 254–259. 1998) have completely ignored *Galium innocuum*, classifying most of the relevant specimens under *G. trifidum*. In the Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) *G. trifidum* var. *modestum* appears as a synonym under *G. innocuum*, with a range from India to China and through Taiwan to SE Asia and New Guinea. Originally, *G. innocuum* was described from Java. In the critical revision of *G. sect. Aparinoides* by Puff (Canad. J. Bot. 54: 1911–1925. 1976), not considered by the above authors, *G. innocuum* is accepted as a valid species and regarded as a southern member of the *G. trifidum* group. The above diagnosis and distribution data correspond to Puff's revision. He differentiated the two species mainly by their fruiting pedicels: relatively short, straight, and ± divaricate in *G. innocuum* but slender, elongated, and conspicuously arcuate in *G. trifidum* s.s. According to Puff (loc. cit.: 1922–1923) only *G. innocuum* but none of the subspecies of *G. trifidum* occur in China. This is in strong conflict with W. C. Chen (loc. cit.: 253) who described the distribution of *G. trifidum* in China by listing the provinces Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, and Zhejiang. As we have seen only limited Chinese material of *G. sect. Aparinoides*, the question remains whether *G. innocuum* extends from S to N China or is replaced further north by populations of the *G. trifidum* group not mentioned by Puff. Furthermore, one has to consider that species from other sections of *Galium* have often been misidentified as members of *G. sect. Aparinoides*, e.g., *G. bungei*. In view of these uncertainties, we accept only *G. innocuum* but not *G. trifidum* for the present Chinese flora.

Another problematic taxon in *Galium* sect. *Aparinoides* for the Flora of China is *G. palustre* Linnaeus. In spite of the critical comments by Cufodontis (Oesterr. Bot. Z. 89: 232. 1940), this species has been included in FRPS by W. C. Chen (loc. cit.: 250). According to Puff (loc. cit.: 1923–1924) this species belongs to the *G. palustre* group of taxa, with leaves often in whorls of more than 4, many-flowered cymes (more than 3 or 4 flowers), and smooth pedicels. Its natural distribution is verified from temperate and boreal Europe to W Siberia, whereas occurrences in E North America (and elsewhere) are obviously adventive. Considering the common confusion of *G. sect. Aparinoides* taxa (in China particularly *G. innocuum* in the south and *G. karakulense* in the north) and the lack of authentic specimens seen by us, we exclude *G. palustre* from China in the present text.

**26. *Galium kamtschaticum*** Steller ex Schultes & J. H. Schultes, Mant. 3: 186. 1827.

三脉猪殃殃 san mai zhu yang yang

Herbs, perennial, erect, 5–25 cm tall, emerging from filiiform rhizomes. Stems mostly unbranched, 4-angled, glabrous to sparsely hispidulous. Leaves in whorls of 4, sessile or subses-

sile; blade drying blackish brown and papery, broadly elliptic, ovate, or suborbicular, 10–25 × 6–17 mm, glabrous to hispidulous at least on veins, otherwise adaxially smooth, abaxially not glandular-striate, base cuneate to obtuse, margins antrorsely ciliolate or hispidulous, apex ± rounded and usually mucronate; principal veins 3, palmate. Inflorescences small, thyrsoid, cymes terminal and in axils of uppermost leaves, 2–6 cm, few to several flowered, lax; peduncles glabrous, smooth; bracts leaflike or ligulate to narrowly elliptic, 0.5–4 mm; pedicels 1–5 mm. Ovary subglobose, ca. 1 mm, densely pubescent with spreading uncinat trichomes. Corolla white or greenish yellow, rotate, 2.5–3(–4) mm in diam., glabrous, lobed for 3/4 or more; lobes 4, elliptic-lanceolate or ovate-triangular, acute. Mericarps ovoid, 1.5–2 mm, with dense uncinat trichomes 0.8–1 mm, on pedicels usually elongating to 15 mm. Fl. and fr. Jul–Sep.

Forests on mountains, tussocks at ditch sides; 1500–2300 m [as low as ca. 100 m in N Japan]. Heilongjiang, Jilin [Japan, Korea, NE Russia; NW North America].

*Galium kamschaticum* is an amphi-Beringian member of *G.* sect. *Platygalium* and forms a related species group with *G. chekiangense* in SE China, *G. nakaii* in Japan, and *G. oreganum* in W North America. In the *Flora of Japan* (Yamazaki, Fl. Japan 3a: 206–240. 1993) three varieties are recognized, one of them endemic to Japan, the second extending to Sakhalin and the Kuriles, and only var. *kamschaticum* more widespread and extending to the NE provinces of China. Specimens from SE China, Zhejiang, that were determined as *G. kamschaticum* and those from Fujian that were listed by W. C. Chen (in FRPS 71(2): 265. 1999) as *G. nakaii* differ from typical *G. kamschaticum* by their leaves drying somewhat leathery, greenish-brownish, papillose, glandular-striate abaxially, and by their fruit with short hairs 0.1–0.2 mm, with a bent but not hooked tip. In the present flora they are treated as a new species, *G. chekiangense* (see the comments under that species).

**27. *Galium karakulense*** Pobedimova in Schischkin, Fl. URSS 23: 712. 1958.

粗沼拉拉藤 cu zhao la la teng

Herbs, perennial, weak to procumbent, 40–70 cm tall. Rootstock slender, with prolonged rhizomes. Stems 4-angled, flaccid, much branched, retrorsely aculeolate, hispidulous or glabrescent at nodes. Leaves in whorls of 4(or 5), subpetiolate; blade drying papery, elliptic to oblanceolate, (12–)15–20(–30) × (2–)5–8(–12) mm, densely antrorsely aculeolate adaxially and along margins, retrorsely aculeolate on abaxial midrib, base attenuate to cuneate, margins thinly revolute, apex rounded to bluntly pointed; vein 1. Inflorescences paniculate, terminal and lateral cymes with several to many flowers (usually more than 4); peduncles scabrous and ± divaricate; bracts ovate to elliptic, 3–7 × 1–3 mm; pedicels 2–4.5 mm, rough, elongated in fruit. Ovary didymous, glabrous. Corolla white, cup-shaped, 3–4(–4.5) mm in diam., 4-lobed to ca. 1/2. Mericarps (sub)globose, 1.5–2.5(–3.5) mm, glabrous, slightly verrucose. Fl. Jul, fr. Aug–Sep.

Swamps and riversides at low to middle elevations. Xinjiang (Chabuchaer) [Afghanistan, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan].

*Galium karakulense* represents *G.* sect. *Aparinoides* in C Asia and is considered as a link between the *G. trifidum* group in the N Hemisphere and the predominantly Mediterranean-European *G. palustre*

group (Puff, Canad. J. Bot. 54: 1923–1924. 1976). It is also treated in Pobedimova et al. (loc. cit.) and Ehrendorfer et al. (Fl. Iranica 176: 174. 2005) and may be responsible for some of the erroneous indications of *G. palustre* for N China, as discussed under *G. innocuum*. The latter is the second verified species of the section in the more southerly part of the Chinese flora. In comparison with *G. karakulense*, *G. innocuum* is a much smaller and more slender plant with few-flowered cymes and smooth pedicels.

**28. *Galium karataviense*** (Pavlov) Pobedimova, Novosti Sist. Vyssh. Rast. 7: 278. 1971.

喀喇套拉拉藤 ka la tao la la teng

*Asperula karataviensis* Pavlov, Vestn. Akad. Nauk Kazhsk. S.S.R. 4: 95. 1951; *A. aparine* M. Bieberstein, s.l.; *A. rivalis* Sibthorp & Smith, s.l.; *Galium rivale* (Sibthorp & Smith) Grisebach, s.l.

Herbs, perennial, procumbent and often matted or lodged, from slender, reddish brown rhizomes. Stems 0.6–1.2 m, much branched, densely retrorsely aculeolate on 4 angles. Leaves in whorls of 6–10, sessile or subsessile; blade drying papery or somewhat leathery and ± glossy, narrowly (ob)lanceolate or narrowly elliptic, (6–)15–25(–50) × (2–)2.5–4(–8) mm, glabrescent, both surfaces sparsely to densely aculeolate on midrib, base acute to cuneate, margins flat to narrowly revolute, densely retrorsely aculeolate, apex acute and shortly mucronate; vein 1. Inflorescences terminal and axillary, to 12 × 9 cm, with several to many-flowered cymes; peduncles elongating as inflorescences develop, becoming much longer than subtending leaves; axes glabrescent, sparsely to densely retrorsely aculeolate; bracts elliptic or oblong-lanceolate, 1.5–3 × 0.5–1 mm; pedicels 1–3 mm. Ovary ellipsoid to obovoid, 0.5–0.8 mm, glabrous. Corolla bluish to violet (rarely white?), shortly funnelform, 1.5–2.5 mm, tube 1–1.5 × as long as lobes; lobes 4, triangular-spatulate. Mericarps subglobose to ellipsoid, 1.5–2 × 1.7–2 mm, glabrous, smooth or often tuberculate. Fl. and fr. Jun–Sep.

Humid forests, riversides, beaches, wet grasslands; 700–3300 m. Gansu, Hebei, Heilongjiang, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang [C Asia].

*Galium karataviense* was treated in FRPS (71(2): 280. 1999) as *G. rivale*. In a wider sense the latter name and its synonyms apply to a polymorphic polyploid complex (2x, 4x, 6x), ranging from NE, E, and SE Europe to SW and C Asia. Because of its funnelform corollas this group formerly was treated as part of the genus *Asperula*, either as *A. aparine* or as *A. rivalis* (e.g., in Pobedimova et al., Fl. URSS 23: 275. 1958). More recently, morphological analyses (see Ehrendorfer et al., Fl. Iranica 176: 188. 2005) and DNA-data have clearly shown that it is closely related to *G. uliginosum* in *G.* sect. *Trachygalium*. Similarities with the annual *G.* sect. *Euaparine* are homoplasies.

In former treatments (e.g., Fl. Europaea 4: 20. 1976) *Galium rivale* was circumscribed in a wide sense. On the basis of differences in floral (relative length of corolla tube and lobes, color), fruit (mericarp epidermis with rounded or acute cells), and other characters, several still insufficiently understood microspecies have been suggested (Pobedimova et al., loc. cit.: 327, under *Asperula*; Ehrendorfer & Schönbeck, Pl. Syst. Evol. 174: 200–202. 1991, under *G. anguinum*; Ehrendorfer et al., loc. cit., under *G. pseudorivale* Tzvelev). Accordingly, among the vicarious microspecies of *G. rivale* s.l., *G. anguinum* Ehrendorfer & Schönbeck-Temesy from Iraq and Iran, with white corollas and divaricate fruiting axes, is replaced toward the east in C Asia by *G. karatav-*

*iense*, with bluish to violet corollas and more convergent fruiting axes. Further studies will have to demonstrate whether species status is really justified for all these taxa and how they correspond to the different cytotypes encountered in this polyploid complex.

**29. *Galium kinuta*** Nakai & H. Hara, J. Jap. Bot. 9: 518. 1933.

显脉拉拉藤 xian mai la la teng

*Galium boreale* Linnaeus var. *japonicum* Maximowicz; *G. japonicum* (Maximowicz) Makino & Nakai (1908), not Makino (1895).

Herbs, perennial, erect, 20–60 cm tall. Stems with 4 thickened angles, glabrous and smooth, hispidulous only at nodes. Leaves in whorls of 4, subsessile or petiole to 2 mm; blade drying mostly somewhat leathery, remaining  $\pm$  green, oblanceolate to ovate-lanceolate, sometimes even narrowly elliptic or ovate, 20–80  $\times$  4–20 mm, length/breadth index (2–)3–5(–6), strigillose or hispidulous at least along veins to glabrescent, sparsely to densely punctate- to striate-glandular abaxially, base acute to rounded, margins flat to thinly revolute, antrorsely ciliate to hispidulous, apex subacute to acute, but hardly concave and long acuminate; principal veins 3, palmate. Inflorescences paniculiform, to 25  $\times$  15 cm, cymes in uppermost leaf axils and terminal, many flowered, lax and often somewhat divaricate; peduncles smooth and glabrous or hispidulous at nodes; bracts oblanceolate to narrowly elliptic, 1.5–3 mm; pedicels 1.5–3 mm. Ovary subglobose to obovoid, ca. 0.8 mm, smooth, glabrous. Corolla white to  $\pm$  purplish, rotate, 2–2.5 mm in diam., glabrous; lobes 4, ovate, acuminate. Mericarps subglobose to obovoid, ca. 2.5 mm, glabrous and smooth. Fl. May–Jul, fr. Aug–Sep.

Mesic, generally rich forests on mountain slopes, rocks at watersides, open grasslands, meadows; 500–2100 m. Gansu, Hebei, Henan, Hubei, Liaoning, Shaanxi, Shanxi, Sichuan, Xinjiang [Japan, Korea].

*Galium kinuta*, described from Japan, was first reported for China by Cufodontis (Oesterr. Bot. Z. 89: 223–224. 1940). Nevertheless, the more numerous samples now available suggest certain differences: in Chinese specimens the leaves are more leathery (not paperlike) when dry, abaxially more markedly punctate-striate-glandular (not inconspicuously so), and apically  $\pm$  acute (but hardly concave and long attenuate). It is still uncertain whether these differences merit taxonomic separation of the Japanese and Chinese populations. Another critical aspect is the occurrence of specimens intermediate between Chinese *G. kinuta* and local *G. boreale* s.l., as observed, e.g., from Henan, Shaanxi, and Shanxi. Local studies will have to show whether this is due to hybridization and whether it is linked to the extreme variability of *G. kinuta* in leaf shape, ranging from narrowly lanceolate to ovate.

*Galium kinuta* may be related to the still badly understood *G. hupehense* (see there). Similarities also exist with *G. platygalium*, which differs by funnellform corollas. *Galium hoffmeisteri* (= *G. japonicum* Makino (1895)) and *G. kinuta* (= *G. japonicum* (Maximowicz) Makino & Nakai (1908)) have been widely confused because of similar habit and name confusion.

**30. *Galium kunmingense*** Ehrendorfer, Novon 20: 270. 2010.

昆明拉拉藤 kun ming la la teng

Herbs, perennial, erect, (12–)15–20(–25) cm tall. Stems with 4 prominent and rounded angles, with scattered antrorsely (or sometimes also retrorsely) curved short hairs, more dense at

nodes; internodes 1.5–4 cm at middle stem regions, longer or somewhat shorter than leaves. Leaves in whorls of 4; blade drying leathery, broadly lanceolate, (10–)15–25(–35)  $\times$  (4.5–)6–7.5(–9) mm, length/breadth index (2–)2.5–3.5(–4), glabrous, adaxially papillose, abaxially without glandular idioblasts, base cuneate, margins revolute, antrorsely aculeolate, apex acute but not acuminate; 3 prominent principal veins extending into apex region. Inflorescences pyramidal, with cymes from middle to upper stem nodes and terminal, several to many flowered; axes glabrous, somewhat divaricate; peduncles mostly 1.5–4 cm; pedicels (0.5–)1–5 mm; bracts lanceolate, small and inconspicuous. Flowers hermaphroditic. Ovary obovoid, ca. 0.5 mm, glabrous, smooth. Corolla white to greenish, cup-shaped or campanulate, (2–)2.3–2.5(–2.7) mm in diam., fused at base for  $\pm$  length of 4 free lobes, 0.8–1 mm, lanceolate, acute but not apiculate. Mericarps ovoid, 1.5–3 mm, glabrous and  $\pm$  smooth. Fl. Jun–Aug, fr. Jul–Sep.

- Open grasslands and rocky slopes; 1900–2500 m. C Yunnan.

The new *Galium kunmingense* clearly belongs to *G.* sect. *Platygalium*. Among species in the section with corollas basally fused to ca. 1/2 the length *Microphysa elongata* deviates by leaves with only one main vein, somewhat inflated fruit mericarp, and funnellform corollas. *Galium platygalium* and *G. maximoviczii* have similar corollas but deviate by their broader and 3–5-veined leaves. Closer relationships can be assumed for some E Asiatic *Galium* species with rotate corollas: *G. kinuta* has glabrous fruit but narrower, adaxially punctate-striate glandular leaves, slender, more floriferous inflorescences, and larger flowers. Apparent relatives with rotate and smaller flowers are *G. hupehense* with spreading straight fruit hairs, *G. chekiangense* with appressed curved fruit hairs, and particularly *G. yunnanense*, with spreading uncinuate fruit hairs. This latter is  $\pm$  sympatric with *G. kunmingense* but differs not only by its rotate (not campanulate/cup-shaped) and smaller corollas and uncinuate fruit hairs, but also by its more hairy and abaxially punctate-striate glandular leaves. It is remarkable that *G. kunmingense*, a quite conspicuous species that evidently was not too rare in the surroundings of the capital of Yunnan, has remained unnoticed up to now.

**31. *Galium linearifolium*** Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 7: 152. 1837.

线叶拉拉藤 xian ye la la teng

Herbs, perennial, erect, sometimes slightly woody at base. Stems up to 65 cm tall, 4-angled, hirtellous or puberulent to glabrescent or smooth and glabrous. Leaves in whorls of 4, sessile or subsessile; blade drying leathery, linear-spatulate, often slightly falcate, 10–60  $\times$  1–4 mm, adaxially glabrous, weakly shiny, antrorsely aculeolate along midrib and/or near margins, abaxially glabrous or sparsely hirtellous along midrib, base cuneate or obtuse, margin antrorsely aculeolate or pubescent, revolute, apex obtuse to acute; vein 1. Inflorescences terminal, paniculiform, with few- to many-flowered, 1.5–5 cm long cymes; peduncles hirtellous to glabrous, smooth; bracts narrowly elliptic, 1–3 mm or often lacking; pedicels 1.5–6 mm. Ovary ellipsoid to obovoid, ca. 0.8 mm, glabrous, smooth. Corolla white, rotate, ca. 4 mm in diam.; lobes 4, lanceolate, acute. Mericarps ellipsoid to subglobose, 2.5–3 mm, glabrous and smooth. Fl. Jun–Aug, fr. Jul–Sep.

Grassy slopes, forests, thickets, mountain meadows; 400–1800 m. Hebei, Hubei, Liaoning [Korea].

*Galium linearifolium* seems to be a rare species and is easily confused with *G. boreale*. The latter has leaves usually somewhat lanceolate and with 3 main veins. Cufodontis (Oesterr. Bot. Z. 89: 219–223. 1940) mentioned a certain affinity of *G. linearifolium* with *G. bungei*. Although *G. linearifolium* is said in FRPS to have leaves in whorls of 4, the relevant figure (71(2): 251, t. 56, f. 3. 1999) shows them in whorls of 5, evidently a mistake.

**32. *Galium maximoviczii*** (Komarov) Pobedimova, Novosti Sist. Vyssh. Rast. 7: 277. 1971 [*"maximowiczii"*].

异叶轮草 yi ye lun cao

*Asperula maximoviczii* Komarov, Trudy Glavn. Bot. Sada 39: 109. 1923, based on *A. platygalium* Maximowicz var. *pratensis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 19: 284. 1874.

Herbs, perennial, from thin creeping rhizomes. Stems erect, 0.3–1 m tall, 4-angled, smooth; nodes hispidulous or glabrous. Leaves in whorls of 4–6(–8), subsessile or with petiole up to 6 mm; blade drying papery, lanceolate-oblong, lanceolate-elliptic, or ovate to ovate-lanceolate, (23–)35–40(–53) × (7–)9–10(–18) mm, glabrous or sparsely to moderately hispidulous, at least on principal veins, margins antrorsely ciliate or -aculeolate, base acute to cuneate, apex tapered and shortly obtuse to acute; veins 3–5, palmate. Inflorescences broadly paniculate, 4–20 × 2–15 cm, lax and many flowered, with cymes in axils of uppermost leaves and terminal; peduncles ± glabrous; bracts linear to narrowly elliptic, 1–5 mm; pedicels 2–4 mm. Ovary obovoid and laterally flattened, ca. 0.8 mm, glabrous, smooth. Corolla white, campanulate; tube ± as long as lobes, 2.5–3.5 mm in diam.; lobes 4, ovate-oblong, obtuse. Mericarps ellipsoid, 2–2.5 mm, glabrous, smooth to granular-papillose. Fl. Jun–Jul, fr. Jul–Oct.

Forests, thickets, or grasslands on mountains, open fields, ditch sides; 1600–3800 m. Anhui, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Zhejiang [Korea, Russia].

*Galium maximoviczii* differs from the quite close *G. platygalium* (see there) by somewhat smaller campanulate flowers and larger leaves in whorls of up to 6(–8). Within *G. sect. Platygalium* the two species form an isolated group limited to the temperate E Asiatic mainland, characterized by its whorls of leaves and leaflike stipules often with more than 4, up to 6, or rarely even 8 elements, with 3–5 palmate principal veins, and campanulate to funnellform corollas. In Pobedimova et al. (Fl. URSS 23: 273. 1958) the two taxa were placed in the artificial *Asperula* sect. *Galioidae* Pobedimova ser. *Paniculatae* Pobedimova.

**33. *Galium megacyttarion*** R. R. Mill, Edinburgh J. Bot. 53: 200. 1996.

大胞拉拉藤 da bao la la teng

Herbs, perennial, weak to procumbent. Stems 6–40 cm, sharply 4-angled, glabrous, smooth, rough or sparsely retrorsely aculeolate; internodes 6.5–33 mm; nodes ± hairy. Middle stem leaves in whorls of up to 6, sessile; blade drying papery, often blackening, linear-oblong to narrowly elliptic, 2–12.5 × 0.4–2 mm, glabrous, smooth or sparsely retrorsely aculeolate on midrib abaxially, adaxially with relatively large epidermal cells (use 20× lens), base acute, margins flat to thinly revolute, apex acute then contracted and mucronate; vein 1. Inflorescences axillary, with 1- or occasionally 3-flowered cymes; pedicels

0.2–1.5 mm, glabrous, smooth. Ovary ellipsoid-obovoid, ca. 0.5 mm, glabrous, smooth. Corolla white or pale green (perhaps sometimes drying pink), rotate, 1.5–2.7 mm in diam.; lobes 4, lanceolate-spatulate, glabrous beneath, puberulent above, with shortly acuminate apex, clearly longer than stamens. Mericarps ellipsoid, 0.7–1.1 × 1–1.5 mm, glabrous, granular-verruculose, with pedicels often elongating to 3.5 mm. Fl. and fr. Jul–Sep.

Open places, forests; 1800–3100 m. ?Sichuan, Xizang [Bhutan, India, Nepal].

*Galium megacyttarion* (type from Uttar Pradesh, Raizada 7326, E) belongs to the high elevation Himalayan subgroup (2) of the *G. asperifolium* group, which includes *G. acutum* (see additional comments under these species). The protologue of *G. megacyttarion* describes the flowers as having stamens shorter than the corolla; comparable information is not yet available for the majority of the Chinese *Galium* species. We have seen no material cited in the original description nor plants which undoubtedly belong here. Nevertheless, one very condensed provenance (*Duthie 7492*, from Bhutan, the Black Mountain Expedition 1888, WU) exhibits the large leaf epidermal cells described for *G. megacyttarion*; but it deviates by having antrorse microhairs on the adaxial leaf side and glabrous leaf margins, finely rough stems, many-flowered cymes, and glabrous petals. It was determined by Cufodontis (Oesterr. Bot. Z. 89: 241–243. 1940) erroneously as *G. asperifolium* var. *sikkimense*. Another plant with large epidermal cells has been seen from Sichuan (W. C. Chen, 23 Jun 1988, PE), but this corresponds in all other characters to *G. pusillosetosum*.

**34. *Galium minutissimum*** T. Shimizu, J. Fac. Textile Sci. Technol. Shinsu Univ., A, 36(12): 58. 1963.

微小拉拉藤 wei xiao la la teng

Herbs, perennial (not annual), ascending, caespitose, minute, 2–3 cm tall. Stems 4-angled, branched, glabrous or sometimes hispidulous at nodes. Leaves in whorls of 4; blade rhombic-oblong, 2–3 × 0.8–1 mm, glabrous or abaxially hispidulous along midrib, base attenuate, apex obtuse; vein 1. Inflorescence with terminal and partly axillary few-flowered cymes, glabrous axes, and ca. 2 mm long pedicels. Flowers unknown. Mericarps reniform, sparsely hispid with apically weakly curved trichomes.

• Mountains; 1800–2400 m. Taiwan (Hualian).

*Galium minutissimum* was accepted as a species by W. C. Chen (in FRPS 71(2): 283. 1999) but was not treated or mentioned by Yang and Li in their publication on *Galium* in Taiwan (Bull. Natl. Mus. Nat. Sci., Taichung 11: 101–117. 1998) or in the subsequent second edition of Fl. Taiwan (4: 254–259. 1998). We have seen no authentic material, and the specific status of *G. minutissimum* remains uncertain. The taxon obviously belongs to *G. sect. Platygalium* and the closely related *G. morii* group (see there) from the high mountains of Taiwan.

**35. *Galium morii*** Hayata, Icon. Pl. Formosan. 7: 32. 1918.

森氏猪殃殃 sen shi zhu yang yang

*Galium sigeyosii* Masamune.

Herbs, perennial, erect, 5–10 cm tall. Stems slender, 4-angled, glabrous. Leaves in whorls of 4, sessile or subsessile; blade drying papery, obovate, ovate, elliptic, or elliptic-oblong, 1–6 × 1.5–10 mm, glabrous or sparsely hairy abaxially, base obtuse, margins smooth, apex obtuse or apiculate-acute; principal veins 3, palmate. Inflorescences terminal or sometimes axil-

lary, with few-flowered cymes of 0.5–1.5 cm; peduncles and bracts glabrous; pedicels 1–2 mm. Ovary densely strigillose with undeveloped trichomes. Corolla ?white, rotate, ca. 1.2 mm in diam., lobed for 3/4 or more; lobes 4, ovate. Mericarps subglobose, ca. 1 mm, with dense,  $\pm$  appressed uncinat trichomes.

- Mountains; 2500–3400 m. Taiwan (Jiayi).

*Galium morii* was described as a very small plant from Yu Shan (Mt. Morrison) in Taiwan. We have seen no authentic material. The present description combines information from the protologue, FRPS (71(2): 241. 1999), and Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 106–107. 1998; Fl. Taiwan, ed. 2, 4: 256. 1998). But there are certain conflicts: whereas the leaves were characterized by FRPS as 1- or indistinctly 3-veined, the protologue and Yang and Li said they were 3-veined.

*Galium morii* was the first species to be described from an obviously closely related assembly of *G.* sect. *Platygalium* taxa growing in the high mountains of Taiwan, which is here called the *G. morii* group and also includes *G. formosense*, *G. minutissimum*, *G. nankotaizanum*, and *G. tarokoense*. On the mainland, the newly described *G. rupifragum* from Yunnan obviously also belongs here. This *G. morii* group is characterized by low and condensed growth, small ovate to elliptic or broadly lanceolate leaves, reduced inflorescences, and hairy fruit. Affinities obviously exist with the aggregates of *G. elegans* and *G. serpylloides*.

Characters used to differentiate the taxa of the *Galium morii* group are stem indumentum, number of leaf veins (1–3), uncinat to straight fruit hairs, etc., but many taxonomical problems remain. As an example: *G. morii* may not be clearly separable from *G. tarokoense* by its smaller and sparsely pubescent, 3-nerved leaves (vs. larger, completely glabrous, and rather 1-nerved leaves of *G. tarokoense*); the two taxa are geographically separated according to Yang and Li (loc. cit. 1998: 107, 110). Furthermore, relationships between the alpine core group (as *G. morii*) and other taxa with taller growth from lower elevations (as *G. formosense*) evidently need more attention in the future. Transitional states in the above characters make it necessary to place several species in two or three different positions in our key.

**36. *Galium nankotaizanum*** Ohwi, Repert. Spec. Nov. Regni Veg. 36: 56. 1934.

南湖大山猪殃殃 nan hu da shan zhu yang yang

*Galium maborasense* Masamune.

Herbs, perennial, erect, often reduced, 5–12(–20) cm tall. Stems 4-angled, sparsely to moderately pilose becoming glabrescent, angles thickened. Leaves in whorls of 4, sessile to subsessile; blade drying membranous, ovate, elliptic, or broadly lanceolate, 4–10  $\times$  2–5 mm, length/breadth index 2–3, both surfaces sparsely hirsute at least along midrib, base cuneate to obtuse, apex acute to obtuse, sometimes apiculate; principal vein 1, 2 lateral veins weakly developed. Inflorescences terminal and in upper leaf axils, with cymes 2- to several flowered, 2–16 mm, shorter to somewhat longer than subtending leaves; peduncles glabrescent, bracteate; pedicels 0.8–4 mm. Flowers hermaphroditic. Ovary obovoid, ca. 0.5 mm, densely appressed hairy. Corolla white, rotate, 2–2.5 mm in diam., lobed for 1/2–2/3; lobes 4, ovate. Fruit on pedicels becoming deflexed to nodding; mericarps obloid to oblate, 0.8–1 mm, densely grayish yellow hairy with straight or slightly curved trichomes ca. 0.8 mm. Fl. Jul, fr. Aug–Sep.

- Under shrubs and in rock crevices; 3000–3500 m. Taiwan (Hualian, Nantou, Yilan).

*Galium nankotaizanum* is closely related to a group of species described from the high mountains of Taiwan (see under *G. morii*). *Galium maborasense*, treated as a separate but dubious species by W. C. Chen (in FRPS 71(2): 284. 1999), was explicitly synonymized by Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 107. 1998) with *G. nankotaizanum*. This publication apparently was not available to Chen, but here we follow these Taiwanese authors.

*Galium nankotaizanum* is mainly characterized by its straight or slightly curved fruit trichomes. This links it to the high-alpine Himalayan group of *G. serpylloides* s.l. (see there). Otherwise, *G. nankotaizanum* also appears similar to taxa with hooked fruit trichomes, e.g., *G. tarokoense*, with glabrous stems and only 1 principal leaf vein, from which it apparently differs by larger flowers.

**37. *Galium odoratum*** (Linnaeus) Scopoli, Fl. Carniol., ed. 2, 1: 105. 1771.

车轴草 che zhou cao

*Asperula odorata* Linnaeus, Sp. Pl. 1: 103. 1753.

Herbs, perennial, from slender and elongated rhizomes. Stems erect, 10–50 cm tall, 4-angled, glabrous and smooth except hispidulous at nodes. Leaves in whorls of 6–10, sessile or petiole to 1 mm; blade drying papery, oblanceolate, oblong-lanceolate, or narrowly elliptic, (6–)15–50(–65)  $\times$  (3–)4.5–15(–17) mm, length/breadth index ca. 4, glabrous except antrorsely aculeolate on margins and with antrorse microhairs on upper side and sometimes on abaxial midrib, base acute to cuneate, margins flat, apex acute or usually obtuse then abruptly mucronate; vein 1. Inflorescences terminal, with several- to many-flowered cymes; axes glabrous, smooth; bracts none or leaflike, 1–3 mm; pedicels 1–4 mm. Ovary ellipsoid to obovoid, ca. 0.8 mm, densely hispidulous. Corolla white or bluish white,  $\pm$  broadly funnel-form, 4.5–6.5  $\times$  3–7 mm, glabrous, lobed for ca. 1/2; lobes 4, triangular-spatulate, acute. Mericarps subglobose, 2–2.5 mm, with dense uncinat trichomes 1–1.2 mm. Fl. and fr. Jun–Sep.

Mountain forests; 1500–2800 m. Gansu, Heilongjiang, Jilin, Liaoning, Ningxia, Qinghai, Shandong, Shanxi, Sichuan, Xinjiang [Japan, Korea, Russia; NW Africa, SW Asia, Europe; introduced in North America].

Dried plants of *Galium odoratum* have a sweet coumarine odor, which is still evident on herbarium specimens; its name refers to this. On account of its funnell-form corollas (with the tube  $\pm$  as long as the lobes), *G. odoratum* usually has been treated as a member of *Asperula*. As shown by Ehrendorfer et al. (Fl. Iranica 176: 183. 2005) and verified by DNA-analytical studies, it belongs to *G.* sect. *Hylaea* and is closely related to *G. asperuloides* and *G. hoffmeisteri*. Without flowers it is difficult to separate, particularly from the former with more narrow leaves, but generally *G. odoratum* is more robust. As a constant element of temperate deciduous forests (often with *Fagus*), it has an extensive but rather disjunct distribution area throughout Eurasia, with diploid cytotypes in E Asia, replaced by tetraploids in Europe.

**38. *Galium paniculatum*** (Bunge) Pobedimova, Novosti Sist. Vyssh. Rast. 7: 277. 1971.

圆锥拉拉藤 yuan zhui la la teng

*Asperula paniculata* Bunge in Ledebour, Fl. Altaic. 1: 140. 1829; *Galium xinjiangense* W. C. Chen.

Herbs, perennial, often somewhat caespitose from elongated, much branched, and ca. 1 mm thick rhizomes. Stems erect, to 60 cm tall, 4-angled, little branched, glabrous and smooth, only sometimes puberulent at nodes. Leaves in whorls of up to 6, subsessile; blade drying papery, discolorous (more pale abaxially), lanceolate or narrowly lanceolate, (15–)25–60(–70) × (3–)5–10(–12) mm, glabrous, smooth or mostly somewhat antrorsely ciliolate on margins and midrib, base acute to cuneate, apex acute to acuminate; vein 1. Inflorescences terminal, 8–16 × 8–16 cm, corymbiform to paniculate, lax, with several- to many-flowered cymes; axes glabrous, smooth with few lanceolate, 1–3 mm long bracts and 1.5–6 mm long pedicels. Ovary obovoid, ca. 1 mm, glabrous. Corolla white, drying often yellowish brown, campanulate to funnel-form, ca. 4 mm in diam., glabrous, lobed for ca. 1/2; lobes 4, triangular, acute. Fruit on elongating pedicels with ellipsoid, ca. 2 mm, glabrous and smooth mericarps. Fl. Jun–Jul, fr. Aug–Sep.

Montane river valleys, open forests, grasslands, rocky slopes and talus; 1300–1900 m. Xinjiang [Russia].

When W. C. Chen described *Galium xinjiangense*, he compared it only with the completely different *G. odoratum*, not being aware of the certainly conspecific *G. paniculatum*. Because of its corolla shape, this characteristic and relatively isolated taxon was originally described as *Asperula*. But there is no affinity to any group of *Asperula* as presently circumscribed. Instead, there are similarities with *G. ser. Nemoralia* M. Popova of *G. sect. Leiogalium* and with some members of *G. sect. Orientigalium*. Therefore, the transfer of *A. paniculata* to *Galium* by Pobedimova was fully justified.

Pobedimova et al. (Fl. URSS 23: 271. 1958) also discussed the disjunct distribution of this relict species, which extends from its center in the Altai to the middle Yenisei and to the Dzungarian Alatau in NW China (Xinjiang).

**39. *Galium paradoxum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 19: 281. 1874.

林猪殃殃 lin zhu yang yang

Herbs, perennial, ascending from filiform rhizomes. Stems erect, slender, 4–25 cm tall, 4-angled and narrowly winged, glabrous and smooth, only nodes slightly shortly hairy. Middle stem leaves opposite and with 2 leaflike but clearly smaller stipules in whorls of 4, at lower nodes stipules linear, 1.5–3 mm; petiole 1.5–10 mm; leaf blade membranous, suborbicular, broadly ovate to ovate-lanceolate, or elliptic-oblong, (5–)6–30(–40) × (3.5–)5–15(–23) mm, adaxially with scattered, ± appressed, short hairs, abaxially glabrescent, base attenuate, obtuse to truncate, margins antrorsely hispidulous-ciliolate, apex acute to rounded; single principal vein with 2–4 pairs of pinnate lateral veins. Inflorescences terminal and in axils of upper leaves with 3–11-flowered cymes; axes trichotomous and ± divaricate; bracts narrowly elliptic or ligulate, 0.8–3 mm; pedicels 1–3 mm. Ovary ovoid, ca. 0.5 mm, with undeveloped uncinat hairs. Corolla white, rotate, 2.5–3 mm in diam., lobed for 1/2–2/3; lobes ovate, obtuse, subapiculate to acute or acuminate. Mericarps ovoid, 1–2 mm, densely covered with uncinat yellowish brown trichomes 0.8–1 mm, on pedicels thickening and elongating up to 11 mm. Fl. May–Aug, fr. Jun–Sep.

Forests, meadows, near water, on shady (sub)alpine rocks; 1200–

4000 m. Anhui, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jilin, Liaoning, Qinghai, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Korea, Nepal, Russia].

*Galium paradoxum* is a rather unusual species of the genus because of its broad, petiolate, and pinnately nerved opposite leaves, forming whorls of 4 with 2 smaller leaflike stipules. Therefore, it can be confused with other genera, in particular *Kelloggia*, which differs by its calyx teeth and its never-leaflike stipules. Because of its isolated position, *G. paradoxum* was made the type species of *G. sect. Cymogalia* and placed into a monotypic series, *G. ser. Paradoxa* (see Pobedimova et al., Fl. URSS 23: 326. 1958). As shown by Ehrendorfer et al. (Fl. Iranica 176: 232. 2005) and unpublished DNA analyses, it is only distantly related to *G. kamschaticum*, *G. rotundifolium*, and *G. elegans* in *G. sect. Platygali* s.l. or to members of *G. sect. Hylaea*, as *G. hoffmeisteri*.

Schönbeck-Temesy and Ehrendorfer (in Tan et al., Davis & Hedge Festschrift, 111–114. 1989) commented on the morphological variation and biogeography of *Galium paradoxum* and recognized three subspecies, of which subsp. *paradoxum* and subsp. *duthiei* occur in China as keyed out and described below. The third, *G. paradoxum* subsp. *franchetianum* Ehrendorfer & Schönbeck-Temesy, is restricted to Japan and can be recognized by its relatively larger leaves with relatively short trichomes and often acute apices, and by its relatively large flowers. A survey of many new collections now available from the herbaria PE, KUN, MO, and WU shows that ranges of variation in all differential features used overlap and that many intermediates occur. With respect to the two Chinese taxa one can suspect not only an allopatric but also an altitudinal differentiation pattern.

- 1a. Leaves usually lanceolate-ovate, (10–)12–30(–40) × (5–)7–15(–23) mm; corolla lobes obtuse to subapiculate ..... 39a. subsp. *paradoxum*
- 1b. Leaves broadly ovate to suborbicular, (5–)6–10(–17) × (3.5–)4–7(–10) mm; corolla lobes acute to acuminate ..... 39b. subsp. *duthiei*

**39a. *Galium paradoxum* subsp. *paradoxum***

林猪殃殃(原亚种) lin zhu yang yang (yuan ya zhong)

Leaves ovate-lanceolate or sometimes ovate or elliptic-oblong, attenuate at base, (10–)12–30(–40) × (5–)7–15(–23) mm. Corolla lobes obtuse to subapiculate. Fl. May–Aug, fr. Jun–Sep.

Forests, meadows, near water; 1200–3000 m. Anhui, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jilin, Liaoning, Qinghai, Shanxi, Sichuan, Yunnan, Zhejiang [Bhutan, Korea, Russia].

**39b. *Galium paradoxum* subsp. *duthiei*** Ehrendorfer & Schönbeck-Temesy in Tan et al., Davis & Hedge Festschrift, 113. 1989.

达氏林猪殃殃 da shi lin zhu yang yang

Leaves broadly ovate to suborbicular, (5–)6–10(–17) × (3.5–)4–7(–10) mm, truncate at base. Corolla lobes acute to acuminate. Fl. Jul–Aug, fr. Jul–Sep.

On shady (sub)alpine rocks; 2700–4000 m. Hubei, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

In an otherwise quite typical specimen of this subspecies (e.g., Sichuan, Lutinghsien Mujaogou: T. P. Wang 18-9-1938, PE) the stipules at the mid-stem region are quite comparable to true leaves, only

slightly smaller. This results in a considerable similarity to small plants of *Galium hoffmeisteri* from *G. sect. Hylaea*, which differ by their leaves and leaflike stipules in whorls of up to 5 or 6.

**40. *Galium platygali*** (Maximowicz) Pobedimova, Novosti Sist. Vyssh. Rast. 7: 277. 1971.

卵叶轮草 luan ye lun cao

*Asperula platygali* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 19: 284. 1874.

Herbs, perennial, from thin creeping rhizomes. Stems erect, 20–35 cm tall, with 4 thickened angles, smooth, at nodes glabrous or hispidulous. Leaves in whorls of 4(–6), subsessile, with petiole up to 2 mm; blade drying papery to leathery, elliptic or elliptic-oblong to ovate, (12–)20–25(–28) × (7–)10–11(–15) mm, glabrous or hirtellous to hispidulous along principal veins, ± abruptly narrowed into short petiole, margins antrorsely ciliate, apex obtuse to subacute; principal veins 3–5, palmate. Inflorescences umbel-like thyrsoid and many-flowered panicles with terminal and lateral cymes from uppermost leaf axils; peduncles smooth and glabrous; bracts narrowly oblanceolate or elliptic to ligulate, 1–3 × 0.5–1.5 mm; pedicels 0.5–1.5 mm. Ovary ellipsoid, ca. 0.8 mm, glabrous. Corolla white, funnelliform, with tube ± as long as lobes, 4–5 mm in diam.; lobes 4, elliptic-oblong. Mericarps ovoid, 1.7–2.8 mm, glabrous and smooth. Fl. and fr. Jul–Sep.

Open forests on mountain slopes; ca. 1700 m. Heilongjiang, Jilin, Shanxi [Korea, Russia].

*Galium platygali* is closely related to *G. maximoviczii* (see there) but has larger flowers and whorls of opposite leaves and leaflike stipules with 4 or more (rarely up to 6) elements. Because of their slightly elongated, fused corolla base, the two species in the older literature were placed into the genus *Asperula*, where they had no other close relatives. In spite of their increase in leaf whorl elements, the two species have been placed by Ehrendorfer et al. (Fl. Iranica 176: 175. 2005) into *G. sect. Platygali* s.l. Though this section normally is characterized by leaf whorls with only up to 4 elements, this placement may be justified because the two species correspond otherwise quite well, as in habit, inflorescences, and leaves (with 3–5 palmate principal veins).

Furthermore, *Galium platygali* and *G. maximoviczii* exhibit similarities with *Microphysa elongata* (see p. 216), also with a well-developed corolla tube but with leaves in whorls of only 4 and only 1 main vein. Thus, the monotypic “genus” *Microphysa*, maintained here, is another obvious member of *G. sect. Platygali*.

**41. *Galium prattii*** Cufodontis, Oesterr. Bot. Z. 89: 244. 1940.

康定拉拉藤 kang ding la la teng

Herbs, perennial, erect to weak, up to 50 cm tall. Stems obtusely 4-angled, usually branched, ± retrorsely aculeolate on angles or glabrous. Leaves in whorls of 6, sessile; blade drying papery, lanceolate, 15–35 × 2.5–6 mm, glabrous, adaxially smooth or scaberulous along midrib and near margins, abaxially sparsely retrorsely aculeolate along midrib; base cuneate, margins sparsely to densely retrorsely aculeolate, flat to thinly revolute, gradually narrowed into acute to acuminate apex; vein 1. Inflorescences terminal and axillary, cymes many flowered; peduncles glabrous, smooth; bracts none or few, 1–2 mm; pedicels 1–4 mm. Ovary obovoid, 0.5–0.8 mm, glabrous. Corolla

white to greenish, rotate, 2.5–3 mm in diam., lobed for 2/3 or more, glabrous; lobes 4, triangular-spatulate, acute to shortly acuminate. Mericarps ovoid, ca. 1 mm, glabrous, smooth or minutely granulose. Fl. Jun, fr. Aug.

• Valleys, open habitats of the montane zone; 3100–3700 m. Sichuan (Kangding).

*Galium prattii* apparently is endemic in Sichuan. It is often so close to forms of the reddish-purplish flowering *G. blinii* that only the longer lanceolate leaves, the more flower-rich cymes, and the white to greenish flower color of *G. prattii* help to separate them. Otherwise, *G. prattii* seems to link *G. asperifolium* and *G. tokyoense*. From the first it differs by less-bracteate inflorescences and less-acuminate corolla lobes, from the second by its leaves, which are lanceolate and apically more gradually narrowed (vs. subspatulate and apically rounded, mucronate).

**42. *Galium pusillosetosum*** H. Hara, J. Jap. Bot. 51: 134. 1976.

细毛拉拉藤 xi mao la la teng

Herbs, perennial, procumbent and ascending, caespitose, (5–)10–20(–40) cm tall. Stems with 4 prominent whitish angles, variable from ± densely hispid with straight trichomes of ca. 0.8 mm to retrorsely (very rarely also antrorsely) aculeolate. Middle stem leaves in whorls of up to 5 or 6 (never only 4), subsessile; blade drying blackish, narrowly oblanceolate to narrowly lanceolate, (3–)5–10(–17) × 0.8–2(–4.2) mm, hispid, retrorsely aculeolate on midrib and margins or glabrescent, base cuneate, apex acute and shortly mucronate; vein 1, whitish. Inflorescences with axillary and/or terminal cymes, few to several flowered; peduncles divaricate, with leaflike bracts, 1–3 mm; pedicels 0.5–3 mm. Ovary ovoid, ca. 0.6 mm, densely hispidulous, glabrescent or glabrous. Corolla purple, yellowish green, or white, rotate, 2.5–3 mm in diam., glabrous or scaberulous inside; lobes 4, ovate, acute. Fruit subglobose, ca. 2 mm in diam., with dense to sparse ± uncinat trichomes 0.5–0.7 mm or glabrous and smooth. Fl. and fr. May–Aug.

Mountain slopes, open ground and grasslands; 2100–3900 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang [Bhutan, Nepal].

*Galium pusillosetosum* is an obvious alpine member of the *G. asperifolium* group (*G. sect. Trachygali* s.l.). Main differential characters are its relatively dense leaf and stem indumentum and its conspicuous whitish stem angles. These separate it from *G. acutum*, *G. baldensiforme*, *G. megacyttarion*, *G. rebæ*, *G. glabriusculum*, and *G. sungpanense*. Nevertheless, its variability with respect to leaf epidermal cell size, flower color, and ovary and fruit indumentum is remarkable.

**43. *Galium rebæ*** R. R. Mill, Edinburgh J. Bot. 53: 195. 1996.

芮芭拉拉藤 rui ba la la teng

?*Galium bodinieri* H. Lévillé.

Herbs, perennial, procumbent and mat-forming. Stems (5–)14–30(–45) cm, 4-angled or -sulcate, branched, glabrous and smooth, but sometimes with scattered straight hairs. Leaves in whorls of up to 6, sessile; blade drying papery, blackish, linear-lanceolate to narrowly oblanceolate, 2.5–10.5 × 0.4–1.4 mm, with inconspicuous epidermal cells, glabrous and smooth, rarely with a few straight hairs on abaxial midvein, base cuneate, margins entire and smooth, flat to thinly revolute, apex acute, contracted and shortly mucronate; vein 1. Inflorescences

with predominantly axillary cymes, 1–6-flowered; axes glabrous, smooth; pedicels 0.1–3.2 mm. Ovary ellipsoid-obovoid, ca. 0.5 mm, glabrous, smooth. Corolla red, purple, or occasionally white, rotate, 1.7–3.6 mm in diam., glabrous to papillose; lobes 4, lanceolate-spatulate, adaxially glabrous except puberulent on margins and central vein, apex acute to shortly acuminate. Mericarps ellipsoid, ca. 1.5 × 0.7 mm, glabrous and smooth or granular-verruculose, on pedicels often elongating to 5 mm. Fl. and fr. Jun–Nov.

Damp banks under evergreen forests, alpine meadows, on rocks; 2000–4000 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

*Galium rebae* belongs to the Himalayan and SW Chinese complex of (sub)alpine taxa from the *G. asperifolium* group studied by Mill (Edinburgh J. Bot. 53: 193–213. 1996; Fl. Bhutan 2(2): 825–834. 1999). It is closely related to *G. acutum* and often only separable by its flower color (see comments under that species). At the same time, it appears linked to the likewise reddish flowering but larger *G. blinii* at lower elevations. Reddish flowers also occur in *G. pusillosetosum*, which differs by its dense stem, leaf, and fruit indumentum.

#### 44. *Galium rupifragum* Ehrendorfer, Novon 20: 273. 2010.

屏边拉拉藤 ping bian la la teng

Herbs, perennial, densely caespitose, emerging from a slender branching rootstock; all vegetative parts very fragile when dried and with a loose indumentum of soft hairs, 0.5–0.8 mm, ± straight and spreading, on upper leaf surface slightly retrorse. Stems ascending or erect, 5–10 cm tall, 4-angled, hairy, with 12–18 internodes, increasing in length from 2–8(–15) mm upward, with some short vegetative lateral branches from middle region to inflorescence base. Leaves in whorls of 4; blade thinly papery and remaining ± greenish when dried, ovate to broadly lanceolate, 5–8 × 2.5–3.5 mm, loosely hairy on both sides and marginally, base attenuate, margins flat or slightly revolute, apex acute to apiculate; principal veins 3, palmate, lateral weak. Inflorescences terminal, often with 3 cymes, each with 3–5 flowers; bracts few and ± reduced; peduncles 4–5 mm and pedicels 0.5–3 mm, glabrescent, somewhat elongated and divaricate in fruit. Flowers hermaphroditic. Ovary ovoid, ca. 0.5 × 0.3 mm, with still undeveloped appressed hairs. Corolla greenish white, rotate, ca. 1.5 mm in diam., with 4 triangular and acute to slightly apiculate lobes. Mericarps 0.8–1 mm, with spreading uncinat trichomes ca. 0.25 mm. Fl. and fr. Jul–Sep.

- Mountain regions, on rocks; ca. 1800 m. Yunnan (Pingbian).

The above description of *Galium rupifragum* is based on two sheets collected by H. T. Tsai (*H. T. Tsai 60986*) on rocks at the type locality and deposited in PE. *Galium rupifragum* belongs to *G. sect. Platygali* s.l. and exhibits affinities with the *G. bungei* group, in particular with *G. salwinense*. Both share slender growth and uncinat fruit hairs. But *G. salwinense* has fewer (only up to 10) and longer (up to 10–20 mm) stem internodes, smaller leaves, only 1 (and not 3) main leaf veins, and smaller flowers. Nevertheless, on Emei Shan (Sichuan) typical *G. salwinense* occurs at lower elevations, whereas at higher elevations reduced forms approach *G. rupifragum*. In addition, there are also obvious similarities between *G. rupifragum* and representatives of the *G. morii* group (see there), growing with five accepted species in the high mountains of Taiwan, particularly with *G. morii* itself and with the related *G. formosense*. Main differences from the latter are its lower growth and smaller leaves, from the former its hirsute stems and the more divaricate, often longer peduncles and pedicels.

45. *Galium salwinense* Handel-Mazzetti, Symb. Sin. 7: 1028. 1936.

怒江拉拉藤 nu jiang la la teng

Herbs, perennial, weak, procumbent to ascending, from filiform rhizome, 8–50 cm tall. Stems 4-angled, glabrous or with sparse spreading hairs. Middle stem leaves in whorls of 4, sessile or subsessile; blade drying papery, dark green, narrowly ovate or elliptic to oblong-lanceolate, (3–)5–18(–23) × (1.5–)3–7(–11) mm, sparsely and at margins antrorsely hairy, base attenuate, apex slightly acute; vein 1. Inflorescences terminal and axillary, slender and slightly divaricate, cymes 1.5–6 cm, rather few flowered; axes glabrous, nearly ebracteate; pedicels (2–)4–8(–12) mm. Ovary obovoid, ca. 1 mm, appressed hairy. Corolla yellowish, ± rotate, 1–1.3 mm in diam.; lobes 4, triangular, ± obtuse. Mericarps ovoid, 1–1.5 mm, densely with short uncinat trichomes ca. 0.1 mm. Fl. and fr. Jul–Oct.

- Shady habitats, rocks in forests; 1700–2800 m. Sichuan, Yunnan (Gongshan).

The regional *Galium salwinense* is apparently closely related to the widespread *G. bungei*. Nevertheless, its habit, elongated pedicels, and fruit surface, always with short and spreading hooked trichomes, offer reliable differential characters.

46. *Galium saurense* Litvinov, Trudy Bot. Muz. Imp. Akad. Nauk 7: 75. 1910.

狭序拉拉藤 xia xu la la teng

*Galium densiflorum* Ledebour var. *saurense* (Litvinov) Tzvelev.

Herbs, perennial, caespitose, with stout rootstock and slender, woody rhizomes. Stems erect or ascending, 8–30 cm tall, 4-angled and ± puberulent. Leaves in whorls of 4 in lower and of 6 in middle stem region, sessile; blade dark green adaxially, pale green abaxially, linear or linear-oblong, 7–15 × 0.5–2.5 mm, smooth or usually sparsely to densely scaberrulous adaxially, usually densely hairy abaxially, base acute to cuneate, margins ± revolute, apex mucronate; vein 1. Inflorescences narrowly paniculate with axillary and terminal, 3–15-flowered cymes; peduncles bracteose, ± densely pubescent (rarely glabrescent), with 1–3 mm long pedicels. Ovary ellipsoid, ± puberulent. Corolla yellow, rotate, 3–4 mm in diam., lobed for 3/4 or more; lobes 4, ovate-oblong, acute. Mericarps ellipsoid, ca. 2 × 3 mm, ± densely puberulent (rarely glabrous or ± tuberculate). Fl. and fr. Jul–Aug.

Alpine and subalpine habitats. Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

*Galium saurense*, a C Asiatic mountain taxon, belongs to *G. sect. Galium* and the extremely polymorphic Eurasian *G. verum* group. It refers to condensed alpine populations, in which the leaf whorls are reduced to 4–6 elements. The Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) treats it as a synonym of *G. verum* subsp. *verum*, whereas Ehrendorfer et al. (Fl. Iranica 176: 199, 204. 2005) suggest to maintain its specific rank as long as the whole group has not been studied more intensively. In Pobedimova et al. (Fl. URSS 23: 368–369. 1958) *G. saurense* is reported i.a. from the Tien Shan in the border region of Kazakhstan and Xinjiang, but its description is in conflict with

plate 21, figure 1, which rather corresponds to *G. majmechense* and *G. consanguineum*. W. C. Chen (in FRPS 71(2): 285. 1999) included *G. saurense* as a dubious species and suspected its occurrence in NW China. We have seen no authentic specimens, but vouchers from Xinjiang and Qinghai (and possibly other provinces) fit its description quite well. Nevertheless, their separation from *G. verum* s.s. is partly doubtful.

**47. *Galium serpylloides*** Royle ex J. D. Hooker, Fl. Brit. India 3: 207. 1881, s.l.

隆子拉拉藤 long zi la la teng

Herbs, perennial, ascending, 3–10 cm tall. Rootstock woody, rhizomatous. Stems 4-angled, branched, shortly pubescent. Leaves in whorls of 4(or ?5), sessile; blade drying papery, ovate or elliptic, 4–6 × 2.5–4 mm, glabrous or sparsely hirtellous, base rounded, margins thinly revolute, usually with antrorse microhairs, apex obtuse or slightly acute; principal vein 1 (or with 2 inconspicuous side veins). Inflorescences terminal and in axils of upper leaves, with cymes 5–8 mm, few or usually 3-flowered; pedicels 1–2 mm. Flowers hermaphroditic to subdioecious. Ovary appressed hairy. Corolla yellowish green, rotate, ca. 2 mm in diam.; lobes 4, ovate-triangular, acute. Mericarps up to 2 mm, with straight lanate hairs. Fl. and fr. Jun–Sep.

Mountain slopes; 3600–3800 m. Xizang (Lhünzê) [India, Nepal].

Originally, *Galium serpylloides* was very broadly circumscribed as a species widely distributed throughout the whole Himalayan range. But a critical taxonomic analysis of the group by Schönbeck-Temesy and Ehrendorfer (Pl. Syst. Evol. 155: 77–87. 1987) revealed five vicarious and geographically well-separated species from Kashmir in the west to Nepal in the east: *G. gymnotetaleum* Ehrendorfer & Schönbeck-Temesy, *G. lakulense* Ehrendorfer & Schönbeck-Temesy, *G. serpylloides* s.s., *G. saipalense* Ehrendorfer & Schönbeck-Temesy, and *G. nepalense* Ehrendorfer & Schönbeck-Temesy. The above cited locality from E Xizang, Lhünzê, published in FRPS (71(2): 228. 1999), is much further to the east, i.e., SE of Lhasa and NE of Bhutan. We have neither seen authentic material from this nor from other Xizang and Charné province collections in the herbarium BM (e.g., Ludlow, Sheriff & Taylor 6390). At the moment, it is not possible to decide whether they correspond to one of the above mentioned species of the *G. serpylloides* group, or the related *G. glandulosum* group, or represent a still undescribed taxon. Therefore, we provisionally classify these SE Xizang populations under *G. serpylloides* s.l.

Characteristic morphological features of the *Galium serpylloides* group are the whorls of 4 leaves and leaflike stipules, the trend toward palmate leaf veins and sexual differentiation of flowers, and the change from hooked to straight fruit hairs. All this suggests relationships with members of *G. sect. Platygalium* s.l., as the *G. morii* group (in particular *G. nankotaizanum*) or the *G. elegans* group. These trends reappear (probably as a homoplasy?) in the W North and South American *G. sect. Lophogalium* K. Schumann, evidently derived from ancestors similar to *G. sect. Platygalium* s.l.

**48. *Galium sichuanense*** Ehrendorfer, Novon 20: 275. 2010.

四川拉拉藤 si chuan la la teng

Herbs, perennial, from filiform rhizomes ascending to erect, ca. 30 cm tall. Stems single, strongly branched from base, with 4 prominent and whitish angles, glabrous and smooth, only slightly aculeolate at nodes. Middle stem leaves and leaf-like stipules in whorls of 4–6; blade drying papery and greenish-brownish, lanceolate, (12–)15–20(–25) × (3–)4–6(–7) mm, glabrous but on adaxial side near margins with antrorse appressed microhairs, on ± flat margins retrorsely (sometimes

also somewhat antrorsely) aculeolate, subsessile and gradually narrowed into base, largest breadth near middle, apex cuspidate with hyaline point; principal vein 1. Inflorescences broadly ovate, many flowered, cymes terminal and lateral, 2.5–5 cm, slender, leafy and bracteate to last branches, ± divaricate; axes glabrous; peduncles 1.5–2 cm; pedicels 0.5–5 mm. Flowers hermaphroditic. Ovary obovoid, 0.5–0.8 mm, with appressed curved hairs. Corolla dried reddish brown, rotate, 1.5–2 mm in diam.; lobes 4, triangular, cuspidate. Mericarps ovoid, 1.8–2.5 mm, with ± spreading uncinat trichomes 0.2–0.3 mm. Fl. Jul–Aug, fr. Aug–Sep.

• Mountain forests; 3200–4000 m. Sichuan (Daocheng).

Up to now, only two collections of *Galium sichuanense* are known from the type locality. The new species is morphologically isolated and not closely related to any other taxon of the genus. Its character profile, particularly its perennial, hemicryptophytic growth form, the partly retrorsely aculeolate leaf margins, and the fruit with uncinat trichomes, designates it as a member of *G. sect. Trachygalium*, but there are also features reminiscent of *G. sect. Hylaea* (cf. Ehrendorfer et al., Fl. Iranica 176: 181. 2005). Nevertheless, the combination of the branching pattern, the membranous leaves, the predominant glabrescence, the leafy inflorescences, and the small flowers separate it clearly from all other members of the two sections.

Another isolated and apparently relict species from E Asia has to be compared with *Galium sichuanense*, the Japanese *G. kikumugura* (see also under *G. hoffmeisteri*). The two share the leaves in whorls of 4–6, the small flowers, and the hooked fruit trichomes. In contrast, the habit and the somewhat antrorsely rough or even aculeolate leaf margins of *G. kikumugura* are reminiscent of *G. bungei* (*G. sect. Platygalium*). Unique characters of *G. kikumugura* are the very few-flowered cymes on long peduncles with a single bract and the elongate, curved mericarps. Its taxonomic placement within *Galium* also is uncertain.

**49. *Galium glabriusculum*** Ehrendorfer, nom. nov.

无梗拉拉藤 wu geng la la teng

Replaced synonym: *Galium smithii* Cufodontis, Oesterr. Bot. Z. 89: 236. 1940, not *Galium smithii* G. Don, Gen. Hist. 3: 660. 1834 [*Sherardia erecta* Smith, Fl. Graec. 2: 14. 1813].

Herbs, perennial, weakly procumbent to erect. Stems (5–)7–15(–30) cm, 4-angled, glabrous and smooth, rarely shortly hairy at nodes. Leaves in whorls of up to 5 or 6, subsessile; blade greenish brown and subleathery when dried, narrowly lanceolate to narrowly elliptic, 3–12 × 1–2.5 mm, glabrous and smooth, very rarely with straight hairs adaxially or slightly retrorsely aculeolate on margins, base cuneate, margins thinly revolute, apex acute and shortly mucronate; vein 1. Inflorescences with terminal and lateral 1–3-flowered cymes on up to 10 mm long peduncles (often elongating in fruit) and with subsessile flowers on 0.5–3 mm long pedicels. Ovary subglobose, ca. 1 mm, densely covered with undeveloped trichomes. Corolla white, rotate, ca. 1.5 mm in diam.; lobes 4, ovate, obtuse. Mericarps ellipsoid, ca. 3 mm, with dense spreading yellowish brown uncinat trichomes ca. 0.7 mm. Fl. and fr. Jul–Aug.

• Meadows, alpine mountain slopes; 3800–4700 m. Gansu, Qinghai, Sichuan, Xinjiang.

*Galium glabriusculum* is a well-documented species of the alpine subgroup (2) within the *G. asperifolium* complex (see under that species and *G. acutum*). It is similar to *G. sungpanense* and *G. baldensisforme*

and mainly differs from the former by its narrower and more leathery leaves and from both by the nearly total lack of indumentum.

**50. *Galium spurium* Linnaeus, Sp. Pl. 1: 106. 1753.**

猪殃殃 zhu yang yang

*Galium agreste* Wallroth; *G. agreste* var. *echinospermum* Wallroth; *G. agreste* var. *leiospermum* Wallroth; *G. aparine* Linnaeus var. *echinospermum* (Wallroth) T. Durand; *G. aparine* f. *leiocarpum* Makino; *G. aparine* var. *leiospermum* (Wallroth) T. Durand; *G. aparine* var. *spurium* (Linnaeus) W. D. J. Koch; *G. aparine* var. *tenerum* (Grenier & Godron) H. G. Reichenbach; *G. aparine* var. *vaillantii* (Candolle) W. D. J. Koch; *G. hongnoense* H. Léveillé; *G. oliganthum* Nakai & Kitagawa; *G. pauciflorum* Bunge (1833), not Willdenow ex Candolle (1830); *G. spurium* var. *echinospermum* (Wallroth) Hayek; *G. spurium* var. *tenerum* Grenier & Godron; *G. vaillantii* Candolle; *G. wutaicum* Hurusawa.

Herbs, annual, procumbent or climbing, 30–50 cm tall. Stems 4-angled, 0.5–2.5 mm in diam.,  $\pm$  branched from base, retrorsely aculeate on angles, glabrescent to pilose at nodes. Leaves at middle stem region in whorls of 6–8, subsessile; blade drying papery, narrowly oblanceolate to narrowly oblong-oblanceolate, 5–40  $\times$  1–5(–8) mm, usually pilosulous or hispidulous adaxially, retrorsely aculeolate along midrib abaxially and along margins, base acute, margins flat to thinly revolute, apex acute and shortly mucronate; vein 1. Inflorescences terminal and axillary, cymes 2- to several flowered; axes glabrous to aculeolate; bracts leaflike or none, 1–5 mm; peduncles 1–4 cm; pedicels 0.5–1.5 mm, finally elongating and often curved directly under fruit. Ovary subglobose, 0.3–0.5 mm, with uncinat trichomes or glabrous. Corolla yellowish green or white, rotate, 1–1.5 mm in diam., lobed for 2/3 or more; lobes 4, triangular to ovate, acute. Mericarps subglobose to broadly kidney-shaped, 1–3 mm in diam., glabrous or often densely covered with uncinat trichomes 0.1–1 mm from straight bases. Fl. Mar–Jul, fr. Apr–Nov.

Open fields, riversides, farmlands, mountain slopes; near sea level to 4600 m. Common and widespread throughout China except Hainan and Nanhai Zhudao [Africa, Eurasia, and the Mediterranean; today sporadically adventive worldwide].

This species is occasionally used medicinally.

*Galium spurium* consists of basal elements ( $2x$  and  $4x$ ,  $2n = 20$ , 40) of a polymorphic polyploid complex, the *G. aparine* group or *G. aparine* s.l. (see there). Following Ehrendorfer et al. (Fl. Iranica 176: 234. 2005), *G. spurium* is maintained here at the species level, with particular reference to its differential characters in flower and fruit size, and not included under the higher polyploid and aneuploid *G. aparine* s.s., as in Cufodontis (Oesterr. Bot. Z. 89: 245–247. 1940) and W. C. Chen (in FRPS 71(2): 237. 1999). *Galium spurium* is very common and widespread in China, in contrast to the rare and partly doubtful *G. aparine* s.s. To our knowledge, no chromosome counts are yet available from Chinese populations of *G. spurium*. Nevertheless, a report of  $2n = 40$  for this species from Novosibirsk (Krasnikov & Schaulo, Bot. Zhurn. 75: 118–120. 1990) suggests the occurrence of  $4x$  *G. spurium* cytotypes in Asia, corresponding to similar  $4x$ -cytotypes reported from Africa.

From the varieties recognized by Cufodontis (loc. cit.) and accepted by W. C. Chen (loc. cit.: 234–237) *Galium spurium* var. *tenerum* refers to reduced specimens, which can appear under extreme conditions as modifications everywhere, and are taxonomically irrele-

vant. But as genetically fixed reduced alpine ecotypes they deserve a name: *G. spurium* subsp. *ibicinum* (Boissier & Haussknecht) Ehrendorfer, described from high mountains in SW Asia (see Ehrendorfer et al., loc. cit.: 236). Some condensed alpine Chinese specimens may belong to this taxon.

In contrast, *Galium spurium* var. *echinospermum* vs. var. *spurium* (= *G. aparine* var. *leiospermum*) refer to genetically fixed forms with uncinat hairy vs. glabrous fruit, which in W Eurasia and the Mediterranean often occur together in the same population and can be separated as taxonomic forms. In China we have seen only the *echinospermum* type, whereas var. *spurium* apparently is missing there. The reference to it by W. C. Chen (loc. cit.: 237) concerns the glabrous fruited *G. ghilanicum* (see there). It is obvious that a more detailed analysis of the *G. aparine*–*G. spurium* polyploid complex in E Asia is badly needed.

The enormous variability of *Galium aparine* and *G. spurium* has caused its many synonyms and common misidentifications with other annual and even perennial taxa of *Galium*. This applies in particular to the annual *G. tricorutum*, which differs by strongly verrucose (but not uncinat hairy) fruit, and to the perennial taxa with retrorsely aculeolate stems and fruit with uncinat hairs, such as *G. sungpanense* (see there), *G. dahuricum*, etc., which often have larger flowers.

**51. *Galium sungpanense* Cufodontis, Oesterr. Bot. Z. 89: 238. 1940.**

松潘拉拉藤 song pan la la teng

Herbs, perennial, slender, with tender rootstock. Stems procumbent or ascending, up to 30 cm, 4-angled,  $\pm$  retrorsely aculeolate to somewhat hispidulous or smooth. Leaves in whorls of up to 5 or 6, sessile or narrowed to very short petiole; blade drying greenish brown and stiffly papery to subleathery, oblanceolate or narrowly elliptic-oblanceolate, 3.5–12(–15)  $\times$  1.5–3.5 mm, glabrous to  $\pm$  hispidulous, sparsely to densely retrorsely aculeolate along margins and sometimes also on abaxial side of midrib, margins thinly revolute, apex acute and cuspidate; vein 1. Inflorescences with terminal and axillary cymes, 1–3-flowered with lanceolate bracts; peduncles up to 10 mm, glabrous and smooth; pedicels 2–7 mm, straight and elongating in fruit. Ovary obovoid, 0.5–0.8 mm, densely covered by undeveloped uncinat trichomes. Corolla pinkish or  $\pm$  purplish, rotate, 1.1–1.5 mm in diam., glabrous; lobes 4, triangular, obtuse. Fruit with obovoid mericarps, ca. 2.5 mm, densely covered with spreading yellowish brown uncinat trichomes 0.4–0.8 mm. Fl. and fr. Jul–Sep.

• Thickets or meadows, often in shady places; higher elevations up to 3300 m. Hebei, Sichuan, Xinjiang.

The description of *Galium sungpanense* in FRPS (71(2): 233. 1999) includes some details that do not agree with the material seen and may have been based in part on specimens of other taxa. This has been corrected in the above description.

*Galium sungpanense* belongs to the throughout-perennial *G.* sect. *Trachygalium* s.l. and the *G. asperifolium* group (see there). It appears to link its montane (1) and alpine (2) subgroups and shares the few-flowered cymes with the latter. From *G. baldensiforme* and *G. glabriusculum*, both also with uncinat fruit hairs, it is separated by marginally stronger retrorsely aculeolate and partly longer leaves.

Remarkable are the close affinities between *Galium sungpanense* and members of the annual *G.* sect. *Euaparine*. The single decisive difference is the tender perennial (and possibly short-lived?) rootstock of *G. sungpanense*. Only its pinkish to purplish flowers and the never-curved fruiting pedicels allow the separation of plants collected without

subterranean organs from the common *G. spurium*. This suggests that *G. sect. Euaparine* could have originated from *G. sect. Trachygalium*-like ancestors.

**52. *Galium taiwanense*** Masamune, Trans. Nat. Hist. Soc. Formosa 29: 180. 1939.

台湾猪殃殃 tai wan zhu yang yang

Herbs, perennial, procumbent. Stems 4-angled, sparsely scabrous. Leaves on main stems in whorls of up to 6, sessile; blade drying papery, oblanceolate or narrowly obovate-oblong, (4-)10-20(-31) × (1-)2-4 mm, glabrous and smooth adaxially, glabrous or hairy and retrorsely aculeolate along midrib abaxially and along margins, base acute to cuneate, apex acute or acuminate; vein 1. Inflorescences with terminal and axillary, few- to several-flowered, usually regularly trichotomous cymes; bracts linear, ca. 2 mm; pedicels slender, 3-5 mm. Ovary ovoid, ca. 0.7 mm, glabrous. Corolla white, rotate, 2-2.5 mm in diam., lobed for 2/3 or more; lobes 4, ovate, obtuse. Mericarps ellipsoid, ca. 2 mm, glabrous. Fl. May-Jul, fr. Jul.

- Mountain slopes; 200-2100 m. N Taiwan.

We have seen no material from this taxon. Judging from the information and the holotype photograph presented by Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 109, pl. 4, 3+4. 1998), this appears to be close to and possibly even identical with *Galium dahuricum* var. *dahuricum*.

**53. *Galium takasagomontanum*** Masamune, Trans. Nat. Hist. Soc. Formosa 26: 52. 1936.

山地拉拉藤 shan di la la teng

Herbs, perennial (not annual), erect, ca. 30 cm tall. Stems 4-angled, slender, much branched, glabrous. Leaves in whorls of 4 or 5, sessile; blade narrowly ovate or ovate, abaxially pilose along veins, apex acuminate; principal vein 1 or with 2 short and weakly developed lateral veins. Inflorescences terminal, with few-flowered trichotomous cymes; peduncles glabrous; pedicels 1-2 mm, glabrous. Ovary ovoid-subglobose, ca. 1 mm, with undeveloped trichomes. Corolla white, rotate, ca. 3 mm in diam.; lobes 4, acute. Mericarps subglobose, with dense uncinulate trichomes. Fl. and fr. Jul.

- Conifer mountain forests; ca. 2800 m. Taiwan.

*Galium takasagomontanum* was not treated or mentioned by Yang and Li (Bull. Natl. Mus. Nat. Sci., Taichung 11: 101-117. 1998; Fl. Taiwan, ed. 2, 4: 254-259. 1998), and we have not seen authentic material. According to the protologue it may belong to the condensed Taiwan mountain group of *G. morii* (see there), where it appears similar with its weakly 3-nerved leaves to *G. nankotaizanum* but differs by glabrous stems, somewhat larger flowers, and uncinulate trichomes on mericarps. Nevertheless, its quite tall growth, the partly 5-whorled leaves, the exclusively terminal inflorescences, and the flower size are more indicative of its being a synonym of the Taiwanese *G. echinocarpum* from *G. sect. Hylaea*. A definite placement will only be possible after inspection of the type material.

**54. *Galium tarokoense*** Hayata, Icon. Pl. Formosan. 7: 33. 1918.

太鲁阁猪殃殃 tai lu ge zhu yang yang

Herbs, perennial, procumbent to erect, condensed, 5-8 cm

tall. Stems 4-angled, glabrous, smooth. Leaves in whorls of 4, sessile or subsessile; blade drying papery, rhombic-elliptic, elliptic, or obovate, 3-6 × 2-3.5 mm, glabrous, base acute to cuneate, margins flat or thinly revolute, apex acute to somewhat obtuse; vein 1. Inflorescences with terminal and axillary cymes, 1- or few flowered, 0.3-1.5 cm; peduncles glabrous, smooth, ebracteate; pedicels 0-2 mm. Ovary obovoid, ca. 0.4 mm, densely strigillose at sides. Corolla pale yellow, rotate, ca. 2 mm in diam.; lobes 4, triangular-oblong, acute. Mericarps ellipsoid, 1-1.5(-2) mm, with dense, appressed uncinulate trichomes ca. 0.3 mm. Fl. and fr. summer-winter.

- Shady sites on limestone substrates; 1400-2700 m. Taiwan.

*Galium tarokoense* belongs to a group of high mountain taxa from Taiwan, including *G. morii* (see there). Its main differential characters are the lack of indumentum on most parts, the only 1-nerved leaves, and the short appressed fruit hairs.

**55. *Galium tenuissimum*** M. Bieberstein, Fl. Taur.-Caucas. 1: 104. 1808.

纤细拉拉藤 xian xi la la teng

Herbs, annual, erect. Stems (10-)30-50(-60) cm tall, with strong, intricate and divaricate branching from base, 4-angled, usually retrorsely aculeolate, more rarely glabrescent to smooth. Leaves at middle stem region in whorls of 6-8, subsessile or sessile; blade drying papery, linear to oblanceolate, (4-)8-15(-20) × 0.5-1(-2) mm, mostly glabrous and sparsely to densely antrorsely aculeolate near margins and on veins abaxially, base straight to acute, apex acute to acuminate-aristate; vein 1. Inflorescences broadly paniculate, very lax and loosely divaricate, cymes axillary and terminal, with 3-11(-14) flowers; axes glabrous or sparsely hispidulous; bracts none or small, leaflike; pedicels 3-15 mm, strongly elongating in fruit up to 20 mm. Ovary obovoid to ellipsoid, ca. 0.8 mm, glabrous. Corolla whitish, pale yellow, or greenish, rotate to slightly cup-shaped, 1.5-2 mm in diam., glabrous; lobes 4, oblong-elliptic, acute to aristate. Mericarps ellipsoid to obovoid, ca. 1 × 1.25 mm, glabrous, smooth or ± tuberculate. Fl. and fr. May-Jul.

Open mountain slopes; 300-2800 m. Xinjiang (Xinyuan) [Kashmir, Kyrgyzstan, Pakistan, Russia, Turkmenistan; SW Asia (Armenia, Georgia, Iran, Iraq, Lebanon, Syria, Turkey), Europe (Balkan Peninsula, Hungary)].

*Galium tenuissimum* is a member of the annual *G. sect. Microgalium*, differentiated by antrorsely aculeolate leaf margins. It is widespread through SE Europe, SW and C Asia, and reaches its eastern limit in NW China.

**56. *Galium tokyoense*** Makino, Bot. Mag. (Tokyo) 17: 72. 1903.

钝叶拉拉藤 dun ye la la teng

*Galium asprellum* Michaux var. *tokyoense* (Makino) Nakai; *G. dahuricum* Turczaninow ex Ledebour var. *tokyoense* (Makino) Cufodontis.

Herbs, perennial, erect or ascending but not clambering. Stems 30-70 cm tall, 4-angled, retrorsely aculeolate. Middle stem leaves in whorls of 5 or 6, subsessile; blade drying papery, subspatulate to obovate, (11-)17-35(-40) × (2.5-)3-7(-10)

mm, mostly retrorsely aculeolate adaxially, along midrib abaxially and always along margins, base acute, apex rounded to emarginate, abruptly cuspidate; vein 1. Inflorescences congested, cymes terminal and in axils of uppermost leaves, several to many flowered, up to 4 cm; axes rough or glabrous and smooth; bracts few and small, only on lower inflorescence branches; pedicels 1–2 mm. Ovary obovoid, ca. 0.8 mm, glabrous. Corolla white, rotate, 1.3–3.5 mm in diam., glabrous; lobes acute to obtuse. Mericarps obovoid, ca. 2 mm, glabrous, smooth or tuberculate. Fl. and fr. Jun–Jul.

Forests, grasslands, meadows, riversides, open fields; 200–900 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shandong [Japan, Korea].

Cufodontis (Oesterr. Bot. Z. 89: 243–244. 1940) and W. C. Chen (in FRPS 71(2): 256. 1999) treated *Galium tokyoense* as a variety of *G. dahuricum* (see discussion under that species), but in the recent *Flora of Japan* (Yamazaki, Fl. Japan 3a: 239. 1993) it is again regarded as a separate species. In view of its erect (not clambering) growth, the abruptly acuminate leaf shape, the short and post-florally not elongated pedicels, and the always glabrous fruit this rank appears quite justified.

#### 57. *Galium tricornutum* Dandy, Watsonia 4: 47. 1957.

麦仁珠 mai ren zhu

Herbs, annual, weakly ascending to procumbent or clambering. Stems 5–80 cm tall, 4-angled, often little branched, glabrescent, densely retrorsely aculeolate on angles. Leaves in whorls of 6–8, subsessile; blade drying papery, narrowly oblanceolate to narrowly elliptic, 10–32 × 2–6 mm, glabrescent, upper side glabrous, lower side densely aculeolate along midrib, base acute, margins densely retrorsely and antrorsely aculeolate, apex acute; vein 1. Inflorescences elongated thyrsoid, cymes terminal and axillary on short lateral stems, mostly 3–5 flowered; axes retrorsely aculeolate; bracts none or leaflike and 3–5 mm; pedicels 0.3–2 mm. Ovary ellipsoid to didymous, 0.3–0.5 mm, smooth to verrucose or spinulose. Corolla white, rotate, 1–1.5 mm in diam., lobed for 2/3 or more; lobes triangular. Mericarps subglobose, ca. 3 × 4–6 mm, becoming verrucose to tuberculate but never with uncinat trichomes, pendulous on arching pedicels to 7 mm. Fl. Apr–Jun, fr. May–Mar.

Adventive weeds in meadows on mountain slopes, open fields, river beaches, ditch sides; 400–4000 m. Anhui, Gansu, Guizhou, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shanghai, Shanxi, Sichuan, Xinjiang, Xizang [India, Pakistan; N Africa, SW Asia, Europe, North America].

In general aspect and habit the weedy annual *Galium tricornutum* from *G. sect. Kolgyda* strongly resembles *G. spurium* and *G. aparine* but can be separated by its above glabrous leaves and its verrucose fruit on arching pedicels. *Galium tricornutum* apparently is rare in China. The above wide distribution data from FRPS evidently is due to misidentifications of the common *G. spurium*.

*Galium tricornutum* has long been treated under the illegitimate superfluous name *G. tricornis* Stokes, published in 1787. Stokes's intent was to transfer *Valantia aparine* Linnaeus (= *G. verrucosum* Hudson, 1767) to *Galium*, where the epithet "*aparine*" was blocked by *G. aparine* Linnaeus. The specimens on which Stokes based his name belonged partly to *G. verrucosum* and partly to *G. tricornutum*, two close but very well-separated species. However, when Stokes published his article, the previously and validly published name in *Galium* by Hudson

(1767) already existed and made his name superfluous. That remained unnoticed and *G. tricornis* was generally used for our species. Only in 1975 did Dandy clarify this situation, designating *G. tricornutum* as the new name for the long known but misnamed *G. tricornis*.

#### 58. *Galium trifloriforme* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 428. 1901.

拟三花拉拉藤 ni san hua la la teng

Herbs, perennial, from elongated rhizomes. Stems procumbent to erect, (10–)25–40(–65) cm tall, 4-angled, mostly slightly retrorsely aculeolate, hirtellous at nodes. Leaves on main stems in whorls of up to 6(–8), subsessile; blade drying papery, blackish or green, narrowly obovate to oblanceolate, (12–)18–28(–50) × (3–)5–10(–15) mm, with sparse antrorse microhairs adaxially, moderately retrorsely aculeolate abaxially on vein and at leaf margins, base acute to cuneate, margins flat to thinly revolute, apex acute, obtuse, or rounded and abruptly mucronate; vein 1. Inflorescences with axillary and terminal cymes on upper 2 or 3 nodes, mostly 2–8 flowered; axes glabrous, smooth; bracts none or few, narrowly elliptic to narrowly lanceolate, 2–5 mm; pedicels ca. 1.5 mm. Ovary obovoid, ca. 0.5 mm, densely hispidulous with undeveloped trichomes. Corolla white or pale green, rotate, 1.5–2 mm in diam., glabrous; lobes 4, triangular, acute. Mericarps ellipsoid, 1.5–2.5 mm, with dense uncinat trichomes ca. 1 mm, fruiting pedicels divaricate and elongating to 10 mm. Fl. and fr. Jul–Sep.

Mountain forests, open fields; 2200–3400 m. Heilongjiang, Jilin, Nei Mongol, Qinghai [Japan, Korea, NE Russia].

*Galium trifloriforme* is a variable and problematic taxon from NE Asia. It was either accepted as a separate species (e.g., by Pobedimova et al., Fl. URSS 23: 303. 1958; Yamazaki, Fl. Japan 3a: 239. 1993) or was treated as a synonym of *G. triflorum* (see Cufodontis, Oesterr. Bot. Z. 89: 236–237. 1940) or of *G. hoffmeisteri* (e.g., W. C. Chen in FRPS 71(2): 230. 1999, as *G. asperuloides* subsp. *hoffmeisteri*; Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010). It differs from the very close typical *G. triflorum* by its more condensed inflorescence with cymes terminal and on the upper 1 or 2(or 3) nodes, its always retrorsely aculeolate leaf margins, and its mostly rough stems.

These differential characters make *Galium trifloriforme* a link between members of *G. sect. Hylaea*, with smooth stems and antrorsely directed microhairs on leaf margins, and of the *G. asperifolium* group of *G. sect. Trachygalium*, mostly with retrorsely aculeolate stems and retrorse microhairs on leaf margins (but often also with antrorse microhairs on the adaxial leaf surface). From the available material, it appears that *G. trifloriforme* applies to the central part of this practically continuous morphological series. This series begins with *G. odoratum*, *G. hoffmeisteri*, *G. echinocarpum*, *G. nipponicum*, and typical *G. triflorum* on the side of *G. sect. Hylaea*, continues via *G. triflorum* var. *asprelliforme* Fernald and *G. trifloriforme*, and ends on the other side with *G. asprellum*, *G. dahuricum*, *G. blinii*, and other typical members of the *G. asperifolium* group of *G. sect. Trachygalium*. It is remarkable that this transitional series apparently corresponds to a polyploid complex with marginal taxa including 2x-, *G. triflorum* 4x- and 6x-, and *G. trifloriforme* ± 10x-cytotypes. Thus, phylogenetic reticulation may have caused the still insufficiently resolved taxonomic confusion around *G. triflorum*, *G. trifloriforme*, and their relatives (cf. Pobedimova et al., loc. cit.: 287–381; Cufodontis, loc. cit.; Yamazaki, loc. cit.; Ehrendorfer et al., Fl. Iranica 176: 182. 2005).

Among the relatively few relevant PE, KUN, and WU specimens we have seen from China and the Himalaya only two typical *Galium triflorum* specimens with antrorsely aculeolate leaf margins were found (see there); otherwise, only plants corresponding to the above description of *G. trifloriforme* with leaf margins retrorsely aculeolate were seen. This finding is in conflict with W. C. Chen (loc. cit.) who accepted only *G. triflorum* for the Chinese flora, but certainly needs verification from more extensive studies including Korea (from where *G. trifloriforme* was described) as well as adjacent NE Siberia and Japan, where both taxa apparently occur.

**59. *Galium triflorum* Michaux, Fl. Bor.-Amer. 1: 80. 1803.**

三花拉拉藤 san hua la la teng

Herbs, perennial, from slender rhizomes. Stems procumbent, ascending or erect, (15–)25–80(–125) cm tall, 4-angled, usually glabrous and smooth (rarely somewhat retrorsely aculeolate), hirtellous at nodes. Leaves in whorls of up to 6(–8), subsessile; blade drying papery, sometimes blackening, narrowly obovate to broadly (ob)lanceolate, (15–)20–35(–45) × (3–)6–12(–16) mm, ± glabrous but with appressed and antrorse microhairs adaxially and antrorse aculei along margins, base acute to cuneate, margin flat to thinly revolute, apex acute or rounded and abruptly mucronate; vein 1. Inflorescences terminal and axillary, with few- to several-flowered cymes at upper 2–4 stem nodes; axes glabrous and smooth; bracts few, narrowly elliptic to narrowly lanceolate, 2–5 mm; pedicels ca. 1.5 mm. Ovary obovoid, ca. 0.5 mm, densely hispidulous with undeveloped trichomes. Corolla white or greenish, rotate, 1.5–2 mm in diam., lobed for 3/4 or more, glabrous; lobes 4, triangular, acute. Mericarps ellipsoid, 1.5–2.5 mm, with dense uncinat trichomes ca. 1 mm, on pedicels elongating up to 10 mm. Fl. and fr. Jul–Sep.

Mountain forests; 1500–2000 m. Guizhou, Sichuan [Japan, Korea, Russia; Europe, North America].

*Galium triflorum* is obviously rare in China and does not occur in the Himalaya, as already suspected by Pobedimova et al. (Fl. URSS 23: 300–303. 1958). We have seen only two non-flowering specimens from SW China (Guizhou: Northern Qian [Guizhou] Team 907, PE; Sichuan: G. H. Yang 54472, PE), which apparently belong here. Indications for more northern provinces by W. C. Chen (FRPS 71(2): 232. 1999) have been listed here under *G. trifloriforme* (see there), a taxon not recognized as distinct by W. C. Chen (loc. cit.: 230). Both taxa urgently need more detailed study. *Galium triflorum* is very similar and morphologically subcontinuous with *G. trifloriforme* but differs from it by its more elongate inflorescences, mostly smooth stems, and particularly by its antrorsely aculeolate leaf margins. This latter character clearly places it into *G. sect. Hylaea* and into the close neighborhood of *G. hoffmeisteri* on the mainland, *G. echinocarpum* on Taiwan, and *G. nipponicum* in Japan.

**60. *Galium turkestanicum* Pobedimova in Schischkin, Fl. URSS 23: 717. 1958.**

中亚拉拉藤 zhong ya la la teng

Herbs, perennial, erect, to 0.55 m tall. Rhizomes slender, reddish. Stems 4-angled, glabrous and smooth except puberulent to hispidulous at nodes. Leaves in whorls of 4, sessile; blade drying papery, linear or linear-lanceolate, 27–40 × 3–9 mm, glabrous or antrorsely scabrous along midrib and margins, base obtuse to rounded, apex narrowed then shortly obtuse; principal vein 1, with 2 weaker lateral veins reticulating near middle of blade. Inflorescences terminal, paniculate, many

flowered, 2–15 cm; peduncles glabrous or scabrous; bracts few, oblanceolate, 1–2 mm; pedicels 1–4 mm. Ovary ellipsoid and laterally flattened, ca. 1 mm. Corolla whitish, rotate, 4–5 mm in diam.; lobes 4(or 5), elliptic to lanceolate, acute or mucronulate. Mericarps ellipsoid, at least 2 mm, glabrous or with ± sparse hooked trichomes ca. 0.3 mm. Fl. Jul–Aug, fr. Aug–Sep.

Meadows and dry slopes in the (sub)alpine zone. Expected in Xinjiang [Kazakhstan, Russia].

*Galium turkestanicum* is included as a dubious species for W China by W. C. Chen (FRPS 71(2): 285. 1999). It belongs to the extremely polymorphic *G. boreale* group of *G. sect. Platygali* s.l. and represents a particularly vigorous taxon with very narrow leaves and lateral leaf veins only weakly developed (Ehrendorfer et al., Fl. Iranica 176: 180. 2005). Pobedimova (loc. cit.) gives its distribution as including the Tien Shan. Therefore, it probably also occurs in NW China, Xinjiang.

**61. *Galium uliginosum* Linnaeus, Sp. Pl. 1: 106. 1753.**

沼猪殃殃 zhao zhu yang yang

Herbs, perennial, tender, from slender rhizomes. Stems 10–60 cm tall, somewhat retrorsely aculeolate along 4 angles. Leaves of middle stem region in whorls of 6–8, sessile; blade drying papery and glossy, narrowly oblanceolate or narrowly elliptic-lanceolate, 3–16 × 1–3 mm, glabrous, ± retrorsely aculeolate on veins and margins, base acute, apex acute; vein 1. Inflorescences terminal and in upper leaf axils, with 2- to several-flowered cymes of 2–5 cm; axes glabrous, smooth; bracts none or inconspicuous, 2–4 mm; pedicels 1–5 mm. Ovary ellipsoid, ca. 0.5 mm, glabrous. Corolla white, subcampanulate, 2–3 mm in diam., lobed for ca. 2/3; lobes 4, triangular, acute. Mericarps obovoid, ca. 1 × 1.5–2 mm, glabrous, smooth or granular. Fl. and fr. Jun–Aug.

Wet grasslands; ca. 2600 m. ?Sichuan, Xinjiang, ?Yunnan [Mongolia, Russia; C and SW Asia, Europe].

*Galium uliginosum* is a typical member of *G. sect. Trachygalium* and closely related to the *G. rivale* group, represented in China by *G. karataviense*. It differs from it by a much more slender habit and much shorter corolla tubes. All other Chinese species of *G. sect. Trachygalium* s.l. have rotate corollas.

We have seen specimens of *Galium uliginosum* from Xinjiang only. In view of the more northerly distribution of the species, the indications for Sichuan and Yunnan (in FRPS 71(2): 258. 1999) may refer to another taxon and should be verified.

**62. *Galium verum* Linnaeus, Sp. Pl. 1: 107. 1753.**

蓬子菜 peng zi cai

Herbs, perennial, with rootstock and rhizomes. Stems erect, (5–)15–70(–120) cm tall, 4-angled, densely puberulent, villousulous, or hirtellous to rarely glabrous and smooth. Leaves in middle stem region in whorls of more than 6 and up to 12, sessile; blade drying papery to subleathery, often blackening, adaxially rather shiny, abaxially paler, linear to linear-oblong, 10–30(–50) × 1–2(–2.5) mm, adaxially glabrous to densely hairy, smooth to sparsely aculeolate, abaxially usually densely puberulent to tomentose, rarely glabrescent or glabrous, base acute to cuneate, margins usually strongly revolute and antrorsely aculeolate, apex acute and shortly mucronate with tip to 1.5 mm; vein 1. Inflorescences thyrsoid or paniculate, terminal and axillary cymes few to many flowered, rather dense and

bracteose; axes usually densely puberulent, hirtellous, rarely glabrous and smooth; bracts  $\pm$  leaflike, 1.5–3 mm; pedicels 1–3 mm. Flowers fragrant, hermaphroditic. Ovary ellipsoid to subglobose, 0.5–0.8 mm, glabrous to densely hairy with straight trichomes. Corolla yellow to white, rotate, ca. 3 mm in diam., glabrous, lobed for 3/4 or more; lobes 4, lanceolate-oblong, subobtusate, acute to apiculate. Mericarps ellipsoid and laterally flattened, 1.5–2 mm, glabrous to densely hispidulous with straight trichomes. Fl. Apr–Aug, fr. May–Oct.

Mountains, grasslands, meadows, river beaches, open fields, ditch sides, streamsides, wet places, forests, thickets, valleys; near sea level to 4100 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Zhejiang [India, Japan, Kashmir, Kazakhstan, Korea, Mongolia, Pakistan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe; adventive in North America and elsewhere].

*Galium verum* is used medicinally and ranks among the most commonly collected species of *Galium* in China, along with *G. bungei*, *G. spurium*, and *G. hoffmeisteri*. Together with closely related taxa (as *G. saurense* and *G. consanguineum* in the Chinese flora), it forms an extremely variable polyploid complex with 2x- and 4x-populations, which is still very badly understood. Together with *G. humifusum*, with which it can form a hybrid, it is placed into *G.* sect. *Galium*.

According to the considerable variation of *Galium verum* with respect to habit, indumentum of leaves, ovaries, and fruit, and flower color, Cufodontis (Oesterr. Bot. Z. 89: 216–219. 1940) and subsequently W. C. Chen (in FRPS 71(2): 266–269. 1999) have rather schematically recognized a number of varieties, which often coexist in one and the same population. Even if they do not correspond to natural entities, they are provisionally treated here for reference, in particular as to the range and adaptation to different habitats in China.

- 1a. Ovary and fruit hairy.
  - 2a. Leaves pubescent and scabrous adaxially ..... 62e. var. *tomentosum*
  - 2b. Leaves glabrous and smooth adaxially ..... 62f. var. *trachycarpum*
- 1b. Ovary and fruit glabrous.
  - 3a. Corolla yellow.
    - 4a. Leaves pubescent and scabrous adaxially ..... 62g. var. *trachyphyllum*
    - 4b. Leaves glabrous and smooth adaxially.
      - 5a. Plants to over 1 m tall; leaves to 5–7 cm ..... 62a. var. *asiaticum*
      - 5b. Plants to 45 cm tall; leaves usually 1.5–3 cm .... 62h. var. *verum*
  - 3b. Corolla pale yellow or white.
    - 6a. Corolla pale yellow ..... 62c. var. *leiophyllum*
    - 6b. Corolla white.
      - 7a. Leaves pubescent and scabrous adaxially ..... 62b. var. *lacteum*
      - 7b. Leaves glabrous and smooth adaxially ..... 62d. var. *nikkoense*

**62a. *Galium verum* var. *asiaticum*** Nakai, J. Jap. Bot. 15: 344. 1939.

长叶蓬子菜 chang ye peng zi cai

*Galium verum* subsp. *asiaticum* (Nakai) T. Yamazaki.

Plants stout, 50–120 cm tall. Leaf blade to 5–7 cm, gla-

brous and smooth adaxially. Corolla yellow. Ovary and mericarps glabrous. Fl. and fr. Jun–Aug.

Mountain grasslands, open fields, river beaches; below 100–1700 m. Anhui, Gansu, Hebei, Heilongjiang, ?Henan, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Shandong, Shanxi, Sichuan, Zhejiang [Japan, Korea, Russia].

According to Yamazaki (Fl. Japan 3a: 240. 1993) *Galium verum* subsp. *asiaticum* includes all Japanese forms of *G. verum* and differs from the typical subspecies by longer leaves and hirsute (not minutely pubescent) stems.

**62b. *Galium verum* var. *lacteum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 19: 283. 1874.

白花蓬子菜 bai hua peng zi cai

*Galium verum* f. *lacteum* (Maximowicz) Nakai.

Leaf blade pubescent and scabrous adaxially. Corolla white. Ovary and mericarps glabrous.

Wet places on mountains and in open fields; 500–1000 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Ningxia, Shaanxi [Japan, Korea].

Yamazaki (loc. cit.: 240) treated this as a form within *Galium verum* subsp. *asiaticum* and listed *G. verum* f. *nikkoense* as a synonym of *G. verum* f. *lacteum*.

**62c. *Galium verum* var. *leiophyllum*** Wallroth, Sched. Crit. 56. 1822.

淡黄蓬子菜 dan huang peng zi cai

Corolla pale yellow. Ovary and mericarps glabrous. Fl. Jun–Jul.

Mountain grasslands, open fields; ca. 600 m. Hebei, Liaoning, Shandong [?Japan; Europe].

Although W. C. Chen (loc. cit.: 268) included Japan in the distribution of this variety, its name is not mentioned in Fl. Japan.

**62d. *Galium verum* var. *nikkoense*** Nakai, J. Jap. Bot. 15: 347. 1939.

日光蓬子菜 ri guang peng zi cai

*Galium verum* f. *nikkoense* (Nakai) Ohwi.

Leaf blade glabrous and smooth adaxially. Corolla white. Ovary and mericarps glabrous.

Shandong [Japan].

Yamazaki (loc. cit.: 240) treated this variety as a synonym of *Galium verum* f. *lacteum*.

**62e. *Galium verum* var. *tomentosum*** C. A. Meyer, Verz. Pfl. Casp. Meer. 54. 1831.

毛蓬子菜 mao peng zi cai

*Galium verum* f. *tomentosum* (C. A. Meyer) Nakai.

Leaf blade pubescent and scabrous adaxially. Ovary and mericarps pilose. Fl. and fr. Jun–Sep.

Forests on mountain slopes, farmland sides, grasslands; 400–3100 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang [Japan].

The type of the name of this variety comes from SW Asia (S Azerbaijan: Talysh) and may not fully conform to the Chinese popula-

tions listed here. Although Nakai (Bot. Mag. (Tokyo) 34: 50–51. 1920; J. Jap. Bot. 15: 348. 1939) and W. C. Chen (loc. cit.: 269) included Japan in the distribution of this taxon, its name is not mentioned in Fl. Japan. In the older literature, specimens with hairy ovaries and fruit, corresponding to this and the following *Galium verum* var. *trachycarpum*, often have been called *G. ruthenicum* Willdenow.

With respect to the synonymy one has to consider the following: Nakai (loc. cit. 1939) under *Galium verum* var. *tomentosum* "Nakai, comb. nov.," cited "*Galium verum* var. *luteum* f. *tomentosum* Nakai," where (loc. cit. 1920) he cited "*G. verum* var. c. Ledebour Fl. Ross. II. p. 415," where Ledebour wrote "c. caule fructibusque tomento denso vestitis. C. A. Meyer l.c. Hab. in provinciis caucasicis [in m. Talüsch, alt. 1100 hexap. (C. A. Meyer)," giving the reference to Meyer on p. 414 as "Ind. cauc. p. 54," i.e., Verz. Pfl. Casp. Meer. 54. 1831, where Meyer wrote "[var.] *δ tomentosum*. caule et mericarpiis tomento denso vestitis. In cacumine montium Talüsch prope pagum Drych, in rupestribus siccis sterilissimis (alt. 1100 hexap.]" It is evident, therefore, that Nakai in 1920 was not publishing the name of a new taxon but a status novus at the rank of forma with an indirect reference (allowed before 1953; Vienna Code, Art. 33.2) to the basionym, i.e., Meyer's varietal name.

**62f. *Galium verum* var. *trachycarpum*** Candolle, Prodr. 4: 603. 1830.

毛果蓬子菜 mao guo peng zi cai

*Galium verum* var. *lasiocarpum* Ledebour.

Leaf blade glabrous and smooth adaxially. Ovary and mericarps pilose. Fl. and fr. Jun–Sep.

Forests, thickets, or grasslands on mountain slopes, streamsides, open fields, river beaches; 100–3900 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Zhejiang [Japan, Korea, Russia; Europe].

This variety (including its synonym) was included by Ehrendorfer et al. (Fl. Iranica 176: 200. 2005) in *Galium verum* f. *subpubescens* Sergievskaya, to which it corresponds. Yamazaki (loc. cit.: 240) recognized *G. verum* f. *album* Nakai for white-flowered plants of this variety.

**62g. *Galium verum* var. *trachyphyllum*** Wallroth, Sched. Crit. 56. 1822.

粗糙蓬子菜 cu cao peng zi cai

Leaf blade pubescent and scabrous adaxially. Corolla yellow. Ovary and mericarps glabrous. Fl. May–Aug, fr. Aug–Sep.

Forests or grasslands on mountain slopes or in valleys, open fields, river beaches; 300–4100 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang [Korea; Europe].

**62h. *Galium verum* var. *verum***

蓬子菜(原变种) peng zi cai (yuan bian zhong)

*Galium luteum* Lamarck; *G. verum* var. *leiocarpum* Ledebour; *G. verum* var. *luteum* (Lamarck) Nakai.

Plants to 45 cm tall. Leaf blade usually 1.5–3 cm, glabrous and smooth adaxially. Corolla yellow. Ovary and mericarps gla-

brous. Fl. Apr–Aug, fr. May–Oct.

Mountains, river beaches, open fields, ditch sides, grasslands, meadows, thickets, forests; near sea level to 4000 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Sichuan, Xinjiang, Xizang [India, Japan, Korea, Pakistan; SW Asia, Europe; adventive in North America and elsewhere].

The citation here of *Galium luteum*, a long-recognized synonym of *G. verum* based on a type from France, follows W. C. Chen (loc. cit.: 266). Ehrendorfer et al. (loc. cit.: 200–201) recognized two forms within *G. verum* subsp. *verum*, separated by density and distribution of pubescence: f. *verum* with glabrous ovaries and fruit vs. f. *subpubescens* with pubescent ovaries and fruit. Thus, their f. *subpubescens* corresponds to var. *tomentosum* and var. *trachycarpum* of Cufodontis (loc. cit.: 216–219) and W. C. Chen (loc. cit.: 268–269).

**63. *Galium yunnanense*** H. Hara & C. Y. Wu, J. Jap. Bot. 61: 74. 1986.

滇拉拉藤 dian la la teng

*Galium elegans* Wallich var. *angustifolium* Cufodontis; *G. elegans* var. *nemorosum* Cufodontis.

Herbs, perennial, procumbent to scrambling or matted, up to 1 m, from slender rhizomes. Stems glabrescent and smooth to sparsely or moderately pilose to villous or retrorsely hispid, nodes more densely hairy, angles 4, usually thickened. Leaves in whorls of 4, subsessile; blade drying membranous, green, elliptic, ovate-lanceolate, or lanceolate, 5–50 × 3–15 mm, length/breadth index normally above 2.5, adaxially hispidulous to hirsute, abaxially glabrescent to densely pilose and usually glandular-punctate, base cuneate to obtuse, margins sparsely to densely pilose or antrorsely ciliate, apex acute to acuminate and often mucronulate; principal veins 3, palmate. Inflorescences terminal and in axils of uppermost leaves, paniculate, many flowered, 2–12 cm, diffusely branched; peduncles pilose to glabrescent; bracts inconspicuous, ligulate to ovate, 1.5–2.5 mm, often lacking upward; pedicels 2.5–7 mm. Flowers dioecious, polygamous, or ?hermaphroditic. Ovary obovoid, ca. 0.5 mm, densely appressed hairy. Corolla white, rotate, 1–1.5 mm in diam.; lobes 4, ovate, subacute. Mericarps ovoid, 1.5–2 mm, with dense, uncinat, stiff and spreading, basally white to apically brown trichomes ca. 0.8 mm. Fl. and fr. Jul–Nov.

• Forests, meadows on mountains, riversides, streamsides; 700–3300 m. Gansu, Guangxi, Guizhou, Hunan, Sichuan, Yunnan.

As noted in the protologue, *Galium yunnanense* is similar to *G. elegans* and comprises plants that previously have been included in a more broadly circumscribed *G. elegans*. In particular, the two varieties of *G. elegans* described by Cufodontis in 1940 and cited as synonyms above now key to *G. yunnanense*. In spite of its variability and occasional forms approaching *G. bungei* (see there), the specific separation of *G. yunnanense* from *G. elegans* by Chen (Acta Phytotax. Sin. 28: 301. 1990) seems well justified. It reduces the morphological variation within *G. elegans* and results in a much clearer circumscription of the two taxa.

## 29. GARDENIA J. Ellis, Philos. Trans. 51: 935. 1761, nom. cons., not Colden (1756).

梔子属 zhi zi shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or rarely trees, sometimes with short shoots (*Gardenia angkorensis*, *G. sootepensis*), unarmed or with short shoots

sometimes spinescent, with buds and young stem apices often resinous. Raphides absent. Leaves opposite or rarely ternate, sometimes clustered at stem apices, often with domatia; stipules persistent or deciduous, united shortly around stem or united completely into a conical cap (i.e., calyprate), triangular or when united into a cap then splitting along one side. Inflorescences pseudoaxillary and/or terminal, fascicled to cymose and several flowered or reduced to 1 flower, pedunculate to sessile, bracteate. Flowers sessile to pedicellate, bisexual, monomorphic, often showy. Calyx with ovary portion well developed and often longitudinally ridged; limb 5–8-lobed or sometimes fused into a tube or conical cap that splits irregularly as corolla elongates (i.e., spathaceous), often well developed. Corolla white to cream, salverform or funnelform, glabrous or variously pubescent inside; lobes 5–12, convolute in bud. Stamens 5–12, inserted in corolla throat, included or partially exserted; filaments very short or reduced; anthers dorsifixed. Ovary 1-celled, ovules numerous on 2–6 parietal placentas; stigma clavate or 2-lobed, included or exserted. Fruit generally yellow to orange, red-orange, or brown with pulp usually orange, baccate, leathery or fleshy, ellipsoid to subglobose, smooth or with longitudinal ridges, with calyx limb usually persistent or sometimes upper part tardily deciduous; seeds numerous, medium-sized, ellipsoid, compressed, embedded in pulp; testa leathery or membranous; endosperm usually corneous; embryo small or medium-sized; cotyledons broad, leaflike.

About 60–200 or 250 species: tropical and subtropical regions of Africa, Asia, Madagascar, and Pacific islands; five species (one endemic) in China.

The persistent calyx lobes apparently enlarge markedly as the fruit develop in many species; this may be confusing when the enlarged fruiting calyx lobes are compared with descriptions of flowering calyx lobes. The flowers are often nocturnal and are usually strongly sweetly fragrant with an odor of, well, gardenia. Several species from Asia and the Pacific are occasionally cultivated, but *Gardenia jasminoides*—native to our region—is very popular worldwide for its flowers.

- 1a. Leaf blade puberulent or pilosulous to glabrous adaxially, densely tomentose abaxially; stipules and calyx limb each fused into a conical cap then splitting along one side; fruit with spathaceous upper portion of calyx limb deciduous ..... 4. *G. sootepensis*
- 1b. Leaf blade glabrous to puberulent or pilosulous; stipules united in basal portion with apical portions free or fused into a conical cap, calyx regularly lobed; fruit with calyx lobes persistent.
  - 2a. Leaf blade 1.5–4 × 1–2.5 cm, obovate or spatulate, obtuse to rounded at apex; calyx lobes 4–5 mm in flower, 5–8 mm in fruit ..... 1. *G. angkorensis*
  - 2b. Leaf blade 3–25 × 0.4–8 cm, acute, acuminate, or obtuse at apex; calyx lobes 4–30 mm in flower, to 40 mm in fruit.
    - 3a. Leaves ternate or sometimes opposite on a few nodes, with blade narrowly lanceolate or linear-lanceolate, 0.4–2.3 cm wide, without domatia; fruit ellipsoid-oblong to ellipsoid, 1.5–2.5 × 1–1.3 cm, smooth or with 5–8 weak to developed longitudinal ridges ..... 5. *G. stenophylla*
    - 3b. Leaves opposite or sometimes ternate on a few nodes, with blade oblanceolate, obovate-oblong, elliptic-oblong, lanceolate-oblong, obovate, or elliptic, 1.5–8 cm wide, without or usually with domatia; fruit ovoid-ellipsoid, subglobose, or ellipsoid, 1.5–7 × 1.2–2 cm, smooth or with 5–9 weak to well-developed longitudinal ridges.
      - 4a. Trees; calyx lobes 4–7 mm in flower; corolla tube ca. 15 mm, shorter than lobes; fruit with 5 weak to well-developed longitudinal ridges ..... 2. *G. hainanensis*
      - 4b. Shrubs; calyx lobes 10–30 mm in flower; corolla tube 30–50 mm, ± equal to or usually longer than lobes; fruit with 5–9 well-developed longitudinal ridges ..... 3. *G. jasminoides*

**1. *Gardenia angkorensis*** Pitard in Lecomte, Fl. Indo-Chine 3: 252. 1923.

匙叶梔子 *chi ye zhi zi*

Shrubs, 1–3 m tall, with short shoots; branches terete, glabrous, becoming grayish white. Leaves opposite, usually crowded at ends of short shoots; petiole 1–4 mm, puberulent to glabrous; blade drying stiffly papery, obovate or spatulate, 1.5–4 × 1–2.5 cm, adaxially glabrous and shiny, abaxially sparsely puberulent to glabrous, base cuneate to acute, apex obtuse to rounded; secondary veins 6–8 pairs, in abaxial axils with pubescent foveolate domatia; stipules united shortly around stem, broadly triangular to ligulate, 2–3 mm, glabrous, obtuse to rounded. Flowers solitary, terminal on short shoots, sessile or subsessile. Calyx puberulent to glabrescent; ovary portion obconical, weakly ridged, 7–8 mm; limb lobed nearly to base; lobes 6, narrowly spatulate, 4–5 mm, obtuse. Corolla outside glabrous; tube 13–15 mm, somewhat funnelform; lobes 6, spatulate, ca. 15 mm, obtuse. Fruiting pedicels to 3 mm. Berry ellip-

soid to subglobose, 15–18 × 10–15 mm, smooth to weakly ridged, with persistent calyx lobes 7–8 mm; seeds ca. 5 × 3–4 mm. Fr. Aug–Dec.

Forests or thickets at streamsides in valleys or on mountain slopes. Hainan [Cambodia].

**2. *Gardenia hainanensis*** Merrill, Lingnan Sci. J. 9: 43. 1930.

海南梔子 *hai nan zhi zi*

Trees, 3–12 m tall; branches with internodes congested to developed, compressed to terete, densely puberulent to glabrous, resinous at apices with usually distalmost several internodes coated with dried resin, becoming straw-brown. Leaves opposite; petiole 0.2–1 cm, puberulent to glabrous; blade drying thinly leathery, bright to dull or yellowed green adaxially, similar but darker or paler abaxially, obovate-oblong, elliptic-oblong, or oblanceolate, 5–19.5 × 2–8 cm, adaxially shiny and glabrous, abaxially glabrous to puberulent, base cuneate to acute, apex acute or shortly acuminate with tip often ultimately

obtuse; secondary veins 10–15 pairs, in abaxial axils with pilosulous domatia; stipules calyptrate, conical, 4–10 mm, splitting for 1/2–3/4 their length, puberulent to usually glabrous. Flowers solitary, terminal or pseudoaxillary; peduncle 0.4–0.8 cm, densely puberulent. Calyx puberulent, usually covered with resin; ovary portion broadly obconical to ellipsoid, 5-ridged, 5–6 mm; limb with tubular portion 3–4 mm; lobes 5, oblong-lanceolate to linear or spatulate, 4–7 mm, 1–1.6 mm wide at base, strongly keeled, narrowed then ultimately rounded at apex. Corolla outside apparently glabrous, often covered with resin; tube ca. 15 mm, somewhat funnelform; lobes 5, obovate-oblong to elliptic, 23–30 × 8–10 mm, acute to obtuse and apiculate. Fruiting peduncles to 2 cm. Berry yellow, subglobose or ovoid-ellipsoid to ellipsoid, 1.6–3.3 × 1.5–1.6 cm, with 5 weak to developed longitudinal ridges, with persistent calyx limb. Fl. Apr, fr. May–Oct.

• Forests at streamsides in valleys or on mountain slopes; below 100–1200 m. Guangxi (Shangsi), Hainan.

### 3. *Gardenia jasminoides* J. Ellis, Philos. Trans. 51: 935. 1761.

梔子 zhi zi

Shrubs, 0.3–3 m tall; branches terete to flattened, with internodes developed to shortened, glabrescent or usually densely puberulent to pilosulous, becoming gray to grayish white, with buds resinous and distalmost internodes often covered with resin. Leaves opposite or rarely ternate, subsessile to petiolate; petiole to 0.5(–1) cm, densely puberulent or shortly pilosulous to glabrous; blade drying thinly leathery to stiffly papery, oblong-lanceolate, obovate-oblong, obovate, oblanceolate, or elliptic, 3–25 × 1.5–8 cm, adaxially shiny and glabrous or sometimes puberulent on principal veins, abaxially puberulent or pilosulous to glabrous, base cuneate to acute, apex acute to acuminate or obtuse then abruptly long acuminate; secondary veins 8–15 pairs, in abaxial axils often with pilosulous domatia; stipules calyptrate, cylindrical, 4–13 mm, splitting for ca. 3/4 their length, densely puberulent to glabrous. Flower solitary, terminal; peduncle 1–10 mm, puberulent or pilosulous to glabrous. Calyx puberulent or pilosulous to glabrous; ovary portion obconic or obovoid, 5–8 mm, with (5 or)6(–8) weak to developed longitudinal ridges; limb with basal tubular portion 3–5 mm; lobes (5 or)6(–8), lanceolate or linear-lanceolate to spatulate, 10–30 × 1–4 mm, often strongly keeled, acute. Corolla white to pale yellow, simple or in cultivation sometimes doubled, outside glabrous; tube 30–50 × 4–6 mm, cylindrical, in throat pilose; lobes (5 or)6(–8) or numerous when doubled, obovate or obovate-oblong, 15–40 × 6–28 mm, obtuse to rounded. Fruiting peduncles apparently not much elongating. Berry yellow or orange-yellow, ovoid, subglobose, or ellipsoid, 1.5–7 × 1.2–2 cm, with 5–9 longitudinal ridges, with persistent calyx lobes to 40 × 6 mm; seeds suborbicular, weakly angled, ca. 3.5 × 3 mm. Fl. Mar–Jul, fr. May–Feb.

Thickets and forests at streamsides, on mountain slopes or hills, or in valleys or fields; near sea level to 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang; cultivated in Gansu, Hebei, Shanxi [Bhutan, Cambodia, India, Japan, N Korea, Laos, Nepal, Pakistan, Thailand, Vietnam; cultivated in Africa, Asia, Australia, Europe, North and South America, and Pacific islands].

This is one of the most commonly collected species of Rubiaceae in China. It is quite variable morphologically especially in leaf size, calyx lobe size, and corolla size. Several varieties have been recognized for Chinese plants (e.g., Qiu & Zhong, Fl. Zhejiang 6: 105. 1986) but are not clearly separated or widely accepted outside this region. The varieties recognized by W. C. Chen (in FRPS 71(1): 332–335. 1999) are outlined below for reference.

- 1a. Corolla doubled; flowers sterile, plants not setting fruit; cultivated plants ..... 3a. var. *fortuneana*
- 1b. Corolla simple; flowers fertile, plants setting fruit; wild and occasionally cultivated plants ..... 3b. var. *jasminoides*

**3a. *Gardenia jasminoides* var. *fortuneana* (Lindley) H. Hara, Enum. Sperm. Jap. 2: 15. 1952 [“*fortuniana*”].**

白蟾 bai chan

*Gardenia florida* Linnaeus var. *fortuneana* Lindley, Edwards's Bot. Reg. 32: t. 43. 1846 [“*fortuniana*”].

Flowers with doubled corolla, sterile. Fl. throughout year.

Cultivated in gardens and green belts as an ornamental in provinces of S China (including Nanhai Zhudao) [cultivated worldwide, outdoors in tropical regions and indoors in temperate regions].

### **3b. *Gardenia jasminoides* var. *jasminoides***

梔子(原变种) zhi zi (yuan bian zhong)

*Gardenia florida* Linnaeus, nom. illeg. superfl.; *G. florida* f. *oblanceolata* Nakai; *G. florida* var. *ovalifolia* Sims; *G. florida* f. *simpliciflora* Makino; *G. grandiflora* Loureiro; *G. jasminoides* f. *grandiflora* (Loureiro) Makino; *G. jasminoides* var. *grandiflora* (Loureiro) Nakai; *G. jasminoides* var. *longispala* (Masamune) F. P. Metcalf; *G. jasminoides* f. *maruba* (Siebold ex Blume) Nakai ex Ishii; *G. jasminoides* var. *maruba* (Siebold ex Blume) Nakai; *G. jasminoides* f. *oblanceolata* (Nakai) Nakai; *G. jasminoides* f. *ovalifolia* (Sims) H. Hara; *G. jasminoides* var. *ovalifolia* (Sims) Nakai; *G. jasminoides* var. *radicans* (Thunberg) Makino; *G. jasminoides* f. *simpliciflora* (Makino) Makino; *G. jasminoides* f. *variegata* (Carrière) Nakai; *G. jasminoides* var. *variegata* (Carrière) Makino; *G. maruba* Siebold ex Blume; *G. radicans* Thunberg; *G. radicans* var. *variegata* Carrière; *G. schlechteri* H. Léveillé (1911), not Bonati & Petitmengin (1907).

Flowers with simple corolla, fertile. Fl. Mar–Jul, fr. May–Feb.

Thickets and forests at streamsides, on mountain slopes or hills, or in valleys or fields; near sea level to 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang; cultivated in Gansu, Hebei, Shanxi [Cambodia, India, Japan, N Korea, Laos, Nepal, Pakistan, Vietnam; cultivated in Europe, North America, Pacific islands].

**4. *Gardenia sootepensis* Hutchinson, Bull. Misc. Inform. Kew 1911: 392. 1911.**

大黄梔子 da huang zhi zi

Trees, 7–10 m tall, often with gelatinous secretions; branches with both developed and shortened internodes, somewhat compressed to angled or subterete, densely puberulent,

pilosulous, or tomentulose, becoming glabrescent. Leaves opposite; petiole 0.6–1.2 cm, puberulent or tomentulose; blade drying papery or thinly leathery, obovate, obovate-elliptic, broadly elliptic, or elliptic-oblong, 7–29 × 3–16 cm, adaxially puberulent or pilosulous to glabrous, abaxially densely tomentose, base rounded to obtuse or cuneate, apex shortly acuminate with tip acute or obtuse; secondary veins 12–20 pairs, in abaxial axils often with densely pilosulous domatia; stipules calyptate, conical, 0.5–1 cm, sericeous outside, densely puberulent or tomentulose inside, apical portion triangular and caducous, basal portion truncate to broadly rounded and usually persisting with leaves and sometimes becoming hardened. Flowers pseudoaxillary usually near branch apices, solitary; peduncle 1–1.5 cm, puberulent. Calyx densely puberulent to pilosulous externally; ovary portion ellipsoid, smooth, 5–6 mm; limb spatheaceous, 13–15 mm, splitting along one side for 2/3–3/4 of its length, inside sericeous, often viscid or mucilaginous. Corolla yellow or white, salverform; tube 50–70 × 3–5 mm, cylindrical, outside sparsely puberulent, inside glabrous; lobes 5, broadly obovate, 40–50 × 20–30 mm, glabrous on both surfaces, obtuse to acute. Berry ellipsoid or ellipsoid-oblong, 2.5–5.5 × 1.5–3.5 cm, puberulent, smooth or with 5 or 6 longitudinal lines or very weak ridges, leathery to hard; seeds suborbicular, flattened, 3–4 mm in diam., foveolate. Fl. Apr–Aug, fr. Jun–Apr.

Forests at streamsides, at village margins, or on mountain slopes; 700–1600 m. Yunnan [Laos, Thailand].

W. C. Chen (in FRPS 71(1): 335. 1999) described the flowers as

terminal on branchlets, but these are pseudoaxillary on all specimens seen as described here.

**5. *Gardenia stenophylla* Merrill**, Philipp. J. Sci. 19: 678. 1922.

狭叶梔子 xia ye zhi zi

Shrubs, 0.5–3 m tall; branches generally slender, angled to subterete, puberulent to glabrescent. Leaves opposite or ternate with arrangement often variable on a branch, subsessile to shortly petiolate; petiole to 5 mm, puberulent to glabrous; blade drying thinly leathery, narrowly lanceolate, narrowly elliptic, elliptic-spatulate, or linear-lanceolate, 3–12 × 0.4–2.3 cm, adaxially glabrous, abaxially puberulent to glabrous, base acute and often decurrent, margin thickened and often thinly revolute, apex acute to obtuse; secondary veins 9–13 pairs, in abaxial axils without domatia; stipules calyptate, conical, 7–10 mm, splitting along one side for 3/4 or more of length, glabrous. Flowers solitary, pseudoaxillary or terminal; peduncles 5–6 mm, glabrous. Calyx glabrous; ovary portion ellipsoid to cylindrical, 5–6 mm, longitudinally 5–8-ridged; limb with basal tubular portion 4–6 mm; lobes 5–8, linear to narrowly lanceolate, 7–15 mm, keeled, acute. Corolla outside glabrous; tube cylindrical, 35–65 × 3–4 mm; lobes 5–8, oblong-obovate, 25–35 × 10–15 mm, obtuse. Fruiting pedicels to 2 cm. Berry yellow or orange-red, ellipsoid-oblong to ellipsoid, 1.5–2.5 × 1–1.3 cm, with 5–8 weak to developed longitudinal ridges, with persistent calyx lobes to 2 cm; seeds 2–3 mm. Fl. Apr–Aug, fr. May–Jan.

Forests or thickets at streamsides in valleys, fields at riversides; below 100–800 m. Anhui, Guangdong, Guangxi, Hainan, Zhejiang [Vietnam].

### 30. *GEOPHILA* D. Don, Prodr. Fl. Nepal. 136. 1825, nom. cons., not Bergeret (1803).

爱地草属 ai di cao shu

Chen Tao (陈涛); Charlotte M. Taylor

*Geocardia* Standley.

Herbs, perennial, unarmed; stems creeping and rooting at nodes. Raphides present. Leaves opposite, usually broadly ovate to cordate and long petiolate, without domatia; stipules persistent, interpetiolar, generally triangular, entire [or 2-lobed]. Inflorescences terminal or pseudoaxillary, cymose to capitate, few to several flowered, pedunculate, bracteate. Flowers sessile or subsessile, bisexual, apparently monomorphic. Calyx limb 4–7-lobed. Corolla white, funnelform, inside pubescent in throat; lobes 4–7, valvate in bud. Stamens 4–7, inserted in corolla tube, included or partly exserted; filaments developed; anthers dorsifixed. Ovary 2-celled, ovules 1 in each cell, erect, basal; stigma 2-lobed, included or exserted. Fruit orange or red [or sometimes blue or black], drupaceous, globose to ellipsoid, fleshy, with calyx limb persistent; pyrenes 2, 1-celled, each with 1 seed, hard, plano-convex and sometimes longitudinally twisted, dorsally (i.e., abaxially) smooth to ridged, ventrally (i.e., adaxially) with a median ridge and 2 submarginal longitudinal grooves; seeds medium-sized; testa membranous; endosperm corneous.

About 30 species: widespread in tropical Africa, Asia, Central, North, and South America, and Madagascar; one species in China.

**1. *Geophila repens* (Linnaeus) I. M. Johnston**, Sargentia 8: 281. 1949.

爱地草 ai di cao

*Rondeletia repens* Linnaeus, Syst. Nat., ed. 10, 2: 928. 1759; *Geophila herbacea* (Jacquin) K. Schumann; *G. reniformis* D. Don; *Psychotria herbacea* Jacquin.

Herbs, perennial, creeping; stems quadrate to subterete, puberulent or hirtellous to glabrescent, vegetative creeping, 40 cm or longer, reproductive ascending, to 15 cm tall. Petiole 1–5

cm, densely puberulent to pilose or hirtellous often in lines; leaf blade drying membranous to papery and sometimes yellowish green, ovate to suborbicular, 1–3 × 1–3 cm, glabrescent on both surfaces, base cordulate to cordate, margins often undulate, apex obtuse to rounded; secondary veins 2 or 3 pairs, usually grouped in basal half of blade; stipules broadly ovate, 1–2 mm. Inflorescence with flowers 1–3 in umbelliform cymules, puberulent to hirtellous or glabrescent; peduncle 1–4 cm; bracts linear to narrowly triangular, 1.5–3 mm. Calyx glabrous to puberulent; ovary portion ellipsoid, 1.5–2 mm; limb deeply lobed; lobes 4, linear-lanceolate, 2–3 mm, ciliate. Corolla pilosulous to

glabrescent outside; tube ca. 8 mm; lobes 4, ovate or ovate-lanceolate, ca. 3 mm, acute. Drupes red, subglobose to ovoid, 4–6 mm in diam., pilosulous to glabrescent; pyrenes dorsally weakly rugulose. Fl. Jul–Sep, fr. Sep–Dec.

Forest and trail margins, ravines, damp places; 100–600 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [widespread in tropical Africa, Antilles, Asia, Central America, Madagascar, North America (Mexico), and South America].

### 31. GUETTARDA Linnaeus, Sp. Pl. 2: 991. 1753.

海岸桐属 hai an tong shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees, sometimes polygamo-dioecious, unarmed. Raphides absent. Leaves opposite or rarely ternate, decussate, usually with domatia; tertiary and/or quaternary venation often arranged in regular, often small rectangles or squares; stipules caducous, interpetiolar, generally triangular. Inflorescences axillary, cymose with axes often markedly dichotomous or scorpioid, several to many flowered, pedunculate with peduncle usually elongated [to sessile], bracts reduced [to well developed]. Flowers sessile to shortly pedicellate, unisexual or bisexual and monomorphic or at least sometimes distylous, sweetly fragrant. Calyx limb tubular or subcampanulate, truncate or irregularly denticulate. Corolla white or pink, salverform with tube infrequently curved, glabrous to variously pubescent inside; lobes 4–9, obtuse, imbricate (and quincuncial) in bud. Stamens 4–9, inserted in corolla tube, included; filaments short or reduced; anthers dorsifixed. Ovary 4–9-celled, ovules 1 in each cell, pendulous from apical placentas, anatropous, with funicle thickened; stigma capitate, included. Fruit red, purple, black, or rarely green, drupaceous, thinly fleshy, oblate (i.e., depressed globose), ellipsoid, or subglobose, with calyx limb persistent; pyrene 1, 4–9-celled with 1 seed in each cell, oblate, ellipsoid, or subglobose, often 4–9-angled or -grooved, with preformed germination pore at apex of each cell; seeds medium-sized, ellipsoid, straight or curved; testa membranous; endosperm absent or scanty; embryo cylindrical or compressed; cotyledons small; radicle ascending.

About 60–80 species: tropical forests, most in tropical America and Pacific region, one species widespread on coasts of Indian Ocean and E Pacific Ocean; one species in China.

#### 1. *Guettarda speciosa* Linnaeus, Sp. Pl. 2: 991. 1753.

海岸桐 hai an tong

Small trees, 3–8 m tall; bark becoming black, smooth or often lenticellate; branchlets rather stout, densely strigillose to velutinous-tomentulose usually becoming glabrescent. Petiole stout, 1.5–5 cm, densely strigillose or velutinous; leaf blade drying thinly to stiffly papery, broadly obovate or broadly elliptic, 11–20 × 8–18 cm, adaxially glabrescent, usually shiny, and often rugulose, abaxially densely tomentulose or strigillose to glabrescent, base obtuse, rounded, subcordate, or shortly cordate, apex obtuse or rounded sometimes with a short tip 3–5 mm; secondary veins 7–11 pairs, weakly but regularly looping to connect; stipules ovate or lanceolate, 6–11 mm, moderately to densely strigillose to strigose sometimes becoming glabrescent, obtuse to rounded. Inflorescences produced in with or often below leaves, subcapitate to congested-cymose, densely velutinous-tomentulose; peduncles 3–12 cm; branched portion 1.5–3 × 2–3.5 cm, axes scorpioid; bracts ovate, 5–7 mm, cadu-

cous. Flowers sessile. Calyx densely velutinous-tomentulose to strigillose; ovary portion obconic to cupulate, 2–2.5 mm; limb tubular, 2–3.5 mm, truncate. Corolla white, outside densely velutinous-tomentulose to strigillose; tube 2.5–3 cm, inside glabrous except sericeous in throat; lobes 7 or 8, obovate, 8–10 mm, obtuse to rounded. Drupes apparently green at maturity, oblate, 2–2 cm in diam., sparsely strigillose or tomentulose to eventually glabrescent; pyrene included in fibrous mesocarp. Fl. Apr–Jul.

Thickets on sandy and limestone coasts; sea level to near sea level. Guangdong, Hainan, Taiwan [Borneo, India, Indonesia, Japan, Malaysia, Philippines, Singapore, Sri Lanka, Thailand; coastal E Africa, Australia, Madagascar, Pacific islands].

The flowers are nocturnal and open for only one night (Puff et al., Rubiaceae of Thailand, 130. 2005). The fruit of this species float and are dispersed by water, and apparently they are green when mature. This species is known to be distylous in Polynesia and E Africa (Bridson & Verdcourt, Fl. Trop. E. Africa, Rub. (Pt. 2), 416. 1988).

### 32. GUIHAIOTHAMNUS H. S. Lo, Bull. Bot. Res., Harbin 18: 279. 1998.

桂海木属 gui hai mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Subshrubs, unarmed; roots woody and stout. Raphides presumably absent. Leaves opposite, often congested or apparently fascicled at stem apices, without domatia; stipules caducous, apparently interpetiolar, triangular. Inflorescences terminal or pseudoaxillary, congested-cymose or subcapitate, several flowered, sessile to shortly pedunculate, bracteate with bracts linear. Flowers shortly pedicellate or subsessile, presumably bisexual, with biology unknown. Calyx limb deeply 5-lobed. Corolla pink, salverform with tube slender and abruptly expanded in throat, inside pubescent; lobes 5, convolute in bud. Stamens 5, inserted in corolla throat, partially exserted; filaments short to reduced. Ovary 2-celled, ovules numerous in each cell on fleshy, peltate, axile placentas; stigma

2-lobed with lobes capitate, exserted. Fruit purplish red, baccate, fleshy, subglobose, with calyx lobes tardily deciduous; seeds numerous, small, angled, reticulate.

- One species: China.

The relationships of this genus and some of its morphological details are unknown. The presence or absence of raphides has not been explicitly noted; absence is here inferred based on H. S. Lo's (in FRPS 71(1): ix. 1999) classification of this genus in *Rondeletieae*, but the one specimen seen has scattered raphidelike structures deep within some intact tissues.

**1. *Guihaiothamnus acaulis*** H. S. Lo, Bull. Bot. Res., Harbin 18: 280. 1998.

桂海木 *gui hai mu*

Plants 3–7 cm tall; stems quadrangular, densely villosulose, becoming glabrescent. Petiole 5–20 mm, villosulous; leaf blade drying papery and grayish brown, broadly elliptic-oblong to obovate, 4.5–11 × 2.5–7.5 cm, villosulous on both surfaces or glabrescent adaxially, base cuneate to truncate and often shortly decurrent, apex rounded or broadly obtuse and shortly cuspidate; secondary veins 8–12 pairs, slender; stipules 1–2

mm, obtuse and partially reflexed. Inflorescences densely villosulous; bracts 1.5–1.7 mm. Calyx pilosulous, villosulous, or glabrous; hypanthium portion obovoid-ellipsoid, ca. 1.7 mm; lobes linear-lanceolate to narrowly triangular, 1.7–2 mm, acute to acuminate. Corolla pale red, glabrous outside; tube ca. 19 mm, ca. 1 mm in diam. at base, 3–3.5 mm in diam. at throat, sparsely villous inside; lobes elliptic or ovate-elliptic, ca. 3 mm, rounded. Fruit purplish red, 2.5–3 mm in diam.; seeds 0.2–0.3 mm. Fl. Apr, fr. Jul.

- Shady rocks; 100–600 m. Guangxi (Rongshui).

### 33. *HALDINA* Ridsdale, *Blumea* 24: 360. 1979.

心叶木属 *xin ye mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Large trees, unarmed; buds flattened with stipules erect and pressed to each other. Raphides absent. Leaves opposite, decussate, with domatia; stipules caducous, interpetiolar, ovate to oblong, entire. Inflorescences axillary, capitate with 1 or 2(–5) fasciculate globose heads, many flowered, pedunculate, bracteate; peduncles articulate and bracteate near top; bracteoles spatulate to spatulate-clavate. Flowers sessile, bisexual, monomorphic. Calyx limb 5-lobed. Corolla pale to dark yellow, salverform, glabrous inside; lobes 5, imbricate in bud. Stamens 5, inserted in upper part of corolla tube, partially exserted; filaments reduced; anthers basifixed. Ovary 2-celled, ovules numerous in each cell, pendulous on axile placentas attached to upper third of septum; stigma ovoid to subglobose, exserted. Fruiting heads globose, with fruit rather tightly packed. Fruit capsular, obconic to ellipsoid-oblong, septicidally then loculicidally dehiscent into 2 valves separating from base to apex and from persistent septum, cartilaginous to stiffly papery, with calyx limb persistent on persistent septum; seeds numerous, medium-sized, ovoid to fusiform, slightly flattened, shortly winged on ends.

One species: Cambodia, China, India, Nepal, Sri Lanka, Thailand, Vietnam.

Ridsdale (loc. cit.) and Puff et al. (*Rubiaceae* of Thailand, 52. 2005) described the aestivation of the corolla lobes as, respectively, “valvate but strongly imbricate at apex” and “valvate in bud (but strongly imbricate at the apex)”; they also both describe the fruit as separating into 4 valves, but only 2 valves have been seen on the specimens studied.

**1. *Haldina cordifolia*** (Roxburgh) Ridsdale, *Blumea* 24: 361. 1979.

心叶木 *xin ye mu*

*Nauclea cordifolia* Roxburgh, Pl. Coromandel 1: 40. 1795;  
*Adina cordifolia* (Roxburgh) J. D. Hooker ex B. D. Jackson.

Trees, deciduous, 7–30(–40) m tall; trunk often buttressed and fluted at base, with outer bark reddish brown, inner bark dark red to brown; branches stout, with well-developed petiole scars. Petiole 2–12 cm, densely tomentulose to pilosulous; leaf blade drying thinly leathery, brown adaxially, and pale to yellowish green abaxially, broadly ovate, (5–)8–16(–25) × (5–)8–16(–20) cm, adaxially sparsely hirtellous to puberulent or glabrescent, abaxially densely puberulent, tomentulose, pilosulous, or glabrescent and with epidermis bullate inside areoles of quaternary veins, base cordate, apex acute to acuminate; secondary veins 6–10 pairs, usually divaricately branched half way along

their length, sometimes with pilosulous domatia; stipules spatulate, ovate, or oblong-oblancheolate, 10–12 × 5–12 mm, usually strongly keeled, densely strigillose to pilosulous, broadly rounded. Inflorescence densely tomentulose to pilosulous; peduncle 2–6(–10) cm, at articulation with 2 bracts 1–2 mm, broadly rounded; flowering heads 5–8 mm in diam. across calyces, ca. 20 mm in diam. across corollas; bracteoles linear to clavate, ca. 2 mm. Calyx densely strigillose; ovary portion 1–2 mm, densely sericeous, surrounded at base by a dense ring of trichomes 1–2 mm; limb deeply lobed, lobes narrowly triangular to linear, 1.3–1.8 mm, at apex clavate. Corolla outside densely strigillose; tube 5–6 mm; lobes elliptic-oblong, 1–2 mm, obtuse to rounded. Stigma ovoid, ca. 0.2 mm, exserted for 5–7 mm. Fruiting heads 10–15 mm in diam. Capsules 4–5 mm, densely strigillose or glabrescent near base; seeds 2–3.5 × 0.5–1 mm. Fl. spring and summer.

Tropical rain forests; 300–1000 m. Yunnan [Cambodia, India, Nepal, Sri Lanka, Thailand, Vietnam].

### 34. *HAMELIA* Jacquin, Enum. Syst. Pl. 2, 16. 1760.

长隔木属 *chang ge mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Duhamelia* Persoon; *Tangaraca* Adanson.

Shrubs, unarmed. Raphides absent. Leaves opposite or verticillate, usually with domatia; stipules persistent, interpetiolar, triangular. Inflorescences terminal, cymose with axes often helicoid and secund, many flowered, bracteate or bracts reduced. Flowers sessile to pedicellate, bisexual, monomorphic. Calyx limb 5-lobed. Corolla red to orange or yellow, tubular [to ventricose or funnel-form], glabrous inside; lobes 5, imbricate in bud. Stamens 5, inserted at base of corolla tube, included or partially exserted; filaments short; anthers dorsifixed, 2-lobed at base, with connective flattened and prolonged at apex. Ovary 5-celled, ovules numerous in each cell on axile placentas; stigmas 1–5, linear to clavate, included or exserted. Fruit becoming red then purple-black, baccate, fleshy to juicy, ellipsoid to ovoid or subglobose, with calyx limb persistent; seeds numerous, small, irregularly angled to lenticular; testa membranous, reticulate.

Sixteen species: neotropical, from S United States and Mexico to Argentina; one species (introduced) in China.

H. S. Lo (in FRPS 71(1): 388. 1999) described the flower arrangement with short pedicels or subsessile, but the structures interpreted there as pedicels are considered by one of us (C. M. Taylor) and by some other authors to be inflorescence axes and the flowers thus are sessile. Lo described the stipules as multifid or bristlelike, but this condition is not otherwise known from the genus and has not been seen on any Chinese specimens. He gave the number of calyx lobes, corolla lobes, and stamens as 4–6, but this has not been seen; these structures are 5 in all *Hamelia* species known. The corollas were described as villous in throat, but all known species of *Hamelia* have corollas that are glabrous inside; as well, the corolla was described as campanulate in shape, but the cultivated species has rather narrowly tubular flowers. The anthers were described as basifixed and entire at base, but other authors all found them dorsifixed and sagittate at base.

#### 1. *Hamelia patens* Jacquin, Enum. Syst. Pl. 16. 1760.

长隔木 *chang ge mu*

Shrubs, deciduous, 1.5–4 m tall; branches angled to subterete, often becoming red, hirtellous or pilosulous to glabrescent. Leaves 2, 3, or 4(or 5) per node; petiole 1.5–4.5 cm, pilosulous or hirtellous to glabrous; blade drying papery to membranous, elliptic to oblanceolate, 7–20 × 4–6 cm, both surfaces pilosulous or hirtellous to glabrescent, base cuneate to acute, apex acute to weakly acuminate; secondary veins 7–9 pairs, in abaxial axils frequently with pilosulous domatia; stipules narrowly triangular to subulate, 2–6 mm, hirtellous or pilosulous to glabrescent. Inflorescences corymbiform, villosulous or pilosulous to glabrescent; peduncle 1–8 cm; branched portion corymbiform, 1.5–7 × 1.5–9 cm; bracts reduced or tri-

angular, 0.2–0.5 mm. Flowers subsessile to pedicellate; pedicels to 2 mm. Calyx hirtellous to glabrous; ovary portion ellipsoid, ca. 3 mm; limb deeply lobed; lobes triangular, 0.8–1 mm. Corolla red to red-orange or yellow, narrowly tubular, outside puberulent to glabrous; tube smooth to shallowly 5-ribbed, 16–23 mm; lobes ovate-triangular, 1–2 mm, acute. Berry ovoid, 6–7 mm in diam., puberulent to glabrescent. Fl. May–Dec.

Cultivated in gardens in Fujian, Yunnan [native and weedy in Mexico, United States (Florida), and the Caribbean region, Central America, and tropical South America; cultivated as a perennial in tropical regions and an annual or indoors in temperate regions worldwide].

In S China and in cultivation in general this species does not set fruit; the fruit description here is based on wild plants. The flowers of the cultivated plants range from yellow to dark scarlet red, and in recent years many new cultivars have been developed.

### 35. *HEDYOTIS* Linnaeus, Sp. Pl. 1: 101. 1753, nom. cons.

耳草属 *er cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Diplophragma* (Wight & Arnott) Meisner; *Exallage* Bremekamp; *Gonothea* Blume ex Candolle (1830), not Rafinesque (1818); *Hedyotis* sect. *Diplophragma* Wight & Arnott; *Metabolos* Blume; *Oldenlandia* Linnaeus; *Thecagonum* Babu.

Herbs, subshrubs, or shrubs, annual or perennial, procumbent to erect or climbing, unarmed. Raphides present. Leaves opposite [or rarely whorled], sometimes clustered at ends of stems, without domatia; secondary venation rarely triplinerved or palmate; stipules persistent, interpetiolar, fused to petiole bases, or united around stem, triangular to truncate, entire or ciliate to lacinate, erose, 1- to several lobed and/or -setose. Inflorescences terminal, pseudoaxillary, and/or axillary, few to many flowered and fasciculate, cymose, paniculate, capitate, or glomerulate or reduced to 1 flower, sessile or pedunculate, bracteate or bracts reduced. Flowers pedicellate or sessile, bisexual and monomorphic or distylous [to unisexual on dioecious plants]. Calyx limb shallowly to deeply (2–)4-lobed (or 5-lobed, *Hedyotis hainanensis*). Corolla white, pink, purple, or blue, tubular, funnel-form, salverform, rotate, or urceolate, variously glabrous or pubescent inside; lobes (2–)4(or 5, *H. hainanensis*), valvate in bud. Stamens 4(or 5, *H. hainanensis*), inserted in corolla tube or throat, included or exserted; filaments developed to reduced; anthers dorsifixed often near base. Ovary 2-celled, ovules few to numerous or rarely 1 in each cell on axile placentas; stigma 2-lobed with lobes linear to clavate or rarely undivided, included or exserted. Fruit indehiscent, schizocarpous, or capsular, generally subglobose to ovoid or dicocous, crusta-

ceous to membranous or leathery, when schizocarpous splitting into 2 mericarps, when capsular splitting partially to entirely septically and/or loculicidally, subsequently sometimes splitting other way, apically flattened or with short to well-developed beak (i.e., disk area inside calyx limb), sometimes dehiscent primarily through beak, with calyx limb persistent; seeds few to numerous, small, angular or plano-convex; testa smooth, reticulate, or otherwise variously ornamented; endosperm fleshy; radicle clavate or terete.

About 500 species: tropical and subtropical regions worldwide, most in Africa and Asia, a few in warm temperate regions; 67 species (38 endemic) in China.

This is a very problematic genus or group of genera. Neither the overall identity and limits of this lineage—distributed throughout the tropics and warm temperate regions of the world, with numerous species with often reduced morphology—nor the evolutionary patterns within it are at all understood or delineated. Widely differing taxonomies and species-level characters have long been used in different regions and floras. It is generally accepted now that *Hedyotis* is closely related to or at least in some cases perhaps includes *Houstonia* Linnaeus, *Kadua* Chamisso & Schlechtendal, *Kohautia* Chamisso & Schlechtendal, *Neanotis*, *Oldenlandia*, and a number of smaller segregate genera including *Exallage*, *Oldenlandiopsis* Terrell & W. H. Lewis, *Pentodon* Hochstetter, *Stenaria* Terrell, *Stenotis* Terrell, and *Thecagonum*. The situation is far from resolution or even general consensus. This genus is treated broadly here, as done also by many recent authors working our flora region (Fukuoka, S. E. Asia Stud. 8(3): 305–336. 1979; W. C. Ko in FRPS 71(1): 26–77. 1999; Wang & Zhao, J. Trop. Subtrop. Bot. 9(3): 219–228. 2001; Dutta & Deb, Taxon. Rev. *Hedyotis*. 2004). Recently, some authors have separated *Oldenlandia*; but, as outlined by Terrell and Robinson (Taxon 52: 775–782. 2003), recent molecular studies have concluded that the circumscriptions and relationships of these two groups are less well understood than had been thought, and these groups are probably paraphyletic and/or polyphyletic with relation to each other as well as several other genera.

The taxonomy of *Hedyotis* is further complicated by nomenclatural issues, in particular the designation of the type species. Dutta and Deb (loc. cit. 2004 – a late publication of a 1991 manuscript), following majority opinion of the time, considered *H. auricularia* as the type of *Hedyotis*; however, subsequently, *H. fruticosa* Linnaeus instead was successfully proposed as the conserved type of the genus (Nicolson, Taxon 41: 564. 1992; see *Vienna Code*, App. III, p. 343). The typification of *Hedyotis* and corresponding generic names were reviewed in detail by Terrell and Robinson (loc. cit.).

Terrell and Robinson (loc. cit.) also summarized the infrageneric classification and species groups of *Hedyotis*, including those accepted by W. C. Ko (loc. cit.), but without noting a few differences between Ko's classifications and theirs, nor the use of some incorrect sectional names by Ko (e.g., *H. sect. "Euoldenlandia"* would have been called *H. sect. "Oldenlandia"* if it had been published, but it was not; Ko's *H. sect. "Diplaphragma"* included the species that is now the type of the genus, thus this should have been called *H. sect. Hedyotis*, while this particular section was synonymized by Terrell & Robinson). The genus circumscription as well as the infrageneric classification of *Hedyotis* are very far from understood at present (Groeninckx et al., Scripta Bot. Belg. 44: 33. 2008).

The information available about *Hedyotis bodinieri* is inadequate to include this species in the key. Because of the complexity of this genus or group of genera and the large number of species in China, the descriptions here are more detailed than in some other Rubiaceae genus treatments here. W. C. Ko (loc. cit.) described the fruit of most species of *Hedyotis* as dehiscent into 2 mericarps at maturity, with mericarps vertically dehiscent at ventral part, but these fruit are considered capsules by other authors. In some cases, this description was not entirely accurate because the fruit are actually truly schizocarpous (i.e., with indehiscent mericarps) or primarily loculicidal.

- 1a. Stems pilose, hirsute, tomentose, or villous and sometimes also hirtellous or villosulous, with pubescence sparsely to densely distributed and with some trichomes 1 mm or more.
- 2a. Plants scandent, climbing, or clambering; inflorescences terminal and in uppermost leaf axils, sometimes on very short lateral stems.
  - 3a. Inflorescences cymose, corymbiform-rounded; flowers all pedicellate, pedicels 1.5–3 mm ..... 42. *H. obliquinervis*
  - 3b. Inflorescences capitate, subcapitate, glomerulate, subglobose, or hemispherical; flowers sessile or subsessile.
    - 4a. Heads solitary on peduncles or glomerulate along stem and/or along peduncles ..... 24. *H. dianxiensis*
    - 4b. Heads several in panicle groups on each or at least most peduncles ..... 13. *H. capitellata*
- 2b. Plants prostrate on ground, erect, or climbing; inflorescences terminal and/or axillary along middle or lower stem nodes.
  - 5a. Stipules entire; inflorescences and flowers sessile; Hainan, Taiwan.
    - 6a. Annual herbs to 30 cm tall; calyx lobes ca. 1.5 mm; Taiwan ..... 11. *H. butensis*
    - 6b. Perennial subshrubs or shrubs to 1 m tall; calyx lobes 2.5–3 mm; Hainan ..... 64. *H. wuzhishanensis*
  - 5b. Stipules erose or 2–5-lobed or -setose; inflorescences and flowers sessile to pedicellate and/or pedunculate; mainland and Hainan.
    - 7a. Low annual herbs, prostrate to weakly erect; leaves 6–10 mm wide; flowers few or solitary, subsessile to pedicellate; Hainan ..... 58. *H. trinervia*
    - 7b. Annual or perennial herbs or subshrubs, generally erect and robust; leaves 5–45 mm wide; flowers several to numerous, sessile to pedicellate in pedunculate heads or cymes.
      - 8a. Flowers subsessile to pedicellate; glomerules or cymes subsessile to pedunculate; calyx lobes 1–1.2 mm ..... 34. *H. lineata*
      - 8b. Flowers sessile or subsessile; cymes or heads pedunculate; calyx lobes 0.3–1 mm ..... 62. *H. vestita*
- 1b. Stems glabrous to puberulent, strigillose, hispidulous, strigose, hirtellous, or pilosulous and sometimes hirsute or pilose in small scattered patches or lines, with trichomes generally all less than 1 mm.

- 9a. Inflorescences mostly or all axillary or pseudoaxillary; stem apices generally vegetative.
- 10a. Inflorescences capitate, cymose, paniculate, fasciculate, or glomerulate, subsessile or on developed peduncles.
- 11a. Bracts lanceolate, ovate, elliptic, or broadly triangular, 1–12 mm, partly to fully enclosing flowers; flowers sessile to shortly pedicellate in heads or congested or somewhat lax cymes, or on pedicels to 1.5 mm; stipules triangular, 4–13 mm.
- 12a. Inflorescences congested-cymose to shortly paniculate or subglomerulate, sessile to pedunculate, peduncle to 2 cm; leaves 15–25 × 3–6 cm ..... 15. *H. cathayana*
- 12b. Inflorescences capitate or glomerulate to laxly cymose, subsessile to pedunculate, peduncle to 8 cm; leaves 12–17 × 0.5–4 cm.
- 13a. Inflorescences capitate or glomerulate, on well-developed peduncles 2.5–7 cm ..... 9. *H. bracteosa*
- 13b. Inflorescences cymose, branched, on peduncles 0.5–8 cm.
- 14a. Stipules 1.5–5 mm; calyx lobes 0.8–1.2 mm; corolla tube 2.2–3.5 mm ..... 1. *H. acutangula*
- 14b. Stipules 8–13 mm; calyx lobes 2–3 mm; corolla tube 4.5–5 mm ..... 20. *H. communis*
- 11b. Bracts reduced, absent, or narrow to triangular, 1–5 mm, not enclosing flowers; flowers separately pedicellate and/or pedunculate, solitary or in lax cymes; pedicels 1–30 mm; stipules reduced or triangular to truncate, 0.3–3 mm.
- 15a. Flowers several (i.e., ca. 5) to many in terminal and axillary lax cymes or panicles, separately pedicellate with pedicels 1–15 mm; leaves 7–35 mm wide.
- 16a. Pedicels 4–15 mm; stipules triangular, ovate, or subtruncate, entire or glandular-serrulate or glandular-erose ..... 55. *H. tenuipes*
- 16b. Pedicels 1–3 mm; stipules entire, 4–6-lobed, -setose, and/or ciliolate.
- 17a. Stipules 4–6-lobed or -setose ..... 3. *H. assimilis*
- 17b. Stipules entire or ciliolate ..... 35. *H. loganioides*
- 15b. Flowers 1–5 per axil, all axillary on separate peduncles or in pedunculate cymes, pedicels and peduncles 1–30 mm; leaves 1–5 mm wide.
- 18a. Capsule with developed beak 1–1.5 mm, conical, longer than calyx lobes; stipules reduced, sheath portion reduced to a line or up to 0.3 mm; corolla tube 2–3 mm and lobes 0.5–1 mm ..... 30. *H. herbacea*
- 18b. Capsule flat on top or with beak rounded to broadly angled, up to 0.5 mm, shorter than or equal to calyx lobes; stipules with sheath tubular to triangular, 0.5–2 mm; corolla tube 0.8–2.5 mm and lobes 0.8–1.5 mm.
- 19a. Stems quadrate to flattened with angles thickened to winged and usually pubescent to scaberulous; flowers 1–5 per peduncle, all pedicellate; stigmas and anthers included ..... 22. *H. corymbosa*
- 19b. Stems terete to flattened or 4-angled when young, glabrous to rather evenly scaberulous or pubescent; flowers 1 or 2 in each stem axil, subsessile to pedicellate; stigmas and anthers exserted.
- 20a. Stems glabrous; peduncles and/or pedicels to 3 mm in flower, to 8 mm in fruit ..... 8. *H. brachypoda*
- 20b. Stems puberulent and/or scaberulous; peduncles 4–20 mm ..... 25. *H. diffusa*
- 10b. Inflorescences sessile or subsessile, unbranched, i.e., glomerulate, capitate, congested-cymose, subcapitate, shortly fasciculate, or 1-flowered.
- 21a. Stipules at flowering nodes with sheath 3–30 mm and these and/or leaf bases partially to fully enclosing and mostly hiding inflorescences.
- 22a. Leaves 15–30 × 5–10 cm; stipules narrowly triangular, 8–30 mm; calyx lobes 6–8 mm; corolla tube 14–16 mm; Hainan ..... 23. *H. cryptantha*
- 22b. Leaves 2.5–12 × 1–4 cm; stipules broadly triangular to obovate, 3–10 mm; calyx lobes 1.5–6 mm; corolla tube 1.8–12 mm; mainland and Hainan.
- 23a. Calyx lobes 1.5–3 mm; corolla tube 1.8–2 mm ..... 33. *H. lianshanensis*
- 23b. Calyx lobes 2–6 mm; corolla tube 6–12 mm.
- 24a. Leaves rounded to obtuse at base and sessile or subsessile; inflorescence terminal and pseudoaxillary; calyx lobes widest above middle ..... 40. *H. merguensis*
- 24b. Leaves rounded to acute at base and petiolate, petioles 3–18 mm; inflorescences axillary; calyx lobes widest at or below middle ..... 47. *H. platystipula*
- 21b. Stipules with sheath 4 mm or shorter (measured from line between bases of petioles), neither these nor leaf bases enclosing inflorescence.
- 25a. Leaves linear, narrowly elliptic, narrowly spatulate, linear-lanceolate, or narrowly elliptic-oblong, 0.8–13 mm wide, with margins mostly straight, with secondary veins not visible.
- 26a. Fruit compressed globose or subglobose; calyx lobes 1–1.5 mm; flowers solitary or 2 per node, pseudoaxillary ..... 8. *H. brachypoda*
- 26b. Fruit ovoid to lanceoloid; calyx lobes 1–2.5 mm; flowers 1 to several per node, axillary, pseudoaxillary, and/or sometimes terminal.

- 27a. Inflorescences terminal and pseudoaxillary on short axillary stems; leaves linear to narrowly spatulate, 0.8–2 mm wide ..... 46. *H. pinifolia*
- 27b. Inflorescences all axillary; leaves narrowly elliptic to linear, 1.5–13 mm wide.
- 28a. Calyx glabrous; flowers 1–3 per node; leaves 1.5–4 mm wide ..... 54. *H. tenelliflora*
- 28b. Calyx densely hispidulous; flowers several per node; leaves 3–13 mm wide ..... 61. *H. verticillata*
- 25b. Leaves narrowly to broadly elliptic, lanceolate, ovate, or elliptic-oblong, 4–45 mm wide, with margins curved, with secondary veins visible or not.
- 29a. Plants prostrate, regularly rooting at nodes; leaves 0.8–3.2 × 0.5–1.4 cm; flowers few, subsessile to pedicellate ..... 19. *H. chrysotricha*
- 29b. Plants erect to procumbent, clambering, or prostrate, rooting only at or near base; leaves 1.2–12 × 0.3–4.5 cm; flowers few to numerous, sessile to pedicellate.
- 30a. Calyx lobes 1.5–4 mm.
- 31a. Fruit indehiscent; inflorescences all produced at nodes below apex; corolla 3–4.5 mm ..... 33. *H. lianshanensis*
- 31b. Fruit dehiscent septicidally then loculicidally; inflorescences terminal and axillary at uppermost stem nodes; corolla 4.5–5.5 mm ..... 59. *H. uncinella*
- 30b. Calyx lobes 0.8–1.5 mm.
- 32a. Leaves 1.2–4.5 cm wide, with secondary veins hardly or not visible; inflorescences axillary at upper nodes and often also terminal; corolla 3–4.2 mm ..... 48. *H. prostrata*
- 32b. Leaves 0.3–3 cm wide, with secondary veins clearly evident; inflorescences at apex and/or nodes below apex; corolla 1–2.5 mm.
- 33a. Leaves subsessile to petiolate, 0.4–3 cm wide; stipules densely setose; inflorescences at nodes well below stem apex; corolla lobes 0.5–1 mm; widespread ..... 4. *H. auricularia*
- 33b. Leaves sessile, 0.3–1 cm wide; stipules entire; inflorescences terminal and at uppermost nodes; corolla lobes ca. 0.2 mm; N Taiwan ..... 11. *H. butensis*
- 9b. Inflorescences terminal, or terminal and in uppermost leaf axils.
- 34a. Flowers 5-merous; calyx lobes 3–3.5 mm ..... 28. *H. hainanensis*
- 34b. Flowers 4-merous; calyx lobes 0.1–35 mm.
- 35a. Leaves linear, linear-lanceolate, narrowly elliptic, narrowly lanceolate, narrowly spatulate, or narrowly elliptic-oblong, consistently 0.8–5.5 mm wide.
- 36a. Flowers 2–12 in lax cymes; pedicels 3–20 mm ..... 32. *H. koana*
- 36b. Flowers 3 to numerous in heads, fascicles, or congested to lax cymes; flowers sessile or on pedicels to 3 mm.
- 37a. Inflorescences with axes regularly dichotomous, 4–13 cm, with numerous flowers ..... 57. *H. tetragularis*
- 37b. Inflorescences up to 3 cm, capitate to cymose, with several flowers.
- 38a. Flowers on pedicels 0.5–1.2 mm; corolla tube 1.5–2.2 mm ..... 10. *H. brevicalyx*
- 38b. Flowers sessile or on pedicels to 1 mm; corolla tube 3–4.2 mm ..... 46. *H. pinifolia*
- 35b. Leaves variously shaped, linear to elliptic, lanceolate, elliptic-oblong, or ovate, 3–120 mm wide with at least some leaves more than 5 mm wide.
- 39a. Inflorescences 1-flowered or capitate, subcapitate, fascicled, or congested-cymose, with flowers few to numerous and sessile to subsessile or shortly pedicellate, in heads or congested to lax cymes.
- 40a. Flowers solitary or 2–5 and fasciculate to very shortly cymose, sessile to shortly pedicellate; leaves 0.8–7 × 0.5–3.5 cm.
- 41a. Calyx lobes ca. 4 mm, longer than or ± as long as corolla tube ..... 43. *H. ovata*
- 41b. Calyx lobes 3–3.5 mm, much shorter than corolla tube ..... 50. *H. pulcherrima*
- 40b. Flowers 4 to numerous, sessile to shortly pedicellate in heads, congested cymes, or umbelliform cymes; leaves 1–12 × 0.6–4.5 cm.
- 42a. Inflorescences with peduncles, with 1 to several heads, with subtending bracts developed to leaflike or reduced.
- 43a. Calyx lobes 3–6 mm.
- 44a. Leaves 4–5.5 × 0.6–2.6 cm ..... 65. *H. xanthochroa*
- 44b. Leaves (at least well-developed ones) 8–12 × 3–4.5 cm ..... 66. *H. yangchunensis*
- 43b. Calyx lobes 0.3–4 mm.
- 45a. Corolla tube ca. 7 mm; inflorescence with 1 congested-cymose head (as far as known); flowers sessile ..... 63. *H. wangii*
- 45b. Corolla tube 1–3 mm; inflorescence (at least usually) with 2–15 heads; flowers sessile or subsessile.
- 46a. Plants erect; corolla lobes shorter than tube, tube ca. 3 mm and lobes ca. 1.3 mm ..... 14. *H. capituligera*
- 46b. Plants clambering to climbing; corolla lobes longer than tube, tube 1–2 mm and lobes 3–5 mm.

- 47a. Stems and leaves glabrescent or hirtellous, pilosulous, hispidulous, or tomentulose;  
calyx limb lobed for 1/3–3/4 ..... 13. *H. capitellata*
- 47b. Stems and leaves densely tomentulose or villous to glabrous; calyx limb deeply lobed ... 24. *H. dianxiensis*
- 42b. Inflorescences sessile or subsessile, in 1 head subtended by leaves or well developed to  
leaflike bracts.
- 48a. Calyx lobes ca. 35 mm; leaves 4–12 cm wide ..... 67. *H. yazhouensis*
- 48b. Calyx lobes 1–5.5 mm; leaves 0.4–6 cm wide.
- 49a. Leaves with petioles 10–15 mm ..... 5. *H. baotingensis*
- 49b. Leaves sessile or with petioles to 10 mm, at least some shorter than 10 mm.
- 50a. Calyx lobes 1–1.2 mm; corolla tube 2–3 mm ..... 48. *H. prostrata*
- 50b. Calyx lobes 2–5.5 mm; corolla tube 3–12 mm.
- 51a. Corolla tube 9–12 mm ..... 40. *H. merguensis*
- 51b. Corolla tube 3–6.5 mm.
- 52a. Stipules acute or aristate.
- 53a. Leaves 0.4–1.2 cm wide, with petioles to 3 mm ..... 37. *H. longipetala*
- 53b. Leaves 1.4–4.5 cm wide, with petioles to 10 mm.
- 54a. Stems glabrous; leaves 7–12 cm; corolla tube 4–5 mm ..... 45. *H. paridifolia*
- 54b. Stems densely villous to hirtellous; leaves 2.5–6.2 cm; corolla tube  
5.5–6.5 mm ..... 64. *H. wuzhishanensis*
- 52b. Stipules lacinate or with several lobes or bristles.
- 55a. Leaves puberulent to glabrous adaxially; flowers sessile or subsessile; corolla  
lobes 1.5–2 mm; fruit 1.8–2 mm in diam. .... 59. *H. uncinella*
- 55b. Leaves glabrous or glabrescent adaxially; flowers sessile or on pedicels to 2 mm;  
corolla lobes 2–2.5 mm; fruit 2–2.5 mm in diam.
- 56a. Corolla tube ca. 5 mm; fruit ca. 2 mm in diam. .... 17. *H. cheniana*
- 56b. Corolla tube ca. 3.5 mm; fruit ca. 2.5 mm in diam. .... 56. *H. terminaliflora*
- 39b. Inflorescences branched, cymose to paniculate, with flowers few to numerous, at least some  
of them regularly pedicellate (or separated on well-developed inflorescence axes).
- 57a. Plants low annuals or perennials, vegetative part (and usually entire plant) mostly up to 15 cm  
tall, sometimes to 40 cm tall, often weak or scapose, often quite succulent; flowers few to  
numerous in small to diffuse cymes.
- 58a. Leaves usually clustered at top of stem (i.e., at base of inflorescence) due to reduced internodes  
and appearing verticillate; stems densely pilosulous, puberulent, or villosulous and often  
glandular on uppermost nodes ..... 44. *H. ovatifolia*
- 58b. Leaves generally distributed along stem in pairs, or entire stem with reduced internodes; stems  
glabrous to variously pubescent, not glandular.
- 59a. Hypanthium and fruit 4-winged, wings usually extending downward along pedicel ..... 49. *H. pterita*
- 59b. Hypanthium and fruit smooth or with low ridges, or hypanthium sometimes narrowly winged  
in flower but becoming smooth as fruit develops.
- 60a. Calyx lobes ovate, relatively broad, sometimes with evident venation ..... 31. *H. hermanniana*
- 60b. Calyx lobes triangular to lanceolate, generally narrow, not veined.
- 61a. Calyx limb lobed essentially to base, with tubular portion reduced or just a line; fruit  
with beak mostly as long as or longer than calyx lobes; plants not or somewhat  
succulent, weedy in various habitats ..... 6. *H. biflora*
- 61b. Calyx limb with tube developed, lobed for 1/2–2/3, remaining developed and connected  
to lobes in fruit; fruit with beak much shorter than calyx lobes; plants succulent, mostly  
on seashores and rocks at low elevations ..... 53. *H. strigulosa*
- 57b. Plants small to large, apparently perennials, vegetative portion usually at least 20 cm tall, robust,  
erect to clambering or climbing, usually not scapose, not or sometimes slightly succulent;  
flowers several to numerous in congested to expanded cymes or panicles.
- 62a. Plants clambering, scandent, lianescent, or climbing.
- 63a. Leaves with secondary veins plane and generally not evident abaxially ..... 51. *H. scandens*
- 63b. Leaves with secondary veins plane to prominulous and evident abaxially.
- 64a. Flowers pedicellate in dichotomous cymules, with pedicels 1–3.5 mm; axes and pedicels of  
inflorescence generally spreading at 60°–90° ..... 2. *H. ampliflora*
- 64b. Flowers sessile to subsessile or pedicellate in congested to subcapitate cymules, with  
pedicels to 2 mm; axes and pedicels of inflorescence generally ascending, at angles less  
than 60°.

- 65a. Stems densely villous and/or tomentulose; flowers in distinct, discrete heads; calyx lobes generally erect ..... 24. *H. dianxiensis*
- 65b. Stems glabrous to papillose, pilosulous, or velutinous-strigillose; inflorescence at least partly cymose; calyx lobes spreading to usually reflexed ..... 29. *H. hedyotidea*
- 62b. Plants erect.
- 66a. Flowers all pedicellate, pedicels 4–15 mm.
- 67a. Calyx lobes 0.1–0.3 mm; corolla 1–1.5 mm ..... 18. *H. chereevensis*
- 67b. Calyx lobes 1–1.5 mm; corolla 4.5–7 mm ..... 55. *H. tenuipis*
- 66b. Flowers sessile to subsessile, mixed sessile and pedicellate, or all pedicellate, pedicels to 5 mm but most less than 4 mm.
- 68a. Inflorescence axes and pedicels spreading at 90° or more; leaves usually borne at only 2 or 3 stem nodes ..... 26. *H. effusa*
- 68b. Inflorescence axes and pedicels ascending to slightly spreading, generally at angles less than 60° (or frequently to 90° or more in *H. vachellii* in fruit); leaves borne at few to numerous stem nodes.
- 69a. Stipules setose, lobed, or lacinate, with 2 to several narrow lobes, awns, or bristles (at least on lower nodes).
- 70a. Corolla tube longer than corolla lobes; inflorescences with several subcapitate to congested-cymose heads or cymules.
- 71a. Flowers sessile to subsessile ..... 14. *H. capituligera*
- 71b. Flowers sessile and pedicellate, pedicels to 4 mm ..... 38. *H. matthewii*
- 70b. Corolla lobes longer than corolla tube; inflorescences with few- to many-flowered cymes; pedicels 1–5 mm.
- 72a. Stipules 4–6-lobed or -setose ..... 3. *H. assimilis*
- 72b. Stipules glandular-serrulate to 3-lobed or -setose ..... 39. *H. mellii*
- 69b. Stipules entire or sometimes with a terminal awn and/or serrate to serrulate-denticulate.
- 73a. Leaves with secondary veins prominulous and evident on abaxial surface ..... 39. *H. mellii*
- 73b. Leaves with secondary veins plane and generally not evident on abaxial surface.
- 74a. Stems sharply angled to winged, at least on lower internodes; leaves sessile, often clasping at base ..... 1. *H. acutangula*
- 74b. Stems rounded to flattened or angled, angles generally not sharp; leaves petiolate to subsessile, at base narrow to rounded but usually not clasping.
- 75a. Calyx lobes ca. 4 mm ..... 43. *H. ovata*
- 75b. Calyx lobes 0.3–2.5 mm.
- 76a. Plants scapose, with leaves clustered at base; leaves 5–9 cm wide ..... 52. *H. shenzhenensis*
- 76b. Plants with leaves distributed along stem; leaves 0.4–3.5 cm wide.
- 77a. Corolla tube 1.5–2.5 mm; calyx lobes 0.5–1.2 mm; inflorescence axes often becoming spiciform and/or scorpioid.
- 78a. Calyx lobes 0.8–1.2 mm; leaves with secondary veins 4–6 pairs ..... 21. *H. consanguinea*
- 78b. Calyx lobes ca. 0.5 mm; leaves with secondary veins ca. 3 pairs ..... 36. *H. longiexserta*
- 77b. Corolla tube 2.5–10 mm; calyx lobes 1–2.5 mm; inflorescence axes generally dichasial.
- 79a. Corolla with tube 4–10 mm, lobes 1/2 as long as tube or shorter.
- 80a. Corolla white or pink, with tube markedly funnelform ..... 16. *H. caudatifolia*
- 80b. Corolla pink to purple, with tube cylindrical to slightly funnelform.
- 81a. Corolla tube ca. 6 mm ..... 27. *H. exserta*
- 81b. Corolla tube 7–10 mm ..... 41. *H. minutopuberula*
- 79b. Corolla with tube 2.5–4 mm, lobes shorter than tube but more than 1/2 as long as tube.
- 82a. Pedicels to 4 mm; corolla tube 3.5–4 mm and lobes 2–3 mm ..... 38. *H. matthewii*
- 82b. Pedicels to 1.5 mm; corolla tube 2.5–3.5 mm and lobes 2–2.2 mm.
- 83a. Inflorescences narrowly cylindrical to pyramidal, axes ascending; fruit 2–3 mm in diam. .... 12. *H. cantoniensis*
- 83b. Inflorescences broadly pyramidal to rounded, axes ascending to spreading at 90° or more; fruit ca. 1.8 mm in diam. .... 60. *H. vachellii*

**1. *Hedyotis acutangula*** Champion ex Bentham, Hooker's J. Bot. Kew Gard. Misc. 4: 171. 1852.

*Oldenlandia acutangula* (Champion ex Bentham) Kuntze.

金草 jin cao

Herbs or subshrubs, apparently biennial or perennial, erect, 25–60 cm tall; stems sometimes slightly constricted at nodes, 4–

angled to 4-winged, wings to 1.5 mm wide. Leaves sessile or subsessile; blade drying stiffly papery to leathery, ovate-lanceolate, lanceolate, elliptic, or lanceolate-elliptic, 2–12 × 0.5–2.5 cm, glabrous, base cuneate to rounded, margins thickened, often inrolled, sometimes glandular-serrulate, apex acute or shortly acuminate; secondary veins indistinct; stipules fused to petiole bases, ovate or triangular, 1.5–5 mm, glabrous, margins often becoming revolute, entire or glandular-serrulate, apex acute to acuminate. Inflorescences terminal, in axils of uppermost leaves, and occasionally also axillary or pseudoaxillary at lower nodes, paniculate or corymbose, 3–20 cm, many flowered, glabrous, pedunculate; peduncle 2–8 cm; axes dichasial, sharply 4-angled to thinly 4-winged; bracts triangular to lanceolate and 0.3–5 mm, or leaflike and larger. Flowers sessile, distylous. Calyx glabrous; hypanthium portion turbinate to ellipsoid, 0.8–1 mm; limb lobed nearly to base; lobes ovate, triangular, or lanceolate, 0.8–1.2 mm. Corolla white to pink, funnelform, outside glabrous; tube 2.2–3.5 mm, inside tomentose above middle; lobes ovate-lanceolate, 2–3 mm. Anthers included or exserted, ca. 1 mm. Stigma included or exserted, 0.5–1 mm. Fruit capsular, obovoid to ellipsoid, 2–2.5 × 1–1.2 mm, glabrous, leathery, apically flat or with beak to 0.3 mm, septicidal and then loculicidal along middle of septum; seeds several, black, suborbicular, angled. Fl. May–Dec, fr. Jun–Dec.

Hill slopes, open fields; near sea level to 600 m. Fujian, Guangdong, Hainan (Wanning) [N Thailand, Vietnam].

Deb and Dutta (Taxon 34: 296–297. 1985) briefly discussed this species and formally synonymized *Hedyotis elegans* Wallich ex Kurz with it; however, they gave no characters or discussion of either species and gave its range as “Burma and Malaysia” even though its type is from Hong Kong, so their conclusions are provisionally not included here.

## 2. *Hedyotis ampliflora* Hance, J. Bot. 17: 11. 1879.

广花耳草 *guang hua er cao*

*Oldenlandia ampliflora* (Hance) Kuntze.

Herbs or shrubs, perennial, lianescent, clambering, twining, or scandent, to perhaps 1 m; stems flattened to subterete, smooth to sulcate, densely hirtellous or pilosulous throughout or in lines, to glabrescent. Leaves petiolate; petiole 2–6 mm, densely hirtellous to puberulent; blade drying papery, lanceolate, broadly lanceolate, elliptic, or narrowly elliptic, 2–7 × 0.8–3 cm, adaxially hispidulous or strigillose along midrib to throughout, abaxially hispidulous or hirtellous to glabrous, base cuneate to obtuse, apex acute or shortly acuminate; secondary veins 3 or 4 pairs; stipules fused to petiole bases, densely hirtellous to hispidulous, sheath portion 1–3 mm, truncate to triangular, apex lacerate into 3–5 narrowly triangular to linear bristles or lobes 1–6 mm. Inflorescences terminal and occasionally also in axils of uppermost leaves, compound-cymose, corymbiform, 3–12 cm, several to many flowered, densely to sparsely hirtellous to puberulent, pedunculate; peduncles 1–3.5 cm; axes dichotomous, spreading; bracts triangular, lanceolate, or narrowly elliptic, 1–7 mm; pedicels 1–3.5 mm. Flowers pedicellate, apparently distylous. Calyx glabrous to densely hirtellous; hypanthium portion subglobose or turbinate, 0.8–1 mm; limb lobed for 3/4–4/5; lobes lanceolate to spatulate, 1.2–1.8

mm, acute, usually spreading to reflexed. Corolla white or greenish white, tubular to salverform, outside granular-puberulent; tube ca. 1 mm, barbate in throat; lobes lanceolate to spatulate, 2–2.5 mm, acute. Anthers partially or long exserted, 0.8–1 mm. Stigmas in short-styled form not seen, or exserted and ca. 0.3 mm. Fruit capsular, subglobose to ovoid, sometimes slightly flattened, 2.5–3 × 2–2.5 mm, glabrous to densely hirtellous, cartilaginous to stiffly papery, loculicidal then septicidal across top then tardily along sides, beak conical, ca. 1 mm; seeds numerous, blackish brown, angled. Fl. May–Nov, fr. Oct–Nov.

• Sparse forests or thickets on mountain slopes; 100–400 m. Hainan.

The Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on May 2007) reports this species also from Vietnam; it is not listed in the Vietnam checklist.

## 3. *Hedyotis assimilis* Tutchter, Rep. Bot. Dept. Hong Kong 1914: 32. 1915.

清远耳草 *qing yuan er cao*

*Oldenlandia assimilis* (Tutchter) Chun.

Herbs or subshrubs, erect, branched, 30–40 cm tall; stems quadrangular, scabrous. Petiole ca. 3 mm; leaf blade drying papery, lanceolate, 5–9 × 1.5–2.5 cm, scabrous, base cuneate, apex long acuminate; secondary veins ca. 4 pairs, adaxially impressed; stipules broadly triangular, ca. 3 mm, usually 4–6-lobed or perhaps setose. Inflorescence axillary and terminal, in cymes arranged into panicles, usually shorter than leaves, 6–8-flowered; bracts small, narrow; pedicels 1–3 mm. Flowers pedicellate, with biology unknown. Calyx glabrous; lobes ovate, acute. Corolla white, outside glabrous, inside and on filaments densely bearded; lobes lanceolate, longer than tube, obtuse. Style exserted, bearded below middle. Fruit capsular, ellipsoid, ca. 3 mm including persistent calyx limb, septicidal then loculicidal through middle of septum; seeds numerous, black, angled. Fl. Apr–May.

• Broad-leaved forests, slopes in ravines. Guangdong (Conghua, Qingyuan).

## 4. *Hedyotis auricularia* Linnaeus, Sp. Pl. 1: 101. 1753.

耳草 *er cao*

Herbs, perennial, tufted to weak or procumbent, sometimes (var. *auricularia*) to usually (var. *mina*) rooting at lowermost nodes, to 1 m tall or long; stems flattened, 4-angled, or terete becoming angled and/or sulcate, densely hirtellous, hispidulous, strigillose, pilosulous, or puberulent, to sometimes glabrescent (var. *auricularia*), or glabrous except villosulous to pilosulous and sometimes also hirsute to pilose inside grooves (var. *mina*). Leaves subsessile to petiolate; petiole to 7 mm, densely strigillose to pilosulous; blade drying subleathery to papery, ovate, lanceolate, elliptic, or elliptic-oblong, 2.2–9 × 0.6–3 cm (var. *auricularia*) or 1.2–3 × 0.4–1.4 (var. *mina*), adaxially glabrous or puberulent along midrib or scabrous, abaxially glabrous on lamina and densely puberulent to strigillose or hispidulous along principal veins and margins, base acute to obtuse and sometimes shortly decurrent, apex acute or

acuminate; secondary veins 4–6 (var. *auricularia*) or 2–4 (var. *mina*) pairs; stipules fused to petiole bases, densely puberulent, strigillose, or pilosulous, sheath 1.5–3.5 mm, truncate to triangular or elliptic, in var. *auricularia* with 3–9 linear or setiform lobes 0.5–5 mm, often glandular at apex, in var. *mina* entire and acute to aristate or sometimes with 2 setose lobes to 2 mm. Inflorescences axillary, glomerulate to congested-cymose, 5–12 mm in diam., several to many flowered (var. *auricularia*) or 2–7-flowered (var. *mina*), puberulent, sessile; bracts lanceolate to stipuliform, 0.3–2 mm; pedicels to 1 (var. *auricularia*) or 3 (var. *mina*) mm. Flowers sessile to pedicellate, distylous. Calyx puberulent (var. *auricularia*) or glabrous (var. *mina*); hypanthium portion obconic, ca. 1 mm; limb lobed essentially to base; lobes lanceolate to triangular, 0.8–1.2 mm, usually ciliolate. Corolla white, tubular or tubular-funnelform, outside pilosulous at least on lobes (var. *auricularia*) or glabrous throughout (var. *mina*); tube 1–1.5 mm, barbate in throat; lobes 0.5–1 mm. Anthers narrowly oblong, ca. 1 mm, exserted or included. Stigma ca. 1 mm, exserted or included. Fruit indehiscent, globose to ovoid, 1.2–1.5 mm in diam., sparsely hirtellous, hispidulous, or puberulent (var. *auricularia*), or glabrous (var. *mina*), sometimes with peduncles and/or pedicels elongating, to 2 mm; seeds 4–12, black, foveolate. Fl. and fr. Mar–Dec.

Forest margins, thickets, grasslands, open fields, streamsides; below 100–1500 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [India, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

- 1a. Young stems densely hirtellous, hispidulous, strigillose, pilosulous, or puberulent to glabrescent; leaf blade lanceolate to elliptic, 2.2–9 × 0.6–3 cm; secondary veins 4–6 pairs ..... 4a. var. *auricularia*
- 1b. Young stems longitudinally sulcate, glabrous except villosulous to pilosulous and sometimes also hirsute to pilose inside grooves; leaf blade ovate to lanceolate, elliptic, or elliptic-oblong, 1.2–3 × 0.4–1.4 cm; secondary veins 2–4 pairs ..... 4b. var. *mina*

#### 4a. *Hedyotis auricularia* var. *auricularia*

耳草(原变种) *er cao* (yuan bian zhong)

*Exallage auricularia* (Linnaeus) Bremekamp; *Oldenlandia auricularia* (Linnaeus) K. Schumann.

Stems densely hirtellous, hispidulous, strigillose, pilosulous, or puberulent to glabrescent with pubescence mostly uniform. Leaf blade lanceolate to elliptic, 2.2–9 × 0.6–3 cm; secondary veins 4–6 pairs; stipules with 3–9 linear to setiform lobes to 5 mm. Inflorescences glomerulate to congested-cymose, several to many flowered; pedicels to 1 mm. Fl. and fr. Mar–Dec.

Forest margins, thickets, grasslands; below 100–1500 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [India, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

The Chinese range of this taxon was not mentioned by Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) but was long known to other authors.

4b. *Hedyotis auricularia* var. *mina* W. C. Ko, Fl. Hainan. 3: 578. 1974.

细叶亚婆潮 *xi ye ya po chao*

Stems at least when young longitudinally sulcate, villosulous to pilosulous and sometimes also hirsute to pilose inside grooves. Leaf blade ovate to lanceolate, elliptic, or elliptic-oblong, 1.2–3 × 0.4–1.4 cm; secondary veins 2–4 pairs; stipules entire and acute to aristate or sometimes with 2 setose lobes to 2 mm. Inflorescences subcapitate to congested-cymose, 2–7-flowered in each node; pedicels to 3 mm. Fl. almost year-round.

• Wet or humid open fields, streamsides, thickets; ca. 200 m. Guangdong, Guangxi, Hainan.

5. *Hedyotis baotingensis* W. C. Ko, J. S. China Agric. Univ. 16(4): 43. 1995.

保亭耳草 *bao ting er cao*

Little branched herbs, prostrate, 40–60 cm tall; stems terete to flattened, scabrous. Leaves petiolate, often congested and appearing verticillate at top of stem; petiole 10–15 mm; blade drying papery, elliptic, elliptic-oblong, ovate, or obovate, 4–13 × 3–6 cm, adaxially glabrous, abaxially sparsely hirtellous at least along veins, base obtuse then decurrent, apex obtuse then sometimes abruptly and shortly acute; secondary veins 5–12 pairs; stipules narrowly triangular, long acuminate, marginally erose. Inflorescence and flowers unknown. Infructescence terminal, capitate, subglobose, 2–2.5 cm in diam., sessile. Fruit indehiscent, sessile or subsessile, globose or ellipsoid, 1–1.5 mm in diam., pilosulous; persistent calyx lobes narrowly spatulate-oblong, narrowly lanceolate, or linear, 5–5.5 mm, striate; seeds 3 or 4, black, angled. Fr. Oct.

• Broad-leaved forests on shady slopes. Hainan (Baoting).

6. *Hedyotis biflora* (Linnaeus) Lamarck, Tabl. Encycl. 1: 272. 1792.

双花耳草 *shuang hua er cao*

*Oldenlandia biflora* Linnaeus, Sp. Pl. 1: 119. 1753; *Hedyotis paniculata* (Linnaeus) Lamarck; *H. racemosa* Lamarck; *O. crassifolia* Candolle; *O. paniculata* Linnaeus.

Herbs, annual or perennial, erect to procumbent, to 15–(30) cm tall; stems 4-angled to subterete and/or sulcate, glabrous. Leaves subsessile to petiolate; petiole to 0.5 cm, glabrous; blade drying papery to subleathery, elliptic-oblong, elliptic-ovate, obovate, oblanceolate, or elliptic, 1–4 × 0.3–1 mm, glabrous, base acute to obtuse then abruptly decurrent, apex acute to rounded; secondary veins indistinct; stipules fused to petioles, triangular, 1–2 mm, glabrous, usually costate, acute to long acuminate. Inflorescences terminal and in axils of uppermost leaves, cymose to compound-cymose, 1–6 cm, glabrous, 2–12-flowered, pedunculate; peduncles 0.5–3 cm; bracts triangular to lanceolate, 0.5–3 mm; pedicels 0.5–10 mm. Flowers subsessile to pedicellate, apparently distylous. Calyx glabrous; hypanthium portion turbinate, 0.5–1 mm; limb lobed essentially to base; lobes triangular, 0.3–1 mm. Corolla white, sometimes flushed with lavender, tubular to somewhat urceolate, outside glabrous or puberulent in lines; tube 1.2–2 mm, barbate in

throat; lobes spatulate-oblong, 1–1.5 mm. Anthers included or exerted, 0.3–0.5 mm. Stigma exerted or apparently included, ca. 0.2 mm. Fruit capsular, subglobose, oblate, or hemispherical, 2.5–3 mm in diam., loculicidally dehiscent across top, beak 0.5–1 mm high, pedicels usually elongating; seeds numerous, black, foveolate. Fl. and fr. Jan–Sep.

Limestone mountains, coastal areas, weedy fields, wastelands; sea level to 1200 m. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Taiwan, Yunnan [India, Indonesia, Malaysia, Nepal, Vietnam; SE Asia to Pacific islands].

The circumscription and name of this species is controversial or, at best, complicated. These are small herbs of ruderal sites and thus probably respond markedly to local conditions, in particular growing to a larger size with larger leaves, inflorescences, and fruit in sites with better conditions. Similar species that have been variously synonymized but are separated here include *Hedyotis strigulosa* and *H. pterita*; see further discussion under *H. strigulosa*. Alternatively Biju et al. (Rheedea 2(1): 11–18, 1992) separated *H. biflora* from *H. racemosa* (syn. *Oldenlandia paniculata*); their treatment is carefully done but regional, and because their key does not correspond well with the Chinese plants, their conclusions are not accepted here.

The name *Oldenlandia crassifolia* was placed in synonymy with both *Hedyotis biflora* and *H. coreana* (*H. strigulosa*) by W. C. Ko (in FRPS 71(1): 39, 77, 1999). The only other author who studied this name in any detail, Merrill (Enum. Philipp. Fl. Pl. 3(4): 492–512; 3(5): 513–576, 1923), cited this as a synonym of *H. biflora* and is followed here.

**7. *Hedyotis bodinieri*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 11: 64, 1912.

大冒山耳草 da mao shan er cao

*Oldenlandia bodinieri* (H. Léveillé) Chun.

Herbs or subshrubs; stems pilosulous. Leaf blade drying membranous, margins not revolute when dry. Inflorescence shortly cymose. Flowers pedicellate. Calyx lobes sublinear, acute, as long as corolla tube. Corolla white; tube slightly longer than lobes. Anthers included. Fl. May.

● Mountaintops. Hong Kong (Damao Shan).

This very poorly known species is not included in the key to species here. It may will turn out to be an older name for an otherwise-known species.

**8. *Hedyotis brachypoda*** (Candolle) Sivarajan & Biju, Taxon 39: 672, 1990.

拟定经草 ni ding jing cao

*Oldenlandia brachypoda* Candolle, Prodr. 4: 424, 1830.

Slender herbs, annual, diffusely branched, to 50 cm tall; stems terete to slightly flattened, glabrous. Leaves sessile or subsessile; blade drying membranous, linear, narrowly elliptic, or narrowly spatulate, 7–36 × 1–4 mm, adaxially glabrous (sometimes appearing papillose due to collapsed, large epidermal cells) to scaberrulous and usually shiny, abaxially glabrous and matte, base acute, margins usually revolute at least when dry, apex acute; secondary veins not evident; stipules fused to petiole bases, glabrous, truncate to broadly triangular, 0.8–2 mm, with 1–3 linear to setiform lobes 0.2–1 mm. Inflorescences

pseudoaxillary, 1-flowered (2-flowered and fasciculate), glabrous, sessile or with peduncle to 3 mm, ebracteate. Flowers subsessile to shortly pedunculate, homostylous. Calyx glabrous; hypanthium portion globose, 1–1.2 mm; limb lobed essentially to base; lobes triangular, 1–1.5 mm. Corolla white, rotate, outside glabrous; tube 1–1.5 mm, glabrous at throat; lobes triangular, 1–1.5 mm. Anthers ca. 0.3 mm, exerted. Stigma ca. 0.8 mm, exerted. Fruit capsular, membranous to papery, compressed globose to subglobose or somewhat dicocous, ca. 2.5 × 3–4 mm, loculicidally dehiscent through flattened top, peduncles to 8 mm; seeds ca. 20, dark brown, angled, deeply and thickly foveolate. Fl. and fr. (Feb–)Mar–Nov.

Paddy fields, ridges of farmlands, humid open fields; below 100–1500 m. Anhui, Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan, Malaysia (Malacca), Nepal, Philippines, Vietnam].

The taxonomy of this and related species is complicated, and different authors have drawn very different conclusions (e.g., Sivarajan & Biju, loc. cit.: 665–674; Dutta & Deb, Taxon. Rev. *Hedyotis*, 2004). In particular, *Hedyotis corymbosa*, *H. diffusa*, and *H. erecta* Manilal & Sivarajan are related and have been variously circumscribed. Here, these species are circumscribed generally, though not completely, following Sivarajan and Biju (loc. cit.) and W. C. Ko (in FRPS 71(1): 72, 75, 1999).

**9. *Hedyotis bracteosa*** Hance, J. Bot. 23: 323, 1885.

大苞耳草 da bao er cao

*Oldenlandia bracteosa* (Hance) Kuntze.

Herbs, erect, to 50 cm tall; stems glabrous, 4-angled with angles rounded to acute or winged, wings to 1 mm wide. Leaves sessile or subsessile; blade drying papery, elliptic-oblong or oblong-lanceolate, 12–15 × 2–4 cm, glabrous, base obtuse to cordulate then abruptly narrowed, apex acute or shortly acuminate; secondary veins ca. 7 pairs, weakly marked or not visible; stipules fused to petiole bases, broadly triangular to ovate, 4–12 mm, glabrous, with 2 winged flanges 1–2.5 mm wide extending from each petiole base to apex, entire or glandular-serrulate, acute to acuminate. Inflorescence axillary, capitate, glabrous, pedunculate; peduncles 2.5–7 cm; involucre bracts 2 or 4, ovate, 10–25 × 9–18 mm; head hemispherical, 10–16 mm in diam.; floral bracts narrowly lanceolate, 1–4 mm; pedicels 0.2–1 mm. Flowers subsessile to shortly pedicellate, distylous. Calyx glabrous; hypanthium portion ellipsoid, ca. 1 mm; limb lobed nearly to base; lobes ovate or lanceolate, 2.2–3 × 1.2–2 mm, often pinnately veined, sometimes ciliolate, obtuse to acute. Corolla white, tubular or tubular-funnelform, outside glabrous; tube ca. 4 mm, pilosulous inside in upper half and throat; lobes lanceolate to triangular, ca. 1.5 mm, acute. Anthers exerted and ca. 0.8 mm in short-styled form, in long-styled form not seen. Stigmas ca. 0.5 mm and positioned near middle of corolla tube in short-styled form, ca. 1 mm and exerted in long-styled form. Fruit capsular, subglobose to ellipsoid, ca. 2 mm, glabrous, septicidal then perhaps rather tardily loculicidal, with calyx limb persistent; seeds numerous, black, angled, rugose. Fl. Apr–Jul, fr. Jul.

● Sparse forests on mountain slopes or on humid lands in valleys/ravines. Guangdong.

W. C. Ko (in FRPS 71(1): 56. 1999) described the corolla as having lobes as long as the corolla tube, but this has not been seen on specimens studied nor reported by other authors.

**10. *Hedyotis brevicalyx*** Sivarajan, Biju & P. Mathew, Kew Bull. 48: 393. 1993.

伞形花耳草 *san xing hua er cao*

*Oldenlandia umbellata* Linnaeus, Sp. Pl. 1: 119. 1753; *Hedyotis umbellata* (Linnaeus) Lamarck (1792), not Walter (1788).

Herbs, annual or perennial, diffusely branched, to 40 cm tall; stems 4-angled perhaps becoming terete, ribbed, scaberrulous. Leaves opposite but often crowded and appearing verticillate, sessile; blade drying papery, linear to narrowly lanceolate, 10–20 × 1–3 mm, adaxially punctate and glabrescent, abaxially scaberrulous along midrib, base acute, margins flat to revolute, apex acute; secondary veins indistinct; stipules fused to petioles, glabrescent, truncate to rounded, 1–1.5 mm, with 2–5 bristles 1–2 mm. Inflorescence terminal and sometimes in uppermost axils, congested-cymose to congested-umbelliform, several flowered, scaberrulous, pedunculate; peduncles 1–2 cm; branched portion ca. 3 cm; bracts stipuliform, ca. 1 mm; pedicels 0.5–1.2 mm. Flowers distylous, shortly pedicellate. Calyx apparently glabrous; hypanthium portion subglobose to ovoid, 0.3–1 mm; limb lobed essentially to base; lobes lanceolate to triangular, 1–2 mm, ciliate. Corolla white, tubular, outside glabrous; tube 1.5–2.2 mm, glabrous inside; lobes lanceolate, 1.5–2 mm, inside sparsely pubescent. Anthers 0.5–1 mm, included or exserted. Stigmas 0.8–1 mm, included or exserted. Fruit capsular, compressed globose to weakly didymous, 2–2.5 × 2–2.5 mm, loculicidally dehiscent across top, glabrous to scaberrulous, perhaps papery; seeds several, blackish brown.

Sandy lands at sea beaches; sea level to near sea level [100–900 m in India]. Hainan (Lingshui) [India, Indonesia (Java), N Myanmar, Pakistan, Sri Lanka, Vietnam].

There is some disagreement over the identity and correct name of this species; whether *Hedyotis brevicalyx* actually occurs in China is unknown as yet, and the description here is taken from Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004, as *H. puberula* (G. Don) R. Brown ex Arnott). The plant illustrated for this species (as *H. umbellata*) in FRPS (71(1): 70, t. 13, f. 1–6. 1999) is actually *H. pinifolia*, and its description there seems to combine some characters of both *H. brevicalyx* sensu Dutta & Deb and *H. pinifolia*.

**11. *Hedyotis butensis*** Masamune, Trans. Nat. Hist. Soc. Formosa 28: 119. 1938.

台湾耳草 *tai wan er cao*

Herbs, erect, annual, to 20 cm tall; stems terete to 4-angled, hirsute. Leaves sessile; blade drying papery, elliptic-oblong, oblanceolate, ovate-lanceolate, or lanceolate, 1.5–6 × 0.3–1 cm, adaxially puberulent to scaberrulous, abaxially densely villous to hirsute, base cuneate to attenuate, apex acute to acuminate; stipules broadly triangular, ca. 3 mm, hirsute, acuminate. Inflorescences terminal and/or axillary, capitate or glomerulate; bracts linear, to 1.5 mm. Flowers sessile. Calyx hirsute; hypanthium portion ovoid, ca. 1.5 mm; lobes linear to deltoid, ca. 1.5 mm. Corolla white, funnelform, pubescent inside and

out; tube 0.8–2.3 mm; lobes oblong-linear, ca. 0.2 mm. Anthers exserted. Fruit indehiscent or dehiscent across top, subglobose, somewhat compressed laterally, 1.5–2 mm in diam.; seeds numerous, angled. Fl. Jul–Sep.

• Taiwan (Yilan).

This species is poorly known, and the available descriptions are limited. It is included in the key to species twice, for the described hirsute stems and the potentially glabrous stems, a condition eventually found in most pubescent species of *Hedyotis* (and other Rubiaceae) and one that can be confirmed as more specimens become available.

**12. *Hedyotis cantoniensis*** F. C. How ex W. C. Ko, J. S. China Agric. Univ. 16(4): 42. 1995.

广州耳草 *guang zhou er cao*

Herbs or subshrubs, erect, perennial, to 60 cm tall; stems subterete, sometimes striate, glabrous. Leaves subsessile to petiolate; petiole to 8 mm, glabrous; blade drying thinly leathery, ovate, oblong-elliptic, narrowly elliptic, or narrowly lanceolate, 3–13 × 0.8–3 cm, glabrous, base acute to cuneate, apex acute to shortly acuminate; secondary veins indistinct; stipules fused to petiole bases, triangular to broadly triangular, 2–5 mm, glabrous, marginally entire to densely glandular serrate, acute to aristate with tip to 4 mm. Inflorescences terminal and in axils of uppermost leaves, cymose, paniculate and pyramidal to narrowly cylindrical or racemiform, 1–15 cm, several to many flowered, glabrous, sessile and tripartite or pedunculate; peduncles 1–4.5 cm; bracts narrowly elliptic to triangular, 0.5–4 mm; pedicels to 1 mm. Flowers sessile to pedicellate, distylous. Calyx glabrous; hypanthium portion subglobose to obconic, 1–1.2 mm; limb 1–2 mm, deeply lobed; lobes triangular to narrowly triangular. Corolla salverform to tubular-funnelform, outside glabrous; tube 2.5–3.5 mm, sparsely barbate in throat; lobes oblong-lanceolate, 2–2.2 mm. Anthers included or exserted, ca. 1.1 mm. Stigmas included or exserted, ca. 0.3 mm when exserted. Fruit capsular, ellipsoid to subglobose, 2–3 mm, septically then loculicidally dehiscent, glabrous, cartilaginous to somewhat woody, apex flat or with low rounded beak; seeds several, angled. Fl. Apr–Aug, fr. Jun–Nov.

• Sparse forests; 200–1000 m. Guangdong.

This species as provisionally circumscribed here is similar to *Hedyotis matthewii* and slightly differently (and more narrowly) than done by W. C. Ko (in FRPS 71(1): 48. 1999).

**13. *Hedyotis capitellata*** Wallich ex G. Don, Gen. Hist. 3: 527. 1834.

头花耳草 *tou hua er cao*

Herbs or shrubs, lianescent, climbing, clambering, or scandent, to 1 m; stems terete to weakly 4-angled, often longitudinally ridged and/or sulcate, glabrous or hirtellous to pilosulous or hispidulous at least in longitudinal lines, or tomentose in var. *mollissima*. Leaves subsessile to petiolate; petiole to 4 mm, glabrous to puberulent or hispidulous, or tomentose (var. *mollissima*); blade drying membranous, ovate, lanceolate, elliptic, or elliptic-lanceolate, 2–12 × 1–4 cm, glabrous or sparsely to moderately puberulent to hispidulous or hirtellous, or tomentose (var. *mollissima*), base acute to obtuse then often decurrent,

apex acute to shortly or long acuminate; secondary veins 3 or 4 pairs; stipules fused to petiole bases, glabrous to densely puberulent, hispidulous, or strigillose, or tomentose (var. *mollissima*), triangular, 1.5–5 mm, entire or serrulate at margins, acute to acuminate with tip 0.5–1.5 mm, often spreading to recurved. Inflorescences terminal and often also in axils of uppermost leaves, 4–25 cm, with 3–15 globose, capitate to subcapitate heads in groups of 3, groups then paniculate, pyramidal, densely puberulent to hirtellous or glabrous, or tomentose (var. *mollissima*), pedunculate; peduncle 1–5 cm; bracts subtending axes triangular to oblanceolate, 1–10 mm, bracts subtending flowers reduced to a tuft of pubescence; heads 3–6 mm in diam. (not including corollas), 8–15 mm in diam. (including corollas). Flowers sessile or subsessile, distylous. Calyx glabrous to densely puberulent; hypanthium portion campanulate to obconic, 0.8–1 mm; limb lobed for 1/3–3/4, 1–2 mm; lobes oblong to narrowly triangular. Corolla white to pale blue, funnellform, outside glabrous, inside densely bearded in throat and onto lobes; tube 1–2 mm; lobes ligulate, 3–5 mm. Anthers included or exerted, 1–1.2(–2) mm. Stigmas linear, 1–2 mm. Fruit capsular, ellipsoid to globose, 2–3 mm in diam., glabrescent, septically then loculicidally dehiscent (but see discussion below); seeds numerous, angled. Fl. almost year-round, fr. not seen from China.

Broad-leaved forests in valleys, sunny mountain slopes; ca. 1500 m. Yunnan [India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

The fruit is described above following W. C. Ko (in FRPS 71(1): 65. 1999); however, Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) described this differently, as loculicidal across the top beak portion, then sometimes tardily septical.

W. C. Ko (loc. cit.: 65–66) reported the varieties below from China; they are treated following that work here for reference. Dutta and Deb (loc. cit.) reported only *Hedyotis capitellata* var. *subpubescens* Kurz from China; this name was not mentioned by Ko but presumably corresponds to one of Dutta and Deb's varieties.

- 1a. Plants glabrous ..... 13a. var. *capitellata*
- 1b. Plants pubescent.
  - 2a. Stems, inflorescences, calyx, and leaf blade sparsely pubescent ..... 13b. var. *mollis*
  - 2b. Stems, inflorescences, calyx, and leaf blade densely pale yellow tomentose ..... 13c. var. *mollissima*

### 13a. *Hedyotis capitellata* var. *capitellata*

头状花耳草(原变种) tou zhuang hua er cao (yuan bian zhong)

*Oldenlandia capitellata* (Wallich ex G. Don) Kuntze; *O. capitellata* var. *glabra* Pitard; *O. rubioides* Miquel.

Plants glabrous. Fl. May, fr. not seen from China.

Broad-leaved forests in valleys; ca. 1500 m [as low as below 100 m in India]. Yunnan [India, Indonesia, Malaysia, Myanmar, Thailand].

**13b. *Hedyotis capitellata* var. *mollis*** (Pierre ex Pitard) T. N. Ninh in T. B. Nguyen, Fl. Taynguyen. Enum. 150. 1984.

疏毛头状花耳草 shu mao tou zhuang hua er cao

*Oldenlandia capitellata* var. *mollis* Pierre ex Pitard in Lecomte, Fl. Indo-Chine 3: 137. 1922.

Stems, leaf blade, inflorescences, and calyx sparsely pubescent. Fl. Apr–Jul, fr. not seen from China.

Broad-leaved forests at middle elevations. Yunnan (Hekou) [India, Indonesia, Malaysia, Vietnam].

Ninh's varietal combination was not known to W. C. Ko (loc. cit.: 66), who intended to publish it himself but was precluded.

**13c. *Hedyotis capitellata* var. *mollissima*** (Pitard) W. C. Ko, Fl. Reipubl. Popularis Sin. 71(1): 66. 1999.

绒毛头状花耳草 rong mao tou zhuang hua er cao

*Oldenlandia capitellata* var. *mollissima* Pitard in Lecomte, Fl. Indo-Chine 3: 138. 1922.

Stems, leaf blade, inflorescences, and calyx densely pale yellow tomentose. Fl. almost year-round, fr. not seen from China.

Sunny mountain slopes at middle to high elevations. Yunnan (Xishuangbanna) [Vietnam].

**14. *Hedyotis capituligera*** Hance, J. Bot. 17: 12. 1879.

败酱耳草 bai jiang er cao

*Oldenlandia capituligera* (Hance) Kuntze.

Leggy herbs, erect, to 80 cm tall; stems terete to 4-angled, longitudinally usually sulcate, sparsely villosulous or hirtellous to densely so at least in longitudinal lines, becoming glabrescent. Leaves subsessile to shortly petiolate; blade drying membranous, oblong-lanceolate, 3.5–11.5 × 0.8–3.5 cm, adaxially glabrous or sparsely to densely puberulent, hirtellous, or hispid, abaxially glabrescent on lamina and hispid to pilosulous or pilose along veins, base acute to rounded, margins ciliate, apex obtuse to acute; secondary veins 5–8 pairs; stipules fused to petiole bases, triangular, 1.5–4 mm, moderately to densely hirtellous or villosulous, with 2–4 bristles or linear to narrowly triangular lobes 1.5–4 mm. Inflorescences terminal on main stems, short lateral stems, and sometimes also in axils of uppermost leaves, several to many flowered, with 1–8 congested-cymose to subcapitate heads or glomerules, these usually in compound cymes 2–18 cm, densely villosulous to strigillose or glabrescent, pedunculate; peduncles 1–10 cm; heads 0.8–1.5 cm in diam.; bracts narrowly triangular to narrowly elliptic, 1.2–7 mm. Flowers subsessile. Calyx glabrous; hypanthium portion subglobose, ca. 0.8 mm; limb lobed nearly to base; lobes triangular, 0.3–0.6 mm. Corolla white, funnellform, outside glabrous; tube ca. 3 mm, stiffly barbate in throat; lobes ca. 1.3 mm, thickened at apex. Fruit capsular, compressed globose, dehiscent; seeds several. Fl. Jul–Aug.

● Open grasslands. Guangdong, Guizhou, Yunnan.

**15. *Hedyotis cathayana*** W. C. Ko, Fl. Hainan. 3: 579. 1974.

中华耳草 zhong hua er cao

Herbs or subshrubs, presumably perennial, erect, to 80(–100) cm tall; stems glabrous, 4-angled, angles sharp to winged, wings to 2 mm wide. Leaves sessile or subsessile; blade drying papery to membranous, purple on midrib at least when young, elliptic-oblong, lanceolate, or oblanceolate, 15–25 × 3–6

cm, glabrous, base obtuse to rounded or truncate, apex acute to long acuminate; secondary veins 7 or 8 pairs, hardly visible; stipules apparently fused shortly around stem, broadly triangular, 4–12 mm, glabrous, with 2 winged flanges 1–2 mm wide extending from each petiole base up to apex, acute to acuminate, entire, sparsely glandular-serrate, or with 1 to numerous bristles 0.1–2 mm, gland-tipped. Inflorescence axillary, congested-cymose to shortly paniculate or subglomerulate, 1.5–3.5 cm, glabrous, subsessile to pedunculate; peduncles to 2 cm; bracts linear-lanceolate, lanceolate, or narrowly elliptic, 1–12 mm; pedicels to 1.5 mm. Flowers subsessile to pedicellate, ?apparently distylous. Calyx glabrous; hypanthium turbinate, 1–1.3 mm; limb deeply lobed; lobes narrowly triangular to spatulate, 2–3 mm, sometimes slightly unequal. Corolla white or pale green, funnelliform to tubular-funnelform, outside glabrous; tube 6–9 mm, bearded in throat; lobes spatulate-oblong, 2.5–4 mm. Anthers exserted, 1–1.5 mm. Stigma ca. 1.5 mm, included, positioned just above middle of corolla tube. Fruit capsular, subglobose to ovoid, 2–3 × 1.5–2 mm, septicidal then loculicidal, papery, glabrous; seeds 4–6, blackish brown, angled, papillose. Fl. and fr. almost year-round, often simultaneously.

- On wet soil in valleys and ravines; ca. 500 m. Hainan.

The specimen *H. Y. Liang 54367* (NY, Web!) was annotated as "*Hedyotis Liangii* Merr. & Chun," but this name was apparently never published.

**16. *Hedyotis caudatifolia*** Merrill & F. P. Metcalf, J. Arnold Arbor. 23: 228. 1942.

剑叶耳草 jian ye er cao

*Hedyotis hui* Diels.

Shrubs or perhaps subshrubs, erect, perennial, to 90 cm tall; stems terete, shallowly striate, glabrous. Leaves petiolate; petiole 10–15 mm; blade drying leathery, grayish white abaxially, lanceolate, 6–13 × 1.5–3 cm, base cuneate or decurrent, apex caudate-acuminate; secondary veins ca. 4 pairs but indistinct; stipules broadly ovate, 2–3 mm, entire or glandular-serrulate, acute. Inflorescences compound-cymose to paniculate, several to many flowered; axes generally dichotomous; bracts lanceolate or linear-lanceolate. Flowers shortly pedicellate. Calyx with hypanthium portion turbinate, ca. 3 mm; limb deeply lobed; lobes ovate-triangular. Corolla white or pink, tubular, outside glabrous; tube 4–8 mm, barbate in throat; lobes lanceolate. Stigmas exserted or included. Fruit capsular, ellipsoid-oblong or ellipsoid, ca. 2.5 × 2 mm, smooth, glabrous, dehiscent; seeds several, black, subtriangular. Fl. May–Jun.

- Dry soil in jungles, thickets, on rock cliffs, on clay soil in grasslands. Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Zhejiang.

W. C. Ko (in FRPS 71(1): 48. 1999) described the petioles of this species as 10–15 mm and the hypanthium as ca. 3 mm, but the accompanying figure (p. 50, t. 7, f. 7–10) does not show these features.

**17. *Hedyotis cheniana*** R. J. Wang, Novon 18: 264. 2008.

焕镛耳草 huan yong er cao

Subshrubs, erect, to 0.5 m tall; stems terete to sulcate, glabrous to densely puberulent, strigillose, or pilosulous. Leaves

petiolate; petiole 3–5 mm, glabrous to densely pilosulous; blade drying papery, ovate, elliptic, ovate-oblong, or suborbicular, 1.7–5 × 1.6–2.5 cm, adaxially glabrescent, abaxially puberulent to pilosulous, base broadly obtuse to rounded or truncate, apex acute or shortly acuminate; secondary veins 3 or 4 pairs, poorly to well developed abaxially; stipules persistent, interpetiolar, triangular, 2–3.5 mm, glabrous or densely pilosulous, lacerate or with 5–9 linear lobes or bristles. Inflorescences terminal and in uppermost leaf axils, subcapitate, 1–2 cm in diam., 10–30-flowered, puberulent to pilosulous, subsessile to pedunculate; peduncles to 3 mm; bracts narrowly triangular to linear, 1–3 mm; pedicels 0.5–2 mm. Flowers distylous, shortly pedicellate. Calyx glabrous; hypanthium portion subglobose-ellipsoid, 0.8–1 mm; limb lobed nearly to base; lobes narrowly triangular, 3.5–4 mm, entire to ciliate, acuminate. Corolla white, salverform, outside glabrous; tube ca. 5 mm, barbate in throat; lobes spatulate-oblong to lanceolate, ca. 2 mm. Anthers exserted or situated in corolla throat, 1–1.5 mm. Stigmas included or exserted, ca. 1 mm. Fruit capsular, subglobose, ca. 2 mm, glabrous, loculicidal then septicidal; seeds 6–10, angled, reticulate. Fl. Jan–Feb, fr. Jun–Nov.

- Dense forests; 600–1000 m. Hainan.

The protologue described *Hedyotis cheniana* as being glabrous, but two specimens cited there are in fact densely pubescent; the protologue also described the secondary veins as not visible, but in fact they are well developed and usually prominent abaxially on these specimens.

**18. *Hedyotis chereevensis*** (Pierre ex Pitard) Fukuoka, S. E. Asian Stud. 8(3): 332. 1970.

越南耳草 yue nan er cao

*Oldenlandia chereevensis* Pierre ex Pitard in Lecomte, Fl. Indo-Chine 3: 143. 1922.

Herbs, erect, perhaps perennial, to 50 cm tall; stems flattened to 4-angled, often ridged, glabrous or puberulent to hispidulous at and shortly below nodes. Leaves subsessile to petiolate; petiole to 2 mm, puberulent to hispidulous; blade drying membranous, ovate, lanceolate, or elliptic, 2–7 × 0.8–3 cm, adaxially glabrous or puberulent on principal veins, abaxially sparsely to densely puberulent or hispidulous at least on principal veins, base cuneate to rounded then decurrent, apex acute to acuminate; secondary veins 5–7 pairs; stipules fused to petiole bases, ovate-lanceolate to triangular, 3–5 mm, densely puberulent, hirtellous, or hispidulous, acuminate to aristate, marginally lacinate or with several filamentous lobes to 1 mm, often glandular at apex. Inflorescences terminal and sometimes in axils of uppermost leaves, cymose to paniculate, 3–7 cm, several to many flowered, glabrous, usually slender, pedunculate; peduncles 1–2 cm; bracts lanceolate, 0.8–1 mm; pedicels 6–10 mm. Flowers all pedicellate. Calyx glabrous; hypanthium portion obconical, 0.5–0.8 mm; limb lobed essentially to base; lobes triangular, 0.1–0.3 mm. Corolla white, tubular to rotate, outside glabrous; tube 0.5–1 mm, inside apparently glabrous; lobes oblong-lanceolate, ca. 0.5 mm. Anthers exserted, ca. 0.5 mm. Stigma apparently exserted, ca. 0.2 mm. Fruit capsular, obconical, turbinate, or subglobose, often somewhat didymous, 1.5–2 × 1–1.5 mm, glabrous, loculicidally dehiscent across top,

beak rounded, ca. 0.4 mm high; seeds ca. 10, dark brown, angled. Fl. May–Jul.

On damp humus soil in forests; [below 100–1300 m in Thailand]. Hainan [Cambodia, Thailand, Vietnam].

The name *Hedyotis chereevensis* has been attributed to W. C. Ko (Fl. Hainan. 3: 306, 579. 1974), but this appears to be a later, superfluous combination.

**19. *Hedyotis chrysotricha*** (Palibin) Merrill, Lingnan Sci. J. 7: 322. 1931.

金毛耳草 jin mao er cao

*Anotis chrysotricha* Palibin, Bull. Herb. Boissier, sér. 2, 6: 20. 1906; *Oldenlandia chrysotricha* (Palibin) Chun.

Herbs, perennial or perhaps annual, procumbent, usually regularly rooting at nodes, to 40 cm; stems weakly 4-angled, flattened, or terete, sometimes 2-sulcate, moderately to densely hirtellous to pilosulous at least along grooves, sometimes glabrescent, trichomes often drying yellowed. Leaves subsessile to petiolate; petiole 1–3 mm, moderately to densely pilosulous to hirtellous; blade drying thinly papery, lanceolate, elliptic, or ovate, 0.8–3.2 × 0.5–1.4 cm, adaxially sparsely hirtellous, hispidulous, or scaberulous at least along margins, abaxially sparsely to densely hirtellous or pilosulous with pubescence denser along principal veins or sometimes glabrous (e.g., *Tsang 20859*, MO!), base cuneate or obtuse, apex obtuse to acute or shortly acuminate; secondary veins 2 or 3 pairs; stipules fused to petiole bases, triangular, 1–2 mm, moderately to densely puberulent to hirtellous, with 1–3 linear lobes or bristles 1.5–3.5 mm, these sometimes glandular and/or bifid at apex. Inflorescences axillary, congested-cymose to fasciculate, 3–10 mm in diam., (1 or) 2–5-flowered in each axil, moderately to densely pilosulous, sessile or subsessile; bracts linear, lanceolate, or narrowly elliptic, 0.5–4 mm; pedicels to 4 mm. Flowers subsessile to pedicellate, distylous. Calyx sparsely to densely hirtellous; hypanthium portion subglobose to obconic, ca. 1 mm; limb lobed essentially to base; lobes lanceolate to triangular, ca. 2 mm, usually ciliate to ciliate. Corolla white or purple, funnel-form, outside pilosulous to glabrous; tube 2.5–4 mm, pubescent inside; lobes linear-oblong to triangular, 2.5–3 mm. Anthers exerted or included, 1–1.2 mm. Stigma exerted or included, 1–1.2 mm. Fruit indehiscent, subglobose to ovoid, 1.5–2 × 2–2.5 mm, with calyx lobes to 3 mm; seeds several. Fl. and fr. year-round.

Broad-leaved forests in valleys, thickets on mountain slopes; 100–900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [Japan, ?Philippines].

**20. *Hedyotis communis*** W. C. Ko, Fl. Hainan. 3: 579. 1974.

大众耳草 da zhong er cao

Subshrubs or herbs, erect, to 1.5 m tall; stems glabrous, flattened to 4-angled or terete. Leaves sessile to subsessile; blade drying papery, narrowly elliptic-oblong or narrowly elliptic, on vegetative stems, 10–17 × 1.5–2.6 cm, glabrous, base cuneate to acute then usually long decurrent, apex acute to acuminate; secondary veins 6–8 pairs, abaxially indistinct; stipules

shortly united around stem or sometimes fused to petiole bases, triangular to narrowly triangular, 8–13 mm, glabrous, long acuminate, marginally sometimes sparsely glandular-serrulate or -setose. Inflorescence axillary, paniculate-cymose with small cymes distributed along axes with leaflike bracts and bracteal stipules, or along axillary branches with reduced leaves (depending on interpretation), 7–24 cm, many flowered, glabrous, pedunculate; peduncle 0.5–4 cm; leaflike bracts or reduced leaves paired, lanceolate to narrowly elliptic, 10–40 mm; cymes 8–15 mm, several flowered; floral bracts linear or linear-lanceolate, 2–8 mm; pedicels to 1 mm. Flowers subsessile to pedicellate. Calyx glabrous; hypanthium portion ellipsoid, 1–1.2 mm; limb lobed nearly to base; lobes narrowly triangular, 2–3 mm. Corolla white, tubular, outside glabrous; tube 4.5–5 mm, bearded in throat; lobes spatulate-oblong to triangular, 2–2.5 mm, acute. Anthers exerted, ca. 1.2 mm. Stigma included, ca. 0.8 mm. Fruit capsular, obovoid or subglobose, 2–3 × 2–2.5 mm, glabrous, septicidally then loculicidally dehiscent, cartilaginous; seeds 2–4, brownish black, tuberculate. Fl. almost year-round, fr. May, Jun, Oct.

• On soil rich in humus in valleys or at streamsides; 900–1000 m. Hainan.

The inflorescences are borne laterally along well-developed axes with numerous leaflike bracts or reduced leaves, or alternatively along lateral branches with reduced leaves; various morphological descriptions of these have been used by different authors.

**21. *Hedyotis consanguinea*** Hance, Ann. Sci. Nat., Bot., sér. 4, 18: 221. 1862.

拟金草 ni jin cao

*Hedyotis lancea* Thunberg ex Maximowicz; *Oldenlandia consanguinea* (Hance) Kuntze; *O. lancea* (Thunberg ex Maximowicz) Kuntze.

Herbs or subshrubs, erect, perennial, to 40 cm tall; stems terete, flattened, or weakly 4-angled, smooth to sulcate, glabrous. Leaves subsessile to petiolate, sometimes appearing verticillate due to axillary groups of reduced leaves on unexpanded lateral stems; petiole to 6 mm, glabrous; blade drying stiffly papery to leathery, lanceolate, ovate, elliptic, lanceolate-elliptic, or elliptic-oblong, 1.5–12 × 0.4–4 cm, glabrous, base acute to obtuse and usually decurrent, margins plane to thinly revolute, apex acute to usually acuminate; secondary veins 2–4 pairs but mostly indistinct; stipules fused around stem, ovate to broadly triangular, 2–5.5 mm, glabrous, marginally glandular-serrulate, acute to acuminate or shortly aristate. Inflorescences terminal and in axils of uppermost leaves, compound-cymose, paniculate, 3–15 cm, many flowered, glabrous, pedunculate; peduncle 1–7 cm; axes strictly dichotomous then often spiciform (due to development of only 1 lateral axis, leaving 1 or 2 flowers at node), or sometimes scorpioid (due to development of alternating axes); bracts triangular to elliptic, 0.8–5 mm or those subtending principal axes sometimes leaflike; pedicels to 1 mm. Flowers sessile to shortly pedicellate, apparently distylous. Calyx glabrous; hypanthium portion obconic, 0.8–1 mm; limb deeply lobed; lobes lanceolate to triangular, 0.8–1.2 mm. Corolla white, salverform, outside glabrous; tube 1.5–2.5 mm, inside sparsely villosulous; lobes lanceolate, 1.5–2.5 mm. An-

thers included or exserted, ca. 0.8 mm. Stigma apparently included or exserted, ca. 0.3 mm. Fruit capsular, ellipsoid, ca. 2 × 2 mm, glabrous, woody, flattened to rounded on top, septically then loculicidally dehiscent; seeds numerous, blackish brown, angled. Fl. and fr. Jun–Nov.

• Grasslands, ditch sides; 400–1000 m. Fujian, Guangdong, Hainan, Zhejiang.

In the description here a distinction is made between the inflorescence axes and the pedicels; measurements in other descriptions sometimes include inflorescence axes that bear only a developed flower together with an undeveloped bud on an apparently indeterminate segment as pedicels and, thus, are correspondingly longer.

**22. *Hedyotis corymbosa*** (Linnaeus) Lamarck, Tabl. Encycl. 1: 272. 1792.

伞房花耳草 san fang hua er cao

Slender herbs, annual, to 40 cm tall; stems 4-angled to flattened, 2-sulcate, with sides glabrous and angles thickened to winged and puberulent and/or scaberulous (var. *corymbosa*) or terete to flattened and sparsely to densely scaberulous to puberulent throughout (var. *tereticaulis*). Leaves sessile; blade drying membranous, linear, narrowly lanceolate, or narrowly elliptic, 0.8–2 × 0.1–0.5 cm, adaxially sparsely scaberulous to glabrescent, abaxially glabrescent, base cuneate to acute, margins usually at least shortly revolute at least when dry, apex acute; secondary veins not visible; stipules fused to petiole bases, tubular, 1–2 mm, puberulent to glabrous, rounded to triangular, with 1–5 (or 7) linear lobes or bristles 0.2–2.5 mm, these sometimes bifid. Inflorescence axillary, 1-flowered or usually cymose and 2–5-flowered, glabrous, pedunculate; peduncles 1 (or 2) per axil, filiform, 1–16 mm; bracts lacking or stipuliform and 1–1.2 mm; pedicels slender, 2–12 mm. Flowers homostylous, pedicellate. Calyx glabrous to puberulent; hypanthium portion subglobose to narrowly ellipsoid, 0.5–0.8 mm; limb lobed essentially to base; lobes narrowly triangular, 0.5–1.2 mm, entire to ciliate. Corolla white or pink, funnelliform to rotate; tube 0.8–1 mm, inside pubescent or glabrous; lobes spatulate-oblong to narrowly triangular, 0.5–0.8 mm. Anthers included, ca. 0.6 mm. Stigma 0.3–0.5 mm, included. Fruit capsular, subglobose, ovoid, or oblate, 1.2–2 × 1.2–2.2 mm, somewhat dicoccous, membranous, glabrous to puberulent, loculicidally dehiscent through flat to broadly rounded apex, beak when present to 0.5 mm, peduncles and pedicels usually elongating rapidly and markedly as fruit develop; seeds 20 or more, dark brown, angled, smooth. Fl. and fr. almost year-round.

Paddy fields, ridges of farmlands, humid grasslands; sea level to 900 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Zhejiang [Africa and tropical Asia; widely adventive in the Americas and the Pacific region].

These plants are low annual weeds found in highly disturbed habitats and show wide morphological variation between sites and usually among plants in one site in plant size, leaf width, number of peduncles per axil, and number of flowers per peduncle. The taxonomy of this and related species is complicated, and different authors have drawn very different conclusions (e.g., Sivarajan & Biju, Taxon 39: 665–674. 1990; Dutta & Deb, Taxon. Rev. *Hedyotis*. 2004). In particular, *Hedyotis brachypoda*, *H. diffusa*, and *H. erecta* are related and have been variously circumscribed. Here, these species are circumscribed generally

though not completely following Sivarajan and Biju (loc. cit.) and W. C. Ko (in FRPS 71(1): 72, 75. 1999). However, W. C. Ko described the hypanthium of *H. corymbosa* as 1–1.2 mm in diam., which corresponds to *H. diffusa* in most recent classifications rather than *H. corymbosa*. The varieties recognized by W. C. Ko are presented here for reference.

- 1a. Stems quadrangular, glabrous to pubescent and/or scaberulous along angles ..... 22a. var. *corymbosa*
- 1b. Stems terete to flattened, farinose puberulent throughout ..... 22b. var. *tereticaulis*

**22a. *Hedyotis corymbosa* var. *corymbosa***

伞房花耳草(原变种) san fang hua er cao (yuan bian zhong)

*Oldenlandia corymbosa* Linnaeus, Sp. Pl. 1: 119. 1753;  
*Pharaceum incanum* Loureiro.

Stems quadrangular, glabrous to pubescent and/or scaberulous along angles. Fl. and fr. almost year-round.

Paddy fields, ridges of farmlands, humid grasslands. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Zhejiang [Africa, America, tropical Asia].

**22b. *Hedyotis corymbosa* var. *tereticaulis*** W. C. Ko, Fl. Hainan. 3: 580. 1974.

圆茎耳草 yuan jing er cao

*Hedyotis burmanniana* Wight & Arnott (1834), not Schultes (1827); *H. pseudocorymbosa* Bakhuijzen f.; *Oldenlandia pseudocorymbosa* (Bakhuijzen f.) Raizada.

Stems terete to flattened, farinose puberulent throughout. Fl. and fr. almost year-round.

• Ridges of farmlands, humid open fields. S and SW China.

This variety may correspond to *Hedyotis diffusa* as circumscribed by Sivarajan and Biju (loc. cit.) and to *H. pseudocorymbosa* as circumscribed by some other authors (e.g., Bakhuijzen f., Fl. Java 2: 286. 1965; Dutta & Deb, loc. cit.).

**23. *Hedyotis cryptantha*** Dunn, Bull. Misc. Inform. Kew 1912: 367. 1912.

闭花耳草 bi hua er cao

*Oldenlandia cryptantha* (Dunn) Chun.

Herbs, perennial, procumbent, to 50 cm tall; stems 4-angled, sulcate, glabrous to puberulent, sometimes with wings to 4 mm wide. Leaves sessile to petiolate, sometimes clustered near top of stem; petiole to 15 mm; blade with midrib often purple, drying papery, elliptic, oblanceolate, or obovate, 15–30 × 5–10 cm, glabrous (but sometimes when dry appearing puberulent due to collapsed large epidermal cells), base acute to attenuate and long decurrent, apex acute to long acuminate; secondary veins 5–7 pairs, sometimes with well-developed intersecondary veins; stipules interpetiolar, narrowly triangular, 8–30 mm, glabrous, laciniate or with 5 to numerous setiform segments or lobes 1–20 mm, these sometimes apparently glandular at apex. Inflorescences axillary at nodes well below stem apex, capitate, subcapitate, or congested-cymose, 1.5–2.5 cm in

diam., several to many flowered, glabrous, sessile; bracts linear-lanceolate, 5–8 mm, acute to erose or shortly lacinate. Flowers sessile or subsessile, biology unknown. Calyx glabrous; hypanthium portion subglobose, ca. 2 mm; limb lobed essentially to base; lobes linear-lanceolate, 6–8 mm. Corolla white to pale purple, salverform or tubular, outside apparently glabrous; tube 14–16 mm, inside tomentulose from above middle to throat; lobes narrowly ovate, ca. 3 mm. Anthers included, 1–1.2 mm. Fruit indehiscent, obovoid, laterally somewhat flattened, ca. 3 × 2 mm, glabrous, with calyx lobes to 10 mm; seeds angled, black, foveolate. Fl. Sep–Nov, fr. Oct–Jan.

• Forests in humid shady valleys, rock crevices at streamsides; 300–1000 m. Hainan (Lingshui).

**24. *Hedyotis dianxiensis*** W. C. Ko, J. S. China Agric. Univ. 16(4): 44. 1995. -

滇西耳草 *dian xi er cao*

Herb, climbing to scandent; stems flattened to subterete, often angled and/or sulcate, densely villous and usually also tomentose. Leaves petiolate; petiole 1–2.5 mm, densely villous or tomentose; blade drying papery, lanceolate, lanceolate-elliptic, or narrowly ovate, 2–9 × 0.6–3 cm, adaxially moderately to densely hispidulous with pubescence denser on principal veins, abaxially densely pilosulous to hirtellous throughout, base cuneate to rounded, apex acute to long acuminate; secondary veins 3–5 pairs; stipules interpetiolar, broadly rounded to truncate, 1–3.5 mm, densely villosulous or pilosulous, with 3–9 bristles or linear lobes 1–6 mm. Inflorescences terminal and in axils of uppermost leaves, capitate, subcapitate, or glomerulate, densely pilosulous or hirtellous, sessile or pedunculate; peduncle 2–12 mm; heads 1–10, solitary or borne separately along peduncles or axes, each subglobose, 1–2 cm in diam., 15–30-flowered; bracts reduced. Flowers sessile or subsessile, distylous. Calyx with hypanthium portion turbinate to subglobose, ca. 1 mm, densely hispid; limb deeply lobed; lobes spatulate-oblong, triangular, or lanceolate, 1.2–2 mm, hispidulous to glabrescent. Corolla yellowish green, funnelform, outside glabrous to pilosulous, inside densely bearded in throat and onto lobes; tube ca. 2 mm; lobes spatulate-oblong to triangular, ca. 4 mm. Anthers 0.8–1.2 mm, exserted or included. Stigma 0.5–0.8 mm, exserted or included. Fruit capsular, subglobose to obovoid, 3.5–4 mm, pilosulous or hirtellous, cartilaginous, septicidally then later loculicidally dehiscent, with conical beak ca. 1 mm; seeds several, angled. Fl. Feb–May, fr. Jun.

• Humid thickets at streamsides; 600–800 m. Yunnan (Xishuangbanna).

Although all specimens seen of this species are pubescent, which agrees with the descriptions available, it is keyed out here also with glabrescent stems in case glabrous individuals are eventually found, as in most pubescent Rubiaceae species.

**25. *Hedyotis diffusa*** Willdenow, Sp. Pl. 1: 566. 1798.

白花蛇耳草 *bai hua she er cao*

*Hedyotis herbacea* Loureiro (1790), not Linnaeus (1753); *Oldenlandia diffusa* (Willdenow) Roxburgh; *O. herbacea* (Linnaeus) Roxburgh var. *uniflora* Benth.

Slender herbs, annual, ascending to procumbent, to 50 cm

tall; stems slightly flattened to terete or young stems sometimes 4-angled, sparsely to densely puberulent, scaberulous, or glabrescent to glabrous, similarly glabrous or pubescent on angles and to sides. Leaves sessile or subsessile; blade drying membranous, linear, narrowly elliptic, or narrowly oblanceolate, 1–4 × 0.1–0.4 cm, adaxially glabrous and smooth or often scaberulous near margins, abaxially glabrous to scaberulous, base acute, margins usually revolute at least when dry, apex acute; secondary veins not visible; stipules fused to petiole bases, triangular to truncate, 0.5–1.5 mm, glabrescent, acute to aristate or with 1–3 bristles 0.2–1 mm. Inflorescences axillary, 1-flowered or fasciculate and 2-flowered, glabrous, pedunculate; peduncles or pedicels 4–20 mm; bracts none or stipuliform, to 1 mm. Flowers pedicellate, apparently homostylous. Calyx glabrous; hypanthium portion subglobose, 1–1.2 mm; limb lobed essentially to base; lobes narrowly triangular, 1–2 mm, ciliate. Corolla white, tubular, outside glabrous; tube 1.5–2.5 mm, glabrous inside; lobes ovate-oblong, 1.2–2 mm. Anthers ca. 0.8 mm, exserted. Stigma ca. 1.2 mm, exserted. Fruit capsular, compressed globose to oblate, 2–3 × 2–3 mm, sometimes somewhat dicocous, membranous, glabrous, loculicidally dehiscent on flat to beaked top, beak rounded, to 0.5 mm, with peduncles elongating rapidly and markedly as fruit mature, to 20 mm; seeds ca. 20, dark brown, angled, deeply thickly foveolate. Fl. and fr. May–Oct.

Paddy fields, ridges of farmlands, humid open fields; sea level to 900 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, Indonesia, Japan, Malaysia, Nepal, Philippines, Sri Lanka, Thailand].

This species is very commonly collected in China. The taxonomy of this and related species is complicated, and different authors have drawn very different conclusions (e.g., Sivarajan & Biju, Taxon 39: 665–674. 1990; Dutta & Deb, Taxon. Rev. *Hedyotis*. 2004). In particular, *Hedyotis brachypoda*, *H. corymbosa*, and *H. erecta* are related and have been variously circumscribed. Here, these species are circumscribed generally, though not completely, following W. C. Ko (in FRPS 71(1): 72, 75. 1999) and Dutta and Deb.

**26. *Hedyotis effusa*** Hance, J. Bot. 17: 11. 1879.

鼎湖耳草 *ding hu er cao*

*Oldenlandia effusa* (Hance) Kuntze.

Herbs or subshrubs, perennial, erect, to 1 m or taller; stems rounded, flattened, or 4-angled, glabrous. Leaves subsessile to petiolate; petiole to 5 mm, glabrous; blade drying papery or leathery, ovate, ovate-lanceolate, or lanceolate-elliptic, 4–13 × 1.5–6.5 cm, glabrous, base cuneate to rounded, apex acute; secondary veins indistinct; stipules united around stem, broadly triangular or truncate, 1–3 mm, glabrous, entire, sometimes partially costate, acute to mucronate. Inflorescences terminal, compound-cymose to paniculate, 5–15 × 4–10 cm, glabrous, several to many flowered, pedunculate; peduncles 2–7 cm; axes regularly dichotomous, spreading at 90° or more; bracts triangular to linear, 0.5–5 mm; pedicels 2–5 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion ovoid, 0.7–1 mm; limb 0.5–0.8 mm, lobed for 1/2–2/3, lobes triangular. Corolla white, funnelform to tubular, outside glabrous; tube ca. 1.5 mm, apparently barbate in throat; lobes narrowly triangular, ca. 1.5 mm. Anthers and stigmas not seen. Fruit capsular, subglobose, 1.5–

2.5 mm, glabrous, stiffly papery to cartilaginous, septicidally then loculicidally dehiscent; seeds several, angled. Fl. Jul–Sep, fr. Aug–Mar.

• Forests or streamsides in valleys, sometimes on humid hill slopes; 200–400 m. Guangdong, Guangxi.

**27. *Hedyotis exserta* Merrill, Lingnan Sci. J. 13: 72. 1934.**

长花轴耳草 chang hua zhou er cao

Herbs or subshrubs, erect, perennial, to 70 cm; stems terete to flattened, smooth or sulcate, glabrous. Leaves petiolate; petiole 2–5 mm, puberulent; blade drying papery, lanceolate, narrowly elliptic, or narrowly lanceolate, 5.5–11 × 0.8–3 cm, adaxially glabrous or papillose at least near margins, abaxially glabrous, base cuneate to acute, apex acute to long acuminate; secondary veins 4–6 pairs but indistinct; stipules fused to petiole bases, triangular to broadly triangular, 3–8 mm, glabrous or papillose-puberulent, smooth or costate, entire or serrulate, acute to caudate-acuminate. Inflorescences terminal and in uppermost leaf axils, congested-cymose, fastigiate to subglobose, 2–3 cm, densely puberulent, several to many flowered, pedunculate; peduncle 5.5–9 cm; bracts triangular, oblong-ovate, or narrowly elliptic, 0.8–6 mm; pedicels 1–2 mm. Flowers pedicellate. Calyx densely papillose or farinose puberulent; hypanthium portion turbinate, 1–1.5 mm; limb deeply lobed; lobes oblong-ovate to triangular, 1–1.8 mm. Corolla purple or pink, salverform, outside farinose puberulent; tube 7–10 mm, inside pilose; lobes oblong-ovate, 1.2–2 mm. Anthers positioned in throat. Stigmas included, positioned near middle of corolla tube, ca. 2 mm. Fruit capsular, subglobose to ellipsoid and somewhat laterally flattened, 2–2.5 mm in diam., puberulent, flat on top, dehiscent; seeds several, blackish brown, angled. Fl. May–Sep.

Slopes or thickets in valleys. Hainan [Vietnam].

**28. *Hedyotis hainanensis* (Chun) W. C. Ko, Fl. Hainan. 3: 580. 1974.**

海南耳草 hai nan er cao

*Oldenlandia hainanensis* Chun, Sunyatsenia 1: 311. 1934, based on *Hedyotis oligantha* Merrill, Philipp. J. Sci. 23: 266. 1923, not Merrill (1921).

Shrubs, erect, to 30 cm tall; stems terete, densely puberulent to pilosulous. Leaves subsessile to petiolate; petiole to 2 mm, densely puberulent to pilosulous; blade drying papery, subelliptic, broadly elliptic, or ovate, 1–2.5 × 0.8–1.5 cm, adaxially glabrous, abaxially densely puberulent at least along midrib, base obtuse to cuneate, margins sometimes thinly revolute when dry, apex obtuse, acute, or shortly acuminate; secondary veins ca. 3 pairs but indistinct; stipules fused to petiole bases, triangular or ovate, ca. 0.5 mm, puberulent to pilosulous, with 3 short narrow lobes. Inflorescences terminal and also in axils of uppermost leaves, capitate or 2-flowered, sessile. Flowers sessile. Calyx sparsely puberulent; hypanthium portion ovoid, ca. 2 mm; limb lobed nearly to base; lobes 5, narrowly lanceolate, 3–3.5 mm. Corolla blue or white, funnelform, outside glabrous; tube ca. 8 mm, bearded in throat; lobes 5, oblong-lanceolate, ca. 4 mm. Anthers 5, included, ca. 1.8 mm. Stigmas not seen. Fruit not seen. Fl. May–Jun.

• Dense forests. Hainan (Ding'an).

The protologue did not describe the fruit; these were described by W. C. Ko (in FRPS 71(1): 62. 1999, modified to format here) as “Fruit capsular, globose, laterally flattened, ca. 2 mm in diam., sparsely hispidulous, septicidally dehiscent then loculicidally dehiscent, with persistent calyx lobes” with the same fruiting period as the flowers. However, this description exactly matches the fruit of a group of plants that have been included in *Hedyotis hainanensis* but do not match the type and are provisionally separated here.

**29. *Hedyotis hedyotideia* (Candolle) Merrill, Lingnan Sci. J. 13: 48. 1934.**

牛白藤 niu bai teng

*Spermacoe hedyotideia* Candolle, Prodr. 4: 555. 1830; *Hedyotis esquirolii* H. Léveillé; *H. macrostemon* Hooker & Arnott; *H. nantoensis* Hayata; *H. recurva* Benth; *Oldenlandia esquirolii* (H. Léveillé) Chun; *O. macrostemon* (Hooker & Arnott) Kuntze.

Shrubs or subshrubs, lianescent, clambering, scandent, or climbing, to 5 m; stems flattened to subterete then often later 4-angled, densely papillose to farinose puberulent or velutinous-strigillose. Leaves petiolate; petiole 1–10 mm, densely papillose, puberulent, or strigillose; blade drying membranous to papery, elliptic-oblong, lanceolate, elliptic, or ovate, 4–10 × 1.5–4 cm, adaxially glabrous or densely papillose to puberulent on principal veins, abaxially glabrous or densely papillose to puberulent or occasionally velutinous-strigillose, base cuneate to rounded, apex acute or shortly acuminate; secondary veins 3–5 pairs; stipules fused to petioles, truncate to broadly rounded, 1.8–3 mm, glabrous to densely papillose, puberulent, or velutinous-strigillose, entire to densely ciliate and/or with 3–7 narrowly triangular to linear lobes or bristles 1–7 mm, at least sometimes gland-tipped. Inflorescences terminal and in axils of uppermost leaves, subcapitate, congested-cymose, compound-cymose, or paniculate, 1–16 cm, several flowered, with 1–10 congested to laxly cymose groups of flowers, densely granular-puberulent to tomentulose-velutinous, pedunculate; peduncles 0.5–2.5 cm; flower groups subglobose to hemispherical, 1–1.5 cm in diam. (not including corollas), 1.8–3 cm in diam. (including corollas); bracts triangular, narrowly elliptic, or narrowly lanceolate, 0.2–2 mm; pedicels 0.8–2 mm. Flowers pedicellate, distylous. Calyx densely puberulent; hypanthium portion turbinate, 1–1.2 mm; limb 2–2.5 mm, lobed essentially to base; lobes linear-lanceolate to spatulate, usually reflexed at anthesis. Corolla white to pale yellow, tubular to funnelform, outside glabrous, inside densely bearded in throat and onto lobes; tube 2–3 mm; lobes narrowly lanceolate to narrowly spatulate, 4–4.5 mm. Anthers exserted or long exserted, 1.2–2 mm. Stigmas exserted or long exserted, 0.8–1 mm in long-styled form, ca. 2 mm in short-styled form. Fruit capsular, subglobose, obovoid, or oblong-ellipsoid, 2.5–3 mm, densely puberulent to glabrescent, cartilaginous to very stiffly papery, loculicidally then septicidally dehiscent through apical beak, beak 0.5–1 mm; seeds several, angled. Fl. and fr. Apr–Dec.

Thickets in ravines, hill slopes; 200–1000 m. Fujian, Guangdong, Guangxi, Guizhou, ?Hainan, Taiwan, Yunnan [Cambodia, Thailand, Vietnam].

The flowers appear to be sessile in heads, but closer study shows they are shortly pedicellate. W. C. Ko (in FRPS 71(1): 67. 1999) de-

scribed the leaves as scabrous above, but this has not been seen nor reported by other authors. Ko also described the anthers of the long-styled flowers as included within the corolla, but they are all distinctly exerted on the specimens studied; this character has not been specifically described by other authors.

W. C. Ko (loc. cit.) said that this species was treated as "*Hedyotis fruticosa*" by Kuntze (Obs. 2: 8. 1781), but in fact Kuntze's name was not applied to the same species described by Linnaeus. The name *H. nantoensis* was overlooked by the Fl. Taiwan (ed. 2, 4: 265–273. 1998) but seems to be validly published and clear as to its identity. Fukuoka (S. E. Asia Stud. 8(3): 326. 1970) reported this species from Hainan based on plants here treated as *H. obliquinervis*, which he treated as a variety of *H. hedyotideae*.

**30. *Hedyotis herbacea*** Linnaeus, Sp. Pl. 1: 102. 1753.

丹草 dan cao

*Hedyotis heynei* (G. Don) Beddome; *Oldenlandia herbacea* (Linnaeus) Roxburgh; *O. heynei* G. Don.

Herbs, annual or biennial, generally erect, to 60 cm; stems weakly to sharply 4-angled, glabrous to scaberrulous at least on angles. Leaves sessile or subsessile; blade linear or linear-lanceolate, 1–2.5 × 0.1–0.3 mm, glabrous to scaberrulous, base acute to obtuse, margins weakly to strongly revolute, apex acute; secondary veins not visible; stipules reduced or fused to petiole bases, glabrous to scaberrulous, truncate to broadly triangular, to 0.3 mm, entire or with 1–5 triangular to linear lobes or bristles 0.2–2 mm. Inflorescences axillary, 1-flowered or several flowered and fasciculate to cymose, glabrous, apparently ebracteate, pedunculate; peduncles 1–3 per axil, 1–30 mm; pedicels 1–30 mm. Flowers homostylous or heterostylous, subsessile to pedicellate. Calyx glabrous to puberulent; hypanthium portion subglobose to ovoid, 0.8–1 mm; limb lobed essentially to base; lobes narrowly triangular to linear, 0.5–1.5 mm. Corolla white to reddish or pale purple, funnelform, outside glabrous; tube 2–3 mm, glabrous at throat; lobes spatulate-oblong, 0.5–1 mm. Anthers exerted or included, 0.2–0.4 mm. Stigma ca. 0.8 mm, included or exerted. Fruit capsular, ovoid to subglobose, 2–2.5 × 2–2.5 mm, loculicidally dehiscent through apical beak 1–1.5 mm; seeds several, dark brown, foveolate. Fl. and fr. Jan, Mar–Apr.

On humid rocks. Fujian, Guangdong, Guangxi, Hainan, Jiangxi [widespread in tropical Africa and Asia].

Very few specimens have been seen of this species from China (or anywhere else east of Sri Lanka); the description here, therefore, is based primarily on plants from India. W. C. Ko (FRPS 71(1): 73. 1999) described the hypanthium as 1.8–2 mm, the calyx lobes as 2.5–2.8 mm and fimbriate-serrulate, the corolla lobes as ca. 2 mm, and the anthers as ca. 1.5 mm, but these features do not agree with specimens of *Hedyotis herbacea*; they do apply to the rather similar species *H. brachypoda* and *H. diffusa*.

**31. *Hedyotis hermanniana*** R. M. Dutta, J. Econ. Taxon. Bot. 23: 734. 1999.

赫尔曼耳草 he er man er cao

Herbs, annual or perennial, erect to procumbent, to 15(–20) cm tall; stems subterete to angled or sulcate, glabrous. Leaves subsessile to petiolate; petiole to 2 mm; blade drying papery, ovate, lanceolate, or elliptic, 1–2.5(–5) × 0.5–1.5 cm,

adaxially sparsely or moderately hispidulous to glabrescent, abaxially glabrous, base acute to obtuse, margins scaberrulous, apex obtuse to acute; secondary veins 2 or 3 pairs but mostly indistinct; stipules fused to petiole bases, broadly triangular, 0.5–1.5 mm, hirtellous or puberulent to glabrescent, rounded to truncate, sometimes apiculate or with 2 or 3 bristles to 1 mm. Inflorescences terminal and in axils of uppermost leaves, fasciculate to loosely dichasial, few flowered, glabrous; peduncles and/or pedicels 2–15 cm; bracts reduced or triangular to setiform, to 1 mm. Flowers pedicellate or pedunculate, floral biology unknown. Calyx glabrous; hypanthium obconic, ca. 1 mm; limb lobed nearly to base; lobes ovate, ca. 1.2 mm, sometimes with evident venation, ciliolate. Corolla white sometimes tinged with pink, salverform, outside glabrous; tube ca. 1.5 mm, inside glabrous; lobes ovate, ca. 0.5 mm. Anthers and stigmas not seen. Fruit capsular, oblate-cupuliform, 2.5–3 × 3.5–4 mm, glabrous, smooth, loculicidally dehiscent across top then sometimes septicidal, with beak to 1 mm, with calyx lobes becoming elliptic to ovate, to 2 mm; seeds numerous, subglobose.

Mountains; ca. 1600 m. Yunnan [India, Sri Lanka].

The description here is based on Chinese material. Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) described the corolla of *Hedyotis hermanniana* in India as having tubes 3–4 mm and lobes 1.5–2 mm, although their figure shows a corolla with a tube slightly over 1 mm and the lobes ca. 2 mm.

**32. *Hedyotis koana*** R. J. Wang, Acta Phytotax. Sin. 45: 696. 2007.

蕴璋耳草 yun zhang er cao

Herbs, erect, to 40 cm tall; stems 4-angled to terete, glabrous. Leaves sessile; blade drying subleathery, linear, 1.4–4 × 0.1–0.15 cm, glabrous, base cuneate, margins revolute, apex acute; secondary veins not visible; stipules fused to petiole bases, triangular, 1–1.8 mm, glabrescent, with 1–3 bristles 0.5–1 mm. Inflorescences terminal and sometimes in uppermost leaf axils, cymose, 2–12-flowered, glabrous, pedunculate; axes ascending; bracts narrowly lanceolate, 1–5 mm, acute to aristate; pedicels 3–20 mm. Flowers pedicellate, biology unknown. Calyx glabrous; hypanthium ovoid to subglobose, 1–1.5 mm; limb deeply lobed; lobes triangular to lanceolate, 1–1.7 mm, acute to acuminate. Corolla white, tubular, glabrous outside; tube 1.5–2.5 mm, glabrous inside; lobes elliptic-oblong to lanceolate, 0.9–1.2 mm. Fruit capsular, subglobose to ovoid, 1.2–2 × 2–3 mm, glabrous, stiffly papery, loculicidally dehiscent from top; seeds several, angled. Fl. and fr. Jun–Sep.

• Weedy open areas; sea level to 200 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi.

**33. *Hedyotis lianshanensis*** W. C. Ko, J. S. China Agric. Univ. 16(4): 41. 1995.

连山耳草 lian shan er cao

Subshrubs, erect, to 80 cm tall; stems hollow, 4-angled to terete, smooth or sulcate, glabrous or usually sparsely hispidulous to puberulent just below stipules when young. Leaves subsessile to petiolate; petiole 3–5 mm, glabrous; blade drying papery, narrowly elliptic-oblong, narrowly elliptic, lanceolate, or ovate, 6–12 × 1.5–4 cm, glabrous or rarely scaberrulous adax-

ially along midrib, base cuneate to acute and usually decurrent, apex acute to long acuminate; secondary veins 4 or 5 pairs; stipules fused to petiole bases, obovate, elliptic, or triangular, 3–6 mm, glabrous or puberulent when young, lacerate or with 7 to numerous narrow lobes or bristles 0.5–7 mm, these often glandular at apex. Inflorescence axillary, glomerulate, subglobose, 5–15 mm in diam., glabrous, sessile; bracts narrowly triangular to linear, 1–2 mm. Flowers sessile to subsessile, biology unknown. Calyx glabrous to puberulent; hypanthium portion cupulate to subglobose, 1–1.2 mm; limb lobed essentially to base; lobes lanceolate, narrowly triangular, narrowly ligulate, or linear, 1.5–3 mm, ciliolate. Corolla funnelform, outside glabrous; tube 1.8–2 mm, glabrous inside; lobes lanceolate to triangular, 1–2.5 mm. Anthers partially exerted. Stigmas exerted. Fruit indehiscent, ellipsoid to subglobose, 1.2–2 mm, glabrescent, with pedicels to 2 mm; seeds numerous, angled. Fl. Feb–Jul, fr. Jul–Dec.

- Sparse forests in valleys; 200–700 m. Guangdong (Liangshan).

The protologue described the flowers as shortly pedicellate, but on the specimens studied they are sessile at anthesis with the pedicels or stipes elongating as the fruit develop. W. C. Ko (in FRPS 71(1): 41. 1999) described the fruit as sometimes dehiscent across the top, but the protologue described them as indehiscent, which agrees with the specimens studied.

**34. *Hedyotis lineata* Roxburgh, Fl. Ind. 1: 369. 1820.**

东亚耳草 dong ya er cao

*Exallage ulmifolia* (Wallich) Bremekamp; *Hedyotis ulmifolia* Wallich; *Oldenlandia lineata* (Roxburgh) Kuntze.

Herbs or subshrubs, annual or perennial, clambering or perhaps erect, to 35 cm tall; stems 4-angled, flattened, or subterete, sometimes sulcate, densely villous, hirsute, or pilose with trichomes drying yellowed. Leaves sessile or petiolate; petiole to 3 mm, hirsute or villous; blade drying papery, ovate-lanceolate, elliptic-lanceolate, or elliptic, (0.5–)1.5–3.5(–4) × 1.2–4.5 cm, adaxially sparsely to moderately strigillose to strigose on blade and densely pilosulous on principal veins, abaxially glabrescent on blade and moderately to densely strigose to pilose on principal veins, base obtuse to rounded, apex acute to shortly acuminate; secondary veins 3 or 4 pairs; stipules interpetiolar or fused to petiole bases, broadly triangular to subtruncate, 2–4 mm, densely villous to pilose, with 3 or 5 linear lobes or bristles 2–7 mm. Inflorescences axillary, congested-cymose to fasciculate or subglomerulate, subglobose, 5–15 mm in diam., several flowered, subsessile to pedunculate; peduncles several in each axil, 0.5–4 mm; bracts linear, 1–2 mm; pedicels to 2 mm. Flowers subsessile to pedicellate, biology unknown. Calyx hirtellous; hypanthium portion subcupulate to obconic, ca. 0.8 mm; limb deeply (but not completely) lobed; lobes triangular, 1–1.2 mm. Corolla white, salverform to rotate, outside glabrous except lobes pilose at tip; tube 1–1.5 mm, pubescent in throat; lobes triangular, 1–1.5 mm. Anthers 0.5–0.8 mm, exerted. Stigma 0.3–0.5 mm. Fruit indehiscent, subglobose to turbinate, 1–1.2 × 1.5–2 mm, hirtellous; seeds 36–40, 0.8–1 mm. Fl. Jun, perhaps Nov, fr. Nov.

Broad-leaved forests at high elevations; [100–1100 m in India, Yunnan (Menghai) [Bangladesh, India, Myanmar, Nepal].

The names *Hedyotis ulmifolia* and *H. lineata* appear to have been published simultaneously; the basis for choosing the name *H. lineata* is not explained in the references consulted but seems to be consistent usage (e.g., Fl. Bhutan 2(2): 761. 1999; Dutta & Deb, Taxon. Rev. *Hedyotis*. 2004).

We have seen no corollas, anthers, or stigmas from China; the description of these parts here is from Dutta and Deb (loc. cit.). W. C. Ko (in FRPS 71(1): 34. 1999) described the corolla tube as 3 × as long as the lobes, which does not agree with the information given by any other authors for this species. Also the elevational range of “at high elevations” given for this species by Ko contrasts markedly with information on the specimens seen and the low to middle elevations noted by other authors.

**35. *Hedyotis loganioides* Benth, Fl. Hongk. 149. 1861.**

粤港耳草 yue gang er cao

*Oldenlandia loganioides* (Benth) Kuntze.

Herbs, erect, perennial, to 30 cm tall; stems terete, weakly angled, or weakly flattened, glabrous. Leaves subsessile to petiolate; petiole 0.5–4 mm, glabrous to puberulent; blade drying papery, elliptic-oblong, lanceolate, or elliptic, 1.5–6 × 1–3.5 cm, glabrous, base acute to cuneate, apex acute to shortly acuminate; secondary veins 3–5 pairs but hardly visible; stipules apparently interpetiolar, ovate-triangular to lanceolate, 2–2.5 mm, puberulent to glabrous, entire to shortly ciliolate, obtuse to rounded. Inflorescences axillary, cymose, 0.8–2 cm, sometimes trichotomous and compact, 10–20-flowered, glabrous; peduncles 2–10(–20) mm; bracts triangular to narrowly triangular, 0.5–3.5 mm; pedicels 1–2 mm. Flowers pedicellate, floral biology unknown. Calyx glabrous; hypanthium portion subglobose to flattened-ovoid, ca. 1 mm; limb lobed nearly to base; lobes linear to narrowly triangular, 1.5–2.2 mm. Corolla outside glabrous. Fruit capsular, ellipsoid to subglobose, ca. 2 × 2–2.3 mm, glabrous, cartilaginous to stiffly papery, smooth, apparently septicidal then loculicidal, beak broadly triangular to conical, up to 0.5 mm; seeds few. Fr. Dec.

- Guangdong.

**36. *Hedyotis longiexserta* Merrill & F. P. Metcalf, J. Arnold Arbor. 23: 229. 1942.**

上思耳草 shang si er cao

Herbs or subshrubs, erect, to 50 cm tall; stems terete, glabrous, smooth. Leaves petiolate; petiole 3–5 mm, glabrous; blade lanceolate or oblong-lanceolate, 5–7 × 1–1.5 cm, base cuneate or obtuse, apex acuminate or acute; secondary veins ca. 3 pairs but very indistinct; stipules fused to petiole bases, broadly ovate, ca. 3 mm, abruptly narrowed apically to acute, marginally weakly glandular-serrulate. Inflorescences terminal, compound-cymose, 7–12 cm, several to many flowered; secondary axes few, racemiform, 3–4 cm, higher order axes shorter, becoming scorpioid; bracts linear-lanceolate or linear, 0.8–1.2 cm. Flowers pedicellate and/or sessile. Calyx glabrous; hypanthium portion ovoid, 1–1.2 mm; lobes triangular-ovate, ca. 0.5 mm. Corolla white, outside glabrous; tube ca. 1.5 mm, inside densely bearded; lobes broadly ovate, rounded. Fruit capsular, oblong-ellipsoid, 2–2.5 × ca. 1.5 mm, septicidally then loculicidally dehiscent; seeds several, black. Fl. Jun–Jul.

- Dry open fields, mountain slopes. Guangxi (Shangsi).

**37. *Hedyotis longipetala* Merrill, J. Arnold Arbor. 8: 18. 1927.**

长瓣耳草 *chang ban er cao*

*Oldenlandia longipetala* (Merrill) Chun.

Subshrubs, erect, to 40 cm tall; stems glabrous, terete to 4-angled with angles obtuse to acute or ridged. Leaves sessile to petiolate; petiole to 8 mm, glabrous; blade drying stiffly leathery, narrowly lanceolate, narrowly elliptic, or linear-lanceolate, 3–8 × 0.4–1.2 cm, glabrous and shiny, base cuneate to usually acute and decurrent, margins revolute at least when dry, apex long acuminate; secondary veins indistinct; stipules interpetiolar, triangular, ovate, or oblong-ovate, 3–5 mm, glabrous, shiny and hardened, acute to acuminate. Inflorescence terminal and sometimes in uppermost leaf axils, congested-cymose to subcapitate, flattened-globose, 1.5–2 cm in diam., glabrous, several to many flowered, sessile, subtended by 2 pairs of leaves or leaflike bracts with inner (i.e., distal) pair ca. 1/2 as large as outer (i.e., proximal), or axillary cymes few flowered and without leaflike bracts; floral bracts elliptic to triangular, 2–6 mm; pedicels to 2 mm. Flowers sessile to shortly pedicellate. Calyx glabrous, shiny; hypanthium portion obconic, ca. 1 mm; limb lobed for ca. 1/2; lobes triangular, lanceolate, or spatulate, 2–4 mm. Corolla white, tubular; tube ca. 3.5 mm, pilosulous in throat; lobes lanceolate, ca. 11 mm. Anthers ca. 2 mm. Fruit capsular, ovoid or ellipsoid, 3–4 mm in diam., glabrous, cartilaginous to hard, septicidal then tardily loculicidal; seeds several. Fl. Apr–Jun, fr. Jul–Sep.

- Broad-leaved forests on mountaintops, grasslands at roadsides; ca. 800 m. Fujian, Guangdong.

The dry plants have a yellowish-brownish cast and a distinctive shiny, hardened surface on all parts.

**38. *Hedyotis matthewii* Dunn, J. Bot. 47: 376. 1909.**

疏花耳草 *shu hua er cao*

*Hedyotis acuminatissima* Merrill; *Oldenlandia matthewii* (Dunn) Chun.

Herbs or subshrubs, erect, perennial, branched, to 75 cm tall; stems terete to 4-angled, glabrous. Leaves subsessile to petiolate; petiole to 8 mm, glabrous; blade drying papery to subleathery, narrowly elliptic, elliptic, or lanceolate, 3.5–12 × 0.8–3 cm, glabrous, base acute to obtuse, apex acute to long acuminate; secondary veins ca. 3 pairs but indistinct; stipules fused to petiole bases, broadly triangular to ovate-triangular, 2–4.5 mm, glabrous, sometimes costate, marginally entire to glandular-serrulate, acute to acuminate and sometimes thickened at apex. Inflorescences terminal and usually also in axils of uppermost leaves, cymose, paniculate, or racemiform, 6–12 × 1.5–7 cm, glabrous, several to many flowered, sessile and apparently tripartite or pedunculate; peduncles 1–4 cm; axes mostly dichotomous; bracts linear-lanceolate, 1–7 mm; pedicels 0.5–4 mm. Flowers subsessile to pedicellate, distylous. Calyx glabrous; hypanthium turbinate or obovoid, 1–1.5 mm; limb 1.5–2.2 mm, lobed for 1/2 to deeply lobed; lobes lanceolate to triangular. Corolla white or purplish, funnelform, outside gla-

brous; tube 3.5–4 mm, inside pubescent in throat; lobes triangular, 2–3 mm, inside puberulent. Anthers included or exserted, 0.8–1 mm. Stigmas included or exserted, 0.5–1 mm. Fruit capsular, ellipsoid, 2–2.5 mm, crustaceous to cartilaginous, smooth, glabrous, septicidally then loculicidally dehiscent; seeds numerous, black, angled. Fl. Mar–Nov, fr. May–Jul.

- Dense forests or thickets on mountains; 100–300 m. Guangdong.

The circumscription here of this species and in particular its separation from *Hedyotis mellii* differs somewhat from that of some previous authors but provides a more consistent separation of it from *H. mellii* and *H. cantoniensis*.

**39. *Hedyotis mellii* Tutcher, Rep. Bot. Dept. Hong Kong 1914: 32. 1915.**

粗毛耳草 *cu mao er cao*

*Hedyotis speciosa* Handel-Mazzetti; *H. wulsinii* Merrill; *Oldenlandia mellii* (Tutcher) Chun.

Herbs, erect, perennial, to 90 cm tall; stems subterete to 4-angled, densely to sparsely hirtellous or pilosulous to sometimes glabrescent. Leaves sessile; blade drying papery, ovate-lanceolate, elliptic, lanceolate, or narrowly elliptic, 3.5–9.5 × 0.5–3.5 cm, adaxially sparsely to densely puberulent or hispidulous or often glabrous on lamina, abaxially sparsely to densely hirtellous, pilosulous, or hispidulous to glabrous; secondary veins 3 or 4 pairs; stipules fused to petiole bases, triangular to broadly triangular, 1–3 mm, densely puberulent, hirtellous, or hispidulous to glabrescent, marginally entire to glandular-serrate, acuminate or with 3–5 narrowly triangular to linear lobes or bristles 0.2–2 mm. Inflorescences terminal and usually also in axils of uppermost leaves, cymose to compound-cymose, paniculate to often racemiform, 3–25 cm, several to many flowered, densely to sparsely pilosulous, puberulent, or hispidulous to glabrous; peduncle 0.5–7 cm; bracts narrowly elliptic to narrowly lanceolate, 1–5 mm; pedicels 1–5 mm. Flowers pedicellate, apparently monomorphic. Calyx glabrous or sparsely to densely hirtellous to pilosulous; hypanthium portion cupulate to obconic or elliptic, ca. 1 mm; limb 1–1.5 mm, lobed for 2/3–4/5; lobes ovate-lanceolate to narrowly triangular. Corolla presumably white, funnelform, outside glabrous to densely hirtellous or pilosulous, inside densely villosulous or tomentulose in throat and onto lobes; tube 2–2.5 mm; lobes lanceolate to spatulate, 4–4.5 mm, acute. Anthers shortly exserted, ca. 1.2 mm. Stigma long exserted, ca. 0.2 mm. Fruit capsular, ellipsoid to subglobose, 2–3 mm, sparsely to densely hirtellous, pilosulous, or glabrous, crustaceous to thickly papery or cartilaginous, septicidally then loculicidally dehiscent; seeds several, black, angled. Fl. Jun–Nov, fr. Aug–Nov.

- Jungles or thickets on mountains or mountain slopes; 400–1100 m. Fujian, Guangdong, Guangxi, Hunan, Jiangxi.

This species is very similar to *Hedyotis cantoniensis*, *H. matthewii*, and *H. tenuipes*, and these are here separated somewhat differently from the circumscriptions of FRPS (71(1): 48, 51, 52, 54. 1999). *Hedyotis matthewii* may be only a glabrous form of *H. mellii*, although they do appear to be distinct.

**40. *Hedyotis merguensis*** Bentham & J. D. Hooker, Gen. Pl. 2: 57. 1873.

合叶耳草 he ye er cao

*Hedyotis connata* J. D. Hooker, nom. illeg. superfl.; *H. coronaria* (Kurz) Craib; *H. coronata* Wallich ex J. D. Hooker & B. D. Jackson, nom. illeg. superfl.; *Oldenlandia connata* K. Schumann, nom. illeg. superfl.; *O. coronata* F. N. Williams, nom. illeg. superfl.; *Scleromitron coronarium* Kurz.

Herbs, perennial or perhaps annual, procumbent; stems to 30 cm, weakly 4-angled to terete, sometimes sulcate, densely pilosulous or hispidulous just below nodes grading to glabrous at bases of internodes. Leaves sessile or subsessile; blade drying membranous or thinly papery, oblong-elliptic or oblong-lanceolate, 2.5–10 × 1–3 cm, glabrous except sometimes puberulent along midrib abaxially and/or scaberulous along margins, base obtuse to rounded, apex obtuse to acute; secondary veins 3–5 pairs; stipules fused to petiole bases, triangular to rounded, 3–4.5 mm, puberulent to glabrescent, ciliolate, with 5–7 linear lobes or bristles 2–12 mm. Inflorescences terminal and/or pseudoaxillary on short lateral stems, capitate, 1–1.5 cm in diam., several flowered, sessile, enclosed by stipules and leaf bases, subtended by 2 or usually 4 leaves; bracts not seen. Flowers sessile or subsessile, apparently distylous. Calyx glabrous; hypanthium portion ellipsoid, ca. 2 mm; limb deeply lobed; lobes lanceolate, oblanceolate, or spatulate, 4–5 mm, distinctly veined, ciliolate. Corolla white tinged with pink or lilac, funnel-form, outside glabrous; tube 9–12 mm, pubescent in throat; lobes lanceolate to triangular, ca. 3 mm. Anthers 1–1.5 mm, exerted or included. Stigma 1–1.5 mm, exerted or included. Fruit indehiscent, ellipsoid to obovoid, 2.2–3 mm, papery, glabrous, with calyx lobes to 5.2 mm; seeds numerous, black, angled or ridged. Fl. [Aug–Oct in Thailand].

Bamboo forests, on rocks at streamsides; 600–1000 m. Hainan, Yunnan (Mengla) [India, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

The widely used name *Hedyotis coronaria* was synonymized with *H. merguensis* by Bakhuizen f. (Fl. Java 2: 286. 1965); this synonymy was accepted by Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) but overlooked by some other authors.

**41. *Hedyotis minutopuberula*** Merrill & F. P. Metcalf, J. Arnold Arbor. 23: 229. 1942.

粉毛耳草 fen mao er cao

Herbs or subshrubs, to 50 cm tall; stems terete, puberulent. Leaves petiolate; petiole 4–8 mm, puberulent; blade drying submembranous, ovate or elliptic-oblong, 4.5–5 × 0.7–2.5 cm, adaxially glabrous, abaxially glabrous or farinose pubescent, base cuneate or decurrent, apex acute or weakly acuminate; secondary veins ca. 3 pairs but indistinct; stipules ovate or lanceolate, 2–5 mm, marginally glandular-serrulate, long acuminate. Inflorescences terminal, cymose to paniculate, 1.5–4 × 2–4.5 cm; axes dichotomous to subumbelliform; bracts subulate, ca. 2 mm; pedicels ca. 1 mm. Flowers pedicellate. Calyx puberulent; hypanthium portion obovoid, ca. 1 mm; lobes lanceolate to narrowly triangular, 1.5–2.5 mm. Corolla purple, tubular-salverform, outside glabrous; tube ca. 6 mm, bearded in

throat; lobes obovate to triangular, 1–1.2 mm. Anthers included. Fruit capsular, subglobose or obovate, ca. 2 × 1.5 mm, puberulent or subglabrous, dehiscent; seeds 2–4, black, angled. Fl. Apr–Jun.

• Jungles or thickets at low elevations or on slopes of low hills. Hainan.

**42. *Hedyotis obliquinervis*** Merrill, Lingnan Sci. J. 14: 56. 1935.

偏脉耳草 pian mai er cao

*Hedyotis hedyotide* (Candolle) Merrill var. *obliquinervis* (Merrill) Fukuoka.

Shrubs or subshrubs, climbing to scandent, to 40 cm; stems terete to 4-angled, sometimes sulcate, densely villous and usually also hirtellous or villosulous. Leaves petiolate; petiole 1–5 mm, densely hirtellous or villosulous; blade drying papery, lanceolate, oblong-lanceolate, or lanceolate-elliptic, 3–8 × 0.8–2.5 cm, adaxially sparsely to moderately hispidulous and sometimes villosulous or villous on lamina and densely hispidulous on principal veins, abaxially moderately to densely hispidulous, villosulous, or hirtellous with pubescence denser on principal veins, base cuneate to rounded, apex acute to acuminate; secondary veins 3–5 pairs; stipules fused to petiole bases, densely villous to villosulous, rounded, 1–4 mm, hispidulous, with 3–7 narrowly triangular to linear lobes or bristles 2–7 mm. Inflorescences terminal and sometimes also in axils of uppermost leaves, cymose to corymbiform-rounded, 2.5–9 × 4–16 cm, densely villous, villosulous, or hirtellous or sometimes glabrescent, pedunculate or sessile and tripartite; peduncles 1.5–5 cm; bracts linear-lanceolate to lanceolate, 0.5–4 mm; pedicels 1.5–3 mm. Flowers pedicellate, distylous. Calyx moderately to densely hirtellous or villosulous; hypanthium portion obconical, 1–1.5 mm; limb lobed nearly to base; lobes lanceolate to spatulate, 2–2.5 mm, sometimes reflexed. Corolla white or greenish white, funnel-form, outside subglabrous or hispidulous at least on upper part; tube 1–1.5 mm, bearded in throat; lobes lanceolate to spatulate, 2–2.5 mm. Anthers exerted or included, 0.8–1 mm. Stigmas included or exerted, 0.2–0.5 mm. Fruit capsular, compressed globose, ca. 2 mm in diam., hirtellous or villosulous, cartilaginous, septicidally then loculicidally dehiscent, beak rounded, ca. 0.6 mm high; seeds several, blackish brown, angled. Fl. Dec–Aug, young fr. Jun–Jul.

Broad-leaved forests, thickets on hills; 100–400 m. Hainan [S Vietnam].

This species is very similar to *Hedyotis ampliflora* and may be only a pubescent form of that species.

**43. *Hedyotis ovata*** Thunberg ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 29: 161. 1883.

卵叶耳草 luan ye er cao

*Oldenlandia ovata* (Thunberg ex Maximowicz) Kuntze.

Herbs or subshrubs, erect, perennial, to 90 cm tall; stems 4-angled, glabrous. Leaves petiolate; petiole ca. 5 mm, glabrous; blade drying papery, ovate, 2.5–7 × 1.5–3.5 cm, glabrous, base acute, margins revolute, apex acute; secondary

veins 3 or 4 pairs but indistinct; stipules triangular to broadly triangular, ca. 2 mm, marginally glandular-serrulate. Inflorescences terminal and sometimes also in axils of uppermost leaves, fascicled, several flowered, sessile or pedunculate; peduncles 0.9–2 cm; bracts triangular, ca. 1.5 mm; pedicels 0.5–1 mm. Flowers subsessile to pedicellate. Calyx with hypanthium portion subglobose, 1–1.5 mm in diam.; lobes lanceolate, ca. 4 mm. Corolla purplish red, villosulous in throat and onto lobes; tube 3–4.5 mm. Anthers included. Stigmas included. Fruit capsular, subglobose, 3–4 mm in diam., septicidally then loculicidally dehiscent; seeds 3 or 4, 4-angled, smooth. Fl. and fr. Apr–Jul.

- On humid soil rich in humus in forests. Hainan (Sanya).

This species has been reported from Vietnam by the Kew Rubiaceae checklist (GoVaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on May 2007); it was not included in the Vietnam checklist.

**44. *Hedyotis ovatifolia*** Cavanilles, Icon. 6: 52. 1801.

矮小耳草 ai xiao er cao

*Gonothea ovatifolia* (Cavanilles) Santapau & Wagh; *Oldenlandia nudicaulis* Roth; *O. ovatifolia* (Cavanilles) Candolle; *Thecagonum ovatifolium* (Cavanilles) Babu.

Herbs, erect, annual, to 15 cm tall; stems terete to 4-angled, often sulcate, densely villosulous, pilosulous, or puberulent with pubescence denser, longer, and apparently glandular on upper (i.e., distal) parts of internodes. Leaves subsessile to usually petiolate, distributed along stem or those at uppermost 2 nodes clustered or apparently 4-verticillate especially at base of inflorescence; petiole 1–5 mm, densely puberulent to villosulous; blade drying membranous, elliptic or ovate, 1–6 × 0.7–3 cm, adaxially glabrous, abaxially puberulent or villosulous to glabrescent, base cuneate to rounded, apex acute to rounded; secondary veins 3–6 pairs; stipules fused to petiole bases, truncate to broadly rounded, 1–2.5 mm, pilosulous to glabrescent, erose to glandular-lacerate and usually also with 1–3 linear lobes to 1 mm. Inflorescence terminal, cymose to panicle, 3–10 cm, glabrous, several to many flowered, pedunculate; peduncles 1–3, 1.5–4 cm, slender; axes mostly dichotomous; bracts triangular, 0.1–0.5 mm; pedicels 1–12 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion subglobose, ca. 0.5 mm; limb lobed essentially to base; lobes triangular, 0.2–0.3 mm. Corolla white, tubular or salverform, outside glabrous; tube 1–1.5 mm, barbate in throat; lobes lanceolate, ca. 1 mm. Anthers exserted, ca. 0.2 mm. Stigma ca. 0.6 mm, exserted. Fruit capsular, compressed globose, 2–3 × 2–3 mm, glabrous, loculicidally dehiscent across top through beak, beak broadly rounded, to 0.3 mm high; seeds numerous, smooth. Fl. and fr. Jul–Aug.

Broad-leaved forests or grasslands on mountain slopes, sometimes on limestone rocks. Guizhou, Hainan, Taiwan, Yunnan [India, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand].

The measurements of several structures, in particular calyx, corollas, and anthers, given by Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) and also W. C. Ko (in FRPS 71(1): 71–72. 1999) do not agree with the specimens studied, nor with Dutta and Deb's own figure. The measurements in the description here are taken from specimens, which

agree with Dutta and Deb's figure. All authors have found both the anthers and stigmas exserted (cf. Dutta & Deb figure; *Cooray 69011901R*, MO!) except Fl. Bhutan (2(2): 762–763. 1999), who found the anthers included.

**45. *Hedyotis paridifolia*** Dunn, Bull. Misc. Inform. Kew 1912: 366. 1912.

延龄耳草 yan ling er cao

*Oldenlandia paridifolia* (Dunn) Chun.

Herbs or subshrubs, perennial, erect, to 30 cm tall; stems green or purplish, flattened to subterete, usually sulcate along each side, glabrous. Leaves subsessile to shortly petiolate, often clustered and apparently verticillate at tops of stems; petiole to 3 mm, glabrous; blade drying papery, ovate, elliptic, or elliptic-ovate, 7–9(–12) × 2.5–4.5 cm, glabrous, base obtuse to rounded and often decurrent, apex acute or shortly acuminate; secondary veins 5–7 pairs; stipules fused to petiole bases, triangular to broadly triangular, 1–3.2 mm, glabrous, sparsely glandular-serrulate or glandular-setulose, apex with aristate projection 1–2 mm. Inflorescences terminal, capitate or subcapitate, hemispherical, 1.5–2.5 cm in diam., glabrous, subsessile; bracts triangular, 1–2 mm; pedicels to 2.5 mm. Flowers shortly pedicellate to sessile, perhaps monomorphic. Calyx glabrous; hypanthium portion purple, turbinate, ca. 1 mm, puberulent; limb lobed nearly to base; lobes on a few flowers rarely 2 or 3, elliptic, elliptic-oblong, or lanceolate (i.e., narrowed at base), 2–4 mm, obtuse to acute. Corolla white, funnelform to tubular, outside glabrous; tube 4–5 mm, inside pilosulous in upper part and throat; lobes triangular, 1–1.2 mm. Anthers exserted, ca. 1 mm. Stigma exserted, ca. 1.2 mm. Fruit indehiscent, straw-yellow, obovoid or subellipsoid, 3–3.5 × 2–2.5 mm, glabrescent; seeds numerous, black, angled, foveolate. Fl. May–Nov, fr. Apr–May.

- Forests or thickets at middle elevations; ca. 200 m. Hainan.

W. C. Ko (in FRPS 71(1): 35. 1999) described the leaf blade as up to 12 cm, but this has not been seen on specimens studied and may include plants that have been subsequently separated as *Hedyotis baotingensis*.

**46. *Hedyotis pinifolia*** Wallich ex G. Don, Gen. Hist. 3: 526. 1834.

松叶耳草 song ye er cao

*Oldenlandia pinifolia* (Wallich ex G. Don) K. Schumann.

Herbs, annual or perennial, diffusely branched, to 25 cm tall; stems wiry, sharply 4-angled to subterete, sometimes sulcate, glabrous. Leaves sessile or subsessile, sometimes borne on very short axillary stems and appearing verticillate or clustered; blade drying stiffly papery to leathery, linear to narrowly spatulate, 5–25 × 0.8–2 mm, adaxially glabrous to densely scaberrulous, abaxially glabrous, base straight to acute, margins markedly revolute at least when dry, apex acute; secondary veins not visible; stipules shortly fused to petiole bases, triangular to rounded, 0.8–1.2 mm, puberulent to glabrous, with 1–5 linear lobes or bristles 0.5–2.5 mm. Inflorescences terminal and pseudoaxillary on short axillary stems, capitate to shortly fasciculate, 4–7 mm in diam., (1 or) 3–10-flowered, sessile and sub-

tended by 1 or 2 pairs of somewhat reduced leaves; bracts lanceolate to setose, 0.5–4 mm, entire to ciliate; pedicels to 1 mm. Flowers sessile, subsessile, or pedicellate, apparently homostylous. Calyx with hypanthium portion obconical to subglobose, 0.8–1.2 mm, glabrous to densely hispidulous; limb lobed for more than 1/2; lobes subulate to narrowly triangular, 1–2 mm, glabrescent, entire to densely ciliate. Corolla white sometimes flushed with pink, tubular to funnelform, outside glabrous; tube 3–4.2 mm, pubescent in throat; lobes spatulate-oblong to elliptic, 1.8–2 mm. Anthers exserted, ca. 1 mm. Stigma 0.5–1 mm, exserted and positioned above anthers. Fruit capsular, ovoid to lanceoloid, 2.5–3 × 1.5–2 mm, cartilaginous to stiff, loculicidal across top; seeds several to numerous, pale brown, angled. Fl. May–Nov, fr. Apr–Nov.

Open fields on hills, sandy wastelands at seashores or riversides; sea level to below 100 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [India, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

The plant illustrated in FRPS (71(1): 70, t. 13, f. 1–6. 1999) as "*Hedyotis umbellata*" is actually *H. pinifolia*. The Fl. Bhutan (2(2): 763–764. 1999) included this species noting that the report is based on a published historical record that has not been re-confirmed.

**47. *Hedyotis platystipula*** Merrill, Philipp. J. Sci. 21: 510. 1922.

阔托叶耳草 kuo tuo ye er cao

*Oldenlandia platystipula* (Merrill) Chun.

Herbs or subshrubs, erect to perhaps weak, to 40 cm tall; stems flattened to 4-angled, sometimes sulcate, glabrous. Leaves petiolate; petiole 3–18 mm, glabrous; blade drying membranous, elliptic, oblong-ovate, or oblong-lanceolate, 5–12 × 2.5–4 cm, adaxially glabrous or rarely puberulent along principal veins, abaxially glabrous or papillose on principal veins, base cuneate to rounded and usually shortly decurrent, apex acute to shortly acuminate; secondary veins 4–6 pairs; stipules interpetiolar, reniform, ovate, or suborbicular, 5–10 mm, glabrous, broadly rounded to broadly triangular, fringed-lacerate or with numerous lobes or bristles 0.3–2 mm, usually glandular at apex. Inflorescence axillary, glomerate, subglobose, 1–2.5 cm in diam., glabrous, sessile; bracts not seen. Flowers sessile to subsessile, biology unknown. Calyx glabrous; hypanthium portion turbinate to ellipsoid, 1.2–2 mm; limb lobed essentially to base; lobes narrowly lanceolate to triangular, 4–6 mm, ciliate. Corolla white, tubular, outside glabrous; tube 6–7 mm, inside apparently glabrous; lobes lanceolate to triangular, 1.5–2 mm. Anthers ca. 2 mm, partially exserted. Stigmas ca. 1.5 mm, included. Capsules oblong-ellipsoid to obconic, 2–3 × 1.5–2 mm, somewhat flattened laterally, septicidally then loculicidally dehiscent; seeds ca. 10, black, scabrous. Fl. May–Aug, fr. Sep.

• Forests in valleys, on rocks at streamsides. Guangdong, Guangxi.

**48. *Hedyotis prostrata*** Blume, Catalogus, 40. 1823.

菲律宾耳草 fei lü bin er cao

*Hedyotis congesta* R. Brown ex G. Don; *H. laevigata* (Candolle) Miquel; *H. philippensis* (Willdenow ex Sprengel) Merrill ex C. B. Robinson; *Metabolos laevigatus* Candolle;

*Oldenlandia congesta* (R. Brown ex G. Don) Kuntze (1891), not Baker (1877); *O. prostrata* (Blume) Kuntze; *Spermacoce philippensis* Willdenow ex Sprengel.

Herbs or subshrubs, erect to perhaps clambering, to 60 cm tall; stems 4-angled, flattened, or terete, sometimes sulcate, glabrous. Leaves petiolate; petiole 3–6 mm, glabrous; blade drying papery or membranous, ovate, lanceolate, ovate-lanceolate, or elliptic, 3.2–12 × 1.2–4.5 cm, glabrous, base cuneate, obtuse, or rounded then often decurrent, apex acute or acuminate; secondary veins 4–6 pairs but usually not visible; stipules shortly fused to petiole bases or around stem, broadly triangular, 2–4 mm, glabrous or pilosulous to hirtellous, acute or usually acuminate to aristate, entire or glandular-serrulate. Inflorescence axillary and/or terminal, capitate or glomerulate, 5–10 mm in diam., 10–18-flowered, glabrous, sessile or subsessile; bracts lanceolate, triangular, or linear, 0.5–4 mm. Flowers sessile to subsessile, floral biology unknown. Calyx glabrous; hypanthium portion obconic to campanulate, 0.8–1 mm; limb lobed essentially to base; lobes triangular, 1–1.2 mm. Corolla white to violet, funnelform; tube 2–3 mm; lobes lanceolate, 1–1.2 mm. Fruit indehiscent or tardily septicidal, ellipsoid-oblong to subglobose, 2–4 × 1.5–3 mm, with pedicels to 2 mm; seeds 10–12, black, foveolate. Fl. Apr–Jun.

Thickets; 200–400 m. Hainan (Xinglong) [India, Indonesia, Philippines, Vietnam].

Plants from the Philippines have fruit that are markedly ellipsoid, but the Chinese plants treated under this name have subglobose fruit that are quite distinctively different in shape.

This species has long been treated under the name *Hedyotis philippensis*, based on the conclusion that Blume's valid publication of the name *H. prostrata* was in 1826 while the basionym of *H. philippensis* was published in 1825. However, Bakhuizen f. (Fl. Java 2: 284–288. 1965) noted that Blume's name was actually published in an earlier work and, thus, is the oldest name for this species. Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) treated this species under the name *H. congesta*, without explanation.

**49. *Hedyotis pterita*** Blume, Bijdr. 972. 1826–1827.

翅果耳草 chi guo er cao

*Gonothecha blumei* Candolle; *Hedyotis alata* Koenig ex Wight & Arnott; *Oldenlandia alata* (Koenig ex Wight & Arnott) J. D. Hooker; *O. pterita* (Blume) Miquel; *Thecagonum pteritum* (Blume) Babu.

Herbs, annual or perennial, at least weakly erect, to 15(–30) cm tall; stems subterete to 4-angled, sometimes sulcate and/or winged, glabrous. Leaves subsessile to petiolate; petiole to 10 mm, glabrous; blade drying membranous, elliptic-oblong, lanceolate, or elliptic, 1–6 × 0.4–1.5 cm, glabrous, base cuneate to obtuse then often abruptly decurrent, apex acute or obtuse; secondary veins indistinct; stipules fused to petiole bases, triangular, 0.5–2.5 mm, glandular-puberulent to glabrescent, apically truncate or serrulate to prolonged and acute. Inflorescences terminal becoming displaced to pseudoaxillary in upper leaf axils by subsequent stem growth, 1-flowered or 2–8-flowered and cymose to fasciculate, glabrous, subsessile or pedunculate; peduncle to 1.5 cm; bracts reduced, triangular, to 0.3 mm; pedicels to 1.5 mm, winged. Flowers subsessile to shortly

pedicellate. Calyx glabrous; hypanthium portion cupular to turbinate, 1–2 mm, with 4 wings to 0.6 mm wide; limb lobed for 1/2–2/3 its length; lobes ovate, ca. 1 mm, reticulately veined, dorsally winged to apex, sometimes ciliolate, acute to acuminate. Corolla white, outside glabrous; tube 1–1.5 mm, barbate in throat; lobes triangular, 1–1.5 mm. Anthers ca. 0.5 mm, included and positioned near base of corolla tube. Fruit capsular, turbinate to ellipsoid, 5–8 × 3–5 mm, glabrous, with 4 wings to 1 mm wide; seeds numerous, ca. 0.5 mm. Fl. Jul–Oct.

Thickets, slightly shaded wastelands. Guangdong, Guangxi [India, Malaysia, Philippines, Thailand, Vietnam].

**50. *Hedyotis pulcherrima*** Dunn, Bull. Misc. Inform. Kew, Addit. Ser. 10: 127. 1912.

艳丽耳草 *yan li er cao*

*Oldenlandia pulcherrima* (Dunn) Chun.

Herbs or subshrubs, perennial, erect, to 30 cm tall; stems terete to slightly flattened, densely farinose puberulent. Leaves petiolate; petiole 0.15–0.6 cm, farinose puberulent; blade drying papery, ovate, lanceolate-elliptic, or lanceolate, 0.8–5 × 0.5–2 cm, both surfaces glabrous or puberulent on midrib, base obtuse to rounded, margins plane to revolute, apex obtuse to acute; secondary veins 3 or 4 pairs but mostly indistinct; stipules fused to petiole bases, broadly triangular to broadly rounded, 1–2 mm, densely farinose puberulent, ciliolate-serrulate, apically sometimes with obtuse to shortly apiculate protuberance. Inflorescences terminal and in axils of uppermost leaves, 1-flowered or 2–4-flowered and fasciculate, densely puberulent, pedunculate; peduncles 2–6 mm, often articulate above middle; bracteoles lanceolate or spatulate, 0.5–2 mm. Flowers pedunculate. Calyx glabrous; hypanthium portion turbinate to ellipsoid, ca. 1.2 mm; limb lobed nearly to base; lobes narrowly lanceolate to narrowly spatulate, 3–3.5 mm. Corolla pale purple, funnelform, outside glabrous; tube 12–13 mm, pubescent in throat; lobes spatulate-oblong to ovate, 4–6 mm. Anthers in apparent short-styled form included or partially exerted, ca. 2 mm. Stigmas included, positioned near middle of corolla tube, ca. 2.3 mm. Fruit capsular, ovoid or obovoid, ca. 2.5 mm, crustaceous to cartilaginous, outside glabrescent, septically then loculicidally dehiscent; seeds several. Fl. Jun–Jul, fr. Apr.

• Open fields at roadsides. Guangdong (Raoping).

**51. *Hedyotis scandens*** Roxburgh, Fl. Ind. 1: 369. 1820.

攀茎耳草 *pan jing er cao*

*Oldenlandia scandens* (Roxburgh) Kuntze.

Shrubs or herbs, perennial, lianescent, climbing, or scandent, to several meters; stems compressed terete to angled, smooth or sulcate, glabrous or puberulent in lines. Leaves sessile to petiolate; petiole to 5 mm, glabrous; blade drying papery to subleathery, pale abaxially, oblong-lanceolate, elliptic, narrowly elliptic, or elliptic-oblong, 5–10 × 1.5–4 cm, glabrous, base acute to cuneate then decurrent, apex long acuminate; secondary veins 3–5 pairs but not evident; stipules fused to petiole bases, truncate to triangular, 2.5–4 mm, glabrous to usually puberulent or strigillose, ciliolate to entire, apex acute to acuminate or bilobed, sometimes glandular and/or with bristle

inserted below top of stipule. Inflorescences terminal and usually also in axils of uppermost leaves, cymose to compound-cymose, 2–15 cm, densely pilosulous or hirtellous, pedunculate; peduncles 2–3 cm; bracts triangular to narrowly triangular, 0.3–6 mm; pedicels 1–3 mm. Flowers pedicellate, distylous. Calyx glabrous; hypanthium portion obconical, ca. 1 mm, sometimes ridged; limb 1–2 mm, lobed for 1/3–1/2, lobes triangular and thickened, sometimes costate. Corolla white or yellow, tubular-funnelform to funnelform, outside glabrous [or puberulent in India], inside densely villous in throat and throughout lobes; tube 1–2 mm; lobes narrowly spatulate-oblong to narrowly triangular, 3–4 mm, acute. Anthers shortly to long exerted, ca. 1.2 mm. Stigmas 0.3–1 mm. Fruit capsular, subglobose, ellipsoid, or ovoid, 3–5 × 3–5 mm, glabrous, cartilaginous to stiffly papery, loculicidally dehiscent across top then sometimes septicidal, beak rounded to conical, 1.2–2 mm; seeds several, black, angled. Fl. Jul–Sep, fr. Aug–Sep.

Sparse forests, on humid soil in valleys; 1000–1800 m [as low as ca. 700 m in India]. Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, Vietnam].

**52. *Hedyotis shenzhenensis*** Tao Chen, Edinburgh J. Bot. 64: 331. 2007.

深圳耳草 *shen zhen er cao*

Herbs, perennial, erect, to 40 cm tall; stems glabrous. Leaves subsessile; blade drying subleathery, adaxially dark green, abaxially pale green, elliptic, elliptic-oblong, or obovate, 8.5–15 × 5–9 cm, glabrous, base cuneate to rounded or cordulate, apex acute to obtuse; secondary veins 4–6 pairs but rather indistinct; stipules fused to leaf bases or very shortly around stem, triangular, 3–5 mm, shortly pubescent, ciliolate, acute. Inflorescence terminal, paniculate, many flowered, branched to several orders, glabrous, flushed with purple; peduncle 10–18 cm; axes flattened to 4-angled; bracts narrowly triangular, 0.2–3 mm; pedicels to 2 mm. Flowers sessile and/or pedicellate, distylous. Calyx glabrous; hypanthium portion obconic, ca. 1 mm; limb deeply lobed; lobes narrowly triangular to ovate, ca. 1.5 mm. Corolla white, tubular-urceolate, glabrous outside; tube ca. 3 mm, villous from middle into throat; lobes ovate to elliptic-triangular, 1.8–2.5 mm. Anthers included or exerted, 0.6–0.8 mm. Stigma included or exerted, ca. 1 mm. Fruit capsular, subglobose, ca. 2 mm, glabrous, weakly ribbed, septicidally dehiscent; seeds numerous, black, irregularly angled. Fl. Apr–Jun, fr. May–Oct.

• Understories of broad-leaved forests; 400–700 m. Guangdong (Shenzhen).

This species was treated by Chen (in T. L. Wu, Check List Hong Kong Pl. 265–266. 2002) under the name *Hedyotis yangchunensis*. The flower sizes in the figure in the protologue, according to the scale in that figure, do not precisely agree with the measurements given in the protologue description.

**53. *Hedyotis strigulosa*** (Bartling ex Candolle) Fosberg, Smithsonian Contr. Bot. 45: 28. 1980.

肉叶耳草 *rou ye er cao*

*Oldenlandia strigulosa* Bartling ex Candolle, Prodr. 4: 427. 1830; *Hedyotis coreana* H. Léveillé; *H. taiwanensis* S. F.

Huang & J. Murata [“*taiwanense*”]; *Thecagonum strigosum* (Bartling ex Candolle) Terrell & H. Robinson.

Herbs, annual or perennial, prostrate to erect, to 15(–20) cm tall; stems terete or weakly to sharply 4-angled, sometimes sulcate, glabrous. Leaves sessile; blade very fleshy, drying leathery, oblong-obovate, elliptic-oblong, oblanceolate, or spatulate, 1–2.5 × 0.2–1 cm, glabrous, base acute to decurrent, apex rounded, obtuse, or acute; secondary veins indistinct; stipules fused to petiole bases, triangular, 1–2 mm, glabrous, with 2 central longitudinal lines of glandular trichomes or fleshy ornamentation, acute to acuminate. Inflorescences terminal and sometimes in axils of uppermost leaves, 1-flowered or 2–12-flowered and shortly cymose, fasciculate, or paniculate, glabrous, subsessile to pedunculate; peduncles to 1.5 cm; bracts triangular, 0.1–2 mm; pedicels 1–12 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion turbinate to ellipsoid, 1–1.5 mm; limb lobed for 1/2–2/3; lobes triangular to lanceolate, 0.8–2 mm. Corolla white, tubular, glabrous outside; tube 1.2–1.5 mm, barbate in throat; lobes triangular to oblanceolate, 1.2–2 mm. Anthers not seen. Stigmas ca. 0.8 mm, exserted. Fruit capsular, subglobose, hemispherical, or compressed turbinate, 3.5–5 mm, glabrous, loculicidal across top, sometimes with rudimentary beak; seeds numerous, blackish brown, subglobose to angled, foveolate. Fl. and fr. Dec–Apr.

Sandy or muddy beaches, wastelands, on rocks near sea; sea level to near sea level. Guangdong, Taiwan, Zhejiang [Japan, Korea; Micronesia].

*Hedyotis taiwanensis* was treated as a species separate from *H. coreana* by W. C. Ko (in FRPS 71(1): 39, 73, 1999), and the name *H. strigulosa* was not cited by her. However, *H. coreana* was synonymized under *H. strigulosa* by Fosberg (loc. cit.), though provisionally. *Hedyotis taiwanensis* was synonymized with *H. strigulosa* by Fl. Taiwan (ed. 2, 4: 268, 1998). The Fl. Taiwan separated *Hedyotis strigulosa* from *H. biflora* based on the stoutness of the pedicels and fleshiness of the leaves, but different characters are used here and most of the specimens included by them in *H. strigulosa* are here included in *H. biflora*.

The Fl. Taiwan and Fl. Japan (3a: 217, 1993) included the Chinese plants in *Hedyotis strigulosa* var. *parvifolia* (Hooker & Arnott) T. Yamazaki (J. Jap. Bot. 58: 284, 1983). This name was not mentioned by W. C. Ko (loc. cit.) and was synonymized with *H. strigulosa* by the Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on May 2007), though without any source or explanation. The basionym of this name is *H. biflora* var. *parvifolia* Hooker & Arnott (Bot. Beechey Voy. 264, 1838). *Hedyotis biflora* var. *parvifolia* was reported from Zhejiang (Qiu & Zhong, Fl. Zhejiang 6: 121–122, 1986), but that report is here interpreted as *H. strigulosa*.

#### 54. *Hedyotis tenelliflora* Blume, Bijdr. 971. 1826–1827.

纤花耳草 xian hua er cao

*Hedyotis angustifolia* Chamisso & Schlechtendal; *Oldenlandia angustifolia* (Chamisso & Schlechtendal) Benth; *O. tenelliflora* (Blume) Kuntze; *Scleromitron angustifolium* (Chamisso & Schlechtendal) Benth; *S. sinense* Miquel.

Herbs, annual or perennial, diffusely branched, to 40 cm tall, often drying blackened; stems subterete and smooth or weakly to sharply 4-angled and/or 2-sulcate, glabrous or often

scaberulous along grooves and/or near nodes. Leaves sessile or subsessile; petiole to 1 mm, glabrescent; blade drying thinly leathery, linear, linear-lanceolate, narrowly elliptic-oblong, or narrowly spatulate, 1.2–5 × 0.15–0.4 cm, adaxially glabrous or scaberulous near margins, abaxially glabrous, both surfaces sometimes apparently scaly due to collapsed large epidermal cells, base cuneate, acute, or decurrent, margins frequently revolute, apex acute or acuminate; secondary veins not visible; stipules fused to petiole bases, triangular to rounded, 1–2 mm, puberulent, hispidulous, or glabrescent, with 2–5 linear or setiform lobes 1–4 mm. Inflorescences axillary, 1-flowered or 2- or 3-flowered in each axil, congested-cymose, glomerulate, or fasciculate, 4–8 mm in diam., sessile to subsessile; bracts acicular to lanceolate, 1–2.5 mm, entire or marginally scaberulous; pedicels to 1 mm. Flowers sessile to subsessile, apparently homostylous. Calyx glabrous; hypanthium portion subglobose to obovoid, ca. 1 mm; limb lobed nearly to base; lobes linear-lanceolate, triangular, or spatulate, 1.5–2 mm, ciliolate. Corolla white, funnelform, outside glabrous; tube ca. 2 mm, pubescent in throat; lobes narrowly spatulate-oblong, 1–2 mm. Anthers exserted, ca. 1 mm. Stigma 0.2–0.3 mm. Fruit capsular, ovoid, 2–2.5 × 1.5–2 mm, cartilaginous to stiff, loculicidal across top; seeds numerous. Fl. and fr. Apr–Dec.

Slopes in valleys, ridges of fields; 100–1400 m. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Philippines, Thailand, Vietnam; Australia, Melanesia].

This species has been treated by most authors as *Hedyotis tenelliflora*; however, Dutta and Deb (Taxon. Rev. *Hedyotis*, 2004) considered that a distinct species and treated these plants as *H. angustifolia*. Unfortunately, they presented no discussion of this situation nor details of the actual identity and range of “true” *H. tenelliflora*; consequently, their conclusion is not yet accepted here.

W. C. Ko (in FRPS 71(1): 41, 1999) described the leaves as densely rotund transparent scaly, which apparently refers to the relatively large epidermal cells that are visible under magnification and sometimes apparently collapse. This character was noted in the Fl. Bhutan (2(2): 757–764, 1999) for several *Hedyotis* species.

The name *Scleromitron sinense* is here provisionally placed in synonymy with *Hedyotis tenelliflora*. As detailed by Sivarajan and Nair (Taxon 35: 363–369, 1986), the name *Spermacoce stricta* Linnaeus f. has also been considered by some authors to apply to *H. tenelliflora* (in which case it would have priority), but the identity of that *Spermacoce* name is so unclear and controversial, as well as involving plants from our flora area, that it is better left aside for now. Other authors have suggested that *S. stricta* is actually a synonym of *H. verticillata*.

#### 55. *Hedyotis tenuipes* Hemsley, J. Linn. Soc., Bot. 23: 375. 1888.

细梗耳草 xi geng er cao

*Oldenlandia tenuipes* (Hemsley) Kuntze.

Herbs or subshrubs, erect, perennial, to 50 cm tall; stems terete to weakly 4-angled, often flexuous, puberulent to glabrous. Leaves subsessile to petiolate; petiole to 2(–6) mm; blade drying papery, usually clear green, narrowly lanceolate, lanceolate, ovate, or lanceolate-elliptic, 2.5–9 × 0.7–3 cm, both surfaces glabrous except densely puberulent on midrib adaxially,

base cuneate to rounded, apex acute to acuminate; secondary veins 3 or 4 pairs but usually indistinct; stipules fused to petiole bases, triangular, ovate, or subtruncate, 1–3 mm, densely puberulent, acute to acuminate, marginally entire, serrulate, or occasionally glandular-erose. Inflorescences terminal and often axillary and/or pseudoaxillary in uppermost leaf axils, cymose to panicle, 4–18 cm, glabrous, several to many flowered, pedunculate; peduncle 0.5–2 cm; axes slender, flexuous, spreading at up to 90°; bracts linear to narrowly triangular, 1–5 mm; pedicels 4–15 mm. Flowers all pedicellate, apparently monomorphic. Calyx glabrous; hypanthium portion turbinate to ellipsoid, 1–1.5 mm; limb lobed for 2/3–3/4; lobes narrowly triangular to lanceolate, 1–1.5 mm. Corolla white, sometimes tinged pink to purple, funnelform, outside glabrous, inside densely barbate in throat and throughout lobes; tube 1.5–3 mm; lobes lanceolate to spatulate, 3–4 mm, acute to acuminate. Anthers partially to fully exserted, ca. 1.5 mm. Stigma 0.1–0.2 mm, exserted by 3–4 mm. Fruit capsular, ovoid to ellipsoid, 2–2.5 mm, glabrous, smooth, septicidally then loculicidally dehiscent; seeds numerous, black, angled. Fl. Jun–Aug, fr. Jun–Nov.

• Sandy lands, barren soil in sparse forests; 200–1000 m. Fujian, Guangdong, Hainan.

This species is similar to *Hedyotis matthewii* and *H. mellii* and is perhaps separated here somewhat differently from other authors (e.g., W. C. Ko in FRPS 71(1): 52. 1999). The pedicel measurements here are for flowers at anthesis and fruit; the pedicels subtending flower buds are much shorter and apparently elongate rapidly as the buds mature.

**56. *Hedyotis terminaliflora*** Merrill & Chun, Sunyatsenia 2: 326. 1935.

顶花耳草 ding hua er cao

Herbs or subshrubs, perennial, erect, to 100 cm tall; stems terete, flattened or weakly 4-angled, 2- or 4-sulcate, glabrescent or sparsely to densely strigillose to hirtellous throughout or in lines along grooves. Leaves petiolate; petiole 1–4 mm, densely puberulent, strigillose, or glabrescent; blade drying papery or subleathery, a bit fragile, ovate, oblong-ovate, lanceolate, or oblong-lanceolate, 2.2–8 × 1–3 cm, adaxially glabrous and shiny, abaxially sparsely to densely puberulent to strigillose, base obtuse to rounded, apex acute to shortly acuminate; secondary veins 2–4 pairs; stipules shortly fused to petiole bases, ovate, triangular, or narrowly triangular, 2–5 mm, glabrous to densely puberulent or strigillose, lacinate or glandular-setose. Inflorescence terminal, subcapitate, hemispherical to subglobose, 1.5–1.8 cm in diam., glabrescent, sessile or subsessile; bracts narrowly lanceolate to narrowly triangular, 1–5 mm; pedicels to 2 mm. Flowers sessile to pedicellate. Calyx glabrescent; hypanthium portion cylindrical, ca. 1 mm; limb deeply lobed; lobes narrowly spatulate-oblong, narrowly triangular, or narrowly elliptic, 3–4 mm, sometimes unequal, usually ciliate. Corolla funnelform, outside glabrous; tube ca. 3.5 mm, barbate in throat; lobes triangular, ca. 2.5 mm. Anthers exserted, ca. 1 mm. Stigmas not seen. Fruit capsular, subglobose to ellipsoid, ca. 2.5 mm in diam., glabrescent, cartilaginous, septicidally dehiscent then quickly loculicidal; seeds several, black, angled. Fl. Feb–Mar, fr. Aug–Nov.

• Broad-leaved forests on mountaintops; 600–1100 m. Hainan.

Broader morphological variation is included in this species here than in the original species circumscription, based on study of specimens. This is the first description of the corolla; it is based on *Liu Qingu* 25932 (MO).

**57. *Hedyotis tetragonalis*** (Korthals) Walpers, Ann. Bot. Syst. 2: 769. 1852.

方茎耳草 fang jing er cao

*Diplophragma tetragonale* Korthals, Ned. Kruidk. Arch. 2: 149. 1851 [*"tetragonalis"*]; *Hedyotis parryi* Hance; *H. quadrangularis* Miquel; *Oldenlandia parryi* (Hance) Kuntze; *O. quadrangularis* (Miquel) Kuntze.

Herbs or subshrubs, erect, perennial or perhaps sometimes annual, to 50 cm tall; stems subterete to 4-angled with angles thickened to ridged, glabrous. Leaves sessile; blade drying papery, linear, linear-lanceolate, narrowly elliptic, or narrowly elliptic-oblong, 1–3.5 × 0.2–0.55 cm, glabrous, base acute to obtuse and usually decurrent, margins usually revolute, apex acute; secondary veins not visible; stipules shortly fused to petiole bases, triangular to truncate, 1–1.5 mm, glabrous, rounded to acute or usually with leaflike appendage, this narrowly elliptic to lanceolate, 2–10 mm, entire or shortly 2- or 3-lobed or -setose. Inflorescences terminal and sometimes in axils of uppermost leaves, compound-cymose to panicle, 4–13 cm, glabrous, many flowered, pedunculate; peduncle 1–5.5 cm; axes mostly regularly dichotomous; bracts linear, 1–2.5 mm; pedicels (or ultimate inflorescence axes) 0.5–3 mm. Flowers subsessile or pedicellate, apparently distylous. Calyx glabrous; hypanthium portion turbinate, 0.8–1 mm; limb lobed nearly to base; lobes narrowly lanceolate to narrowly triangular, 1–1.5 mm. Corolla white, tubular or tubular-funnelform, outside glabrous, inside tomentose at throat and onto lobes; tube ca. 2 mm; lobes lanceolate-oblong, ca. 2 mm. Anthers included or exserted, 0.8–1 mm. Stigmas 0.8–1 mm, included or exserted. Fruit capsular, subglobose, sometimes slightly didymous, ca. 2 × 2 mm, glabrous, septicidally then loculicidally dehiscent; seeds several, black, angled. Fl. and fr. Jul–Nov.

Open fields, grassy slopes, sometimes on ridges of farmlands; low elevations. Guangdong, Guangxi [Borneo, Cambodia, Indonesia, Malaysia, Thailand, Vietnam].

Merrill and Metcalf (Lingnan Sci. J. 16(3): 400. 1937) noted that Veleton provided a much-expanded and detailed description of this species (Bot. Jahrb. Syst. 44: 543. 1910), and they formally synonymized *Hedyotis parryi* with *H. tetragonalis*, though as *"tetragonalia."*

**58. *Hedyotis trinervia*** (Retzius) Roemer & Schultes, Syst. Veg. 3: 197. 1818.

三脉耳草 san mai er cao

*Oldenlandia trinervia* Retzius, Observ. Bot. 4: 23. 1786; *Hedyotis rotundifolia* Sprengel, nom. illeg. superfl.

Herbs, annual, prostrate to weakly erect, to 15 cm tall; stems 4-angled to 4-winged, hirsute to pilose. Leaves subsessile to petiolate; petiole to 2 mm, pilose to hirsute; blade drying papery, ovate, elliptic, or suborbicular, 0.3–1.2 × 0.6–1 cm, adaxially glabrous, abaxially glabrous or sparsely strigillose to hispid, base obtuse and shortly decurrent, margins usually ciliate,

apex obtuse and shortly acuminate; secondary veins 2 or 3 pairs; stipules fused to petiole bases, hispidulous to villosulous, truncate, ca. 0.5 mm, irregularly erose and with 1–3 narrowly triangular to linear lobes or bristles 0.3–1 mm. Inflorescences axillary, 1-flowered to 2–4-flowered and cymose or fascicled, pilose, subsessile; pedicels to 1.5 mm. Flowers subsessile to pedicellate. Calyx pilosulous to hispidulous; hypanthium portion subglobose, ca. 1 mm; limb lobed nearly to base; lobes triangular, 1–1.2 mm. Corolla white, rotate, apparently glabrous; tube ca. 0.5 mm; lobes 1–2 mm. Anthers exserted or included, 0.5–1 mm. Stigmas included. Fruit capsular, subglobose, somewhat didymous, 1–2 × 1–1.5 mm, pilosulous or hispidulous, loculicidally dehiscent across top; seeds several, black, angled. Fl. and fr. Oct–Mar.

Sparse forests on mountains. Hainan (Ledong) [India, Indonesia, Malaysia, Sri Lanka, N Vietnam].

The descriptions seen suggest that this is a rather distinctive species. The description here is compiled from Dutta and Deb (Taxon. Rev. *Hedyotis*. 2004) and Augustine (J. Econ. Taxon. Bot. 26: 91. 2002).

The synonym *Hedyotis rotundifolia* was attributed by W. C. Ko (in FRPS 71(1): 76. 1999) to Candolle, but Candolle clearly indicated (Prodr. 4: 420. 1830) that Sprengel was the author of the name. W. C. Ko gave the range of this species as including "Tropical Africa," but Verdcourt (Fl. Trop. E. Africa, Rub. (Pt. 1), 279–280. 1976) noted that throughout Africa this name was long incorrectly applied to *Oldenlandia goreensis* (Candolle) Summerhayes (= *H. goreensis* Candolle); thus, *H. trinervia* is not currently known from Africa.

**59. *Hedyotis uncinella*** Hooker & Arnott, Bot. Beechey Voy. 192. 1833.

长节耳草 chang jie er cao

*Hedyotis borrierioides* Champion ex Benth; *H. kuraruensis* Hayata; *H. uncinella* var. *cephalophora* Craib; *Oldenlandia uncinella* (Hooker & Arnott) Kuntze.

Herbs, perennial, erect, to 70 cm tall; stems 4-angled and/or sulcate, angles becoming sharp and thickened or narrowly winged, sparsely to densely puberulent or hispidulous to glabrescent. Leaves opposite or rarely ternate at 1 or 2 nodes, subsessile to petiolate; petiole to 2.5 mm, puberulent to glabrescent; blade drying papery, ovate-oblong, oblong-lanceolate, ovate, lanceolate, or elliptic, 1.5–7.5 × 0.4–3.8 cm, both surfaces sparsely to densely puberulent, hispidulous, or pilosulous, base acute to rounded and usually shortly decurrent, apex acute to acuminate; secondary veins 4 or 5 pairs; stipules interpetiolar, triangular to narrowly triangular, 2–3.5 mm, moderately to densely pilosulous, pilosulous, or puberulent, acute, aristate, or usually lacinate or with 2–5 linear lobes or bristles 0.5–2 mm. Inflorescences terminal and axillary in axils of uppermost leaves, capitate or glomerulate, 8–15 mm in diam., globose, many flowered, sessile; bracts linear to lanceolate, 0.5–2 mm. Flowers sessile or subsessile, distylous. Calyx moderately to densely pilosulous to hispidulous; hypanthium portion subglobose to obconic, ca. 1 mm; limb lobed essentially to base; lobes narrowly triangular, 2.5–4 mm, ciliate. Corolla white or purple, funnelform or tubular-funnelform, outside puberulent or pilosulous at least on lobes; tube 3–3.5 mm, tomentose in throat;

lobes oblong-lanceolate, 1.5–2 mm. Anthers exserted or included, 0.8–1 mm. Stigma 0.3–1 mm, included or exserted. Fruit capsular, subglobose to broadly ovoid, 1.5–2 × 1.8–2 mm, often somewhat compressed, septicidally dehiscent then loculicidal, with stipes or pedicels to 1 mm; seeds several, pale brown, angled. Fl. and fr. Apr–Sep.

Dry open fields; 200–1200 m. Fujian, Guangdong, Guizhou, Hainan, Hunan, Taiwan [India, Myanmar].

The name *Hedyotis uncinella* var. *cephalophora* has been cited as a combination by some authors, but the basionym cited for it, "*H. cephalophora* R. Brown," is apparently a nomen nudum.

W. C. Ko (in FRPS 71(1): 60. 1999) described the anthers as ca. 3 mm, which has not been reported by any other authors nor seen on any specimens.

**60. *Hedyotis vachellii*** Hooker & Arnott, Bot. Beechey Voy. 194. 1837.

香港耳草 xiang gang er cao

*Oldenlandia vachellii* (Hooker & Arnott) Kuntze.

Herbs or subshrubs, erect, to 40 cm tall; stems terete, weakly angled, or flattened, glabrous. Leaves subsessile to petiolate; petiole to 8 mm, glabrous; blade drying papery to subleathery, oblong-lanceolate, elliptic, lanceolate, or elliptic-oblong, 4–8.5 × 1–3.5 cm, glabrous, base acute to usually cuneate or obtuse, apex acute; secondary veins indistinct; stipules perhaps interpetiolar or shortly fused around stem, triangular to ovate, 1.5–2 mm, marginally densely glandular-ciliate, acute to obtuse. Inflorescences terminal, paniculate, cymose, multichotomous, 4–8 × 3.5–8 cm, many flowered, glabrous, purple, pedunculate; peduncles 2–4.5 cm; principal lateral axes 0.8–1.5 cm; bracts lanceolate to narrowly triangular, 0.5–3 mm; pedicels to 1.5 mm. Flowers subsessile to pedicellate, floral biology unknown. Calyx glabrous, somewhat succulent; hypanthium portion turbinate to ellipsoid, 0.9–1 mm; limb lobed essentially to base; lobes lanceolate to narrowly triangular, 1.2–2 mm. Corolla white to pale green, salverform, outside glabrous; tube 2.5–3 mm, sparsely pubescent inside; lobes ovate-triangular, ca. 2 mm. Anthers exserted, ca. 1.2 mm. Stigma included. Fruit capsular, subglobose, ca. 1.8 mm in diam., dehiscent; seeds several, brown. Fl. Apr–Aug.

• Hong Kong (New Territories).

**61. *Hedyotis verticillata*** (Linnaeus) Lamarck, Tabl. Encycl. 1: 271. 1792.

粗叶耳草 cu ye er cao

*Oldenlandia verticillata* Linnaeus, Mant. Pl. 1: 40. 1767; *Hedyotis hispida* Retzius; *O. hispida* (Retzius) Poir.

Herbs, annual or perennial, diffusely branched, often decumbent, to 30 cm tall; stems flattened, subterete, or 4-angled and/or usually 2-sulcate, sparsely to densely hirtellous, hispidulous, and/or scaberulous. Leaves sessile to petiolate; petiole to 2 mm, scaberulous or hispidulous to glabrescent; blade drying papery or thinly leathery, narrowly elliptic or linear-lanceolate, 2.5–6 × 0.3–1.3(–2) cm, adaxially glabrous or scaberulous at least near margins, abaxially glabrous to densely hirtellous or

hispidulous at least on midrib, base acute to obtuse, margins often revolute at least when dry, apex acute or acuminate; secondary veins not visible; stipules shortly fused to petiole bases, triangular to subtruncate, 1–3 mm, sparsely to densely hispidulous to hirtellous, with 5–9 linear lobes or bristles 1–8 mm. Inflorescences axillary, glomerulate to congested-cymose, 5–10 mm in diam., several flowered, moderately to densely hispidulous, sessile; bracts linear to lanceolate, 1–4 mm. Flowers sessile to subsessile, apparently homostylous (e.g., *Anon.* 788, MO). Calyx densely hispidulous; hypanthium portion obconical to subglobose, ca. 1 mm; limb lobed essentially to base; lobes lanceolate to triangular, 1–2 mm, ciliolate. Corolla white, funnellform, outside glabrous except lobes sometimes bearded at apex; tube ca. 2 mm, glabrous inside; lobes lanceolate, 1.8–2 mm. Anthers exserted, ca. 1 mm. Stigma ca. 0.3 mm. Fruit capsular, ovoid, 2–3 × 1.5–2 mm, loculicidal across top, with calyx lobes to 3 mm, with petioles to 1.5 mm; seeds numerous, pale brown, angled. Fl. and fr. Mar–Nov.

Tussocks or thickets on foothills, roadsides, sparse forests; 200–1600 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Philippines, Singapore, Thailand, Vietnam].

As noted under *Hedyotis tenelliflora*, *Spermacoe stricta* may be a synonym of *H. verticillata*.

W. C. Ko (in FRPS 71(1): 42. 1999) described the leaves as up to 2 cm wide; this has not been reported by other authors nor seen on any specimens.

**62. *Hedyotis vestita*** R. Brown ex G. Don, Gen. Hist. 3: 526. 1834.

脉耳草 mai er cao

*Hedyotis capituliflora* Miquel; *H. costata* (Roxburgh) Kurz (1876), not R. Brown ex G. Don (1834); *Metabolos lineatus* Bartling ex Candellet; *Spermacoe costata* Roxburgh.

Herbs, annual or perennial, diffusely branched, weak to clambering or prostrate, to 60 cm tall; stems flattened, 4-angled, or subterete, sometimes sulcate, densely villous or hirsute with trichomes drying golden yellow. Leaves subsessile to petiolate; petiole 1–10 mm, densely hirtellous to villous; blade drying membranous to papery, lanceolate, elliptic-lanceolate, or elliptic, 2–8 × 0.5–3 cm, adaxially sparsely to densely strigose and/or strigillose to hirsute on lamina and moderately to densely pilosulous on principal veins, abaxially sparsely strigillose to glabrescent on lamina and densely strigose to hirsute on principal veins, base cuneate to obtuse and frequently decurrent, apex acute to usually acuminate; secondary veins 4–6 pairs; stipules fused to petiole bases, truncate to triangular, 2–4 mm, moderately to densely hirtellous, hirsute, or villous, with 3–5 linear or setose lobes 2–5 mm. Inflorescences axillary, congested-cymose, capitate, or fasciculate, 5–20 mm, densely hirtellous to hirsute, several to many flowered, pedunculate; peduncles 1–3 per leaf axil, 2–12 mm; bracts subulate, to 1 mm. Flowers sessile or subsessile, distylous. Calyx densely hirtellous to villosulous; hypanthium portion turbinate to obconic, ca. 0.5 mm; limb lobed nearly to base; lobes lanceolate to triangular, 0.3–1 mm. Corolla white or purple, tubular to funnellform, outside puberulent to pilosulous; tube 1.2–1.5 mm, pu-

bescent in throat; lobes narrowly elliptic to triangular, 0.8–1.2 mm. Anthers 0.5–1 mm, exserted. Stigma 0.3–0.6 mm, exserted. Fruit indehiscent, subglobose, 0.8–1.5 mm in diam., pilosulous; seeds 6–8, black, trigonous. Fl. and fr. Jul–Nov.

Forest margins in valleys, open fields, grassy slopes; 400–2000 m. Guangdong, Guangxi, Hainan, Yunnan [India, Indochina, Indonesia, Malaysia, Philippines, Thailand].

This species has been treated by many previous authors under the name *Hedyotis costata*; the basionym of that name, *Spermacoe costata* Roxburgh, is indeed the oldest name for this species, but that epithet was previously occupied for another species in *Hedyotis* when Kurz published his name and, thus, was blocked from transfer.

**63. *Hedyotis wangii*** R. J. Wang, Acta Phytotax. Sin. 41: 85. 2003.

启无耳草 qi wu er cao

Herbs, annual or perennial, to 6 cm tall; stems glabrous. Leaves petiolate; petiole 3–6 mm; blade drying papery, elliptic-oblong or ovate-elliptic, 3–5 × 1.5–2.3 cm, glabrous, base obtuse, apex acute; secondary veins ca. 5 pairs; stipules broadly rounded, ca. 0.5 mm, with 3 or 4 linear to narrowly triangular lobes or bristles ca. 2 mm. Inflorescence terminal, capitate or subcapitate, pedunculate; peduncle ca. 1.7 cm; head solitary, ovoid, ca. 0.5 cm, 4- or 5-flowered; bracts linear-lanceolate, ca. 3 mm. Flowers sessile. Calyx sparsely hirtellous or pilosulous or perhaps glabrous; hypanthium portion ellipsoid to obconic, 0.8–1 mm, ribbed; limb lobed nearly to base; lobes lanceolate, narrowly triangular, or linear, ca. 2 mm. Corolla white, tubular-funnelform, inside villosulous in upper part of tube and onto lobes; tube ca. 7 mm; lobes lanceolate, ca. 1 mm. Anthers ca. 2 mm, apparently exserted. Stigmas ca. 0.8 mm, apparently exserted. Fruit capsular, subglobose, ca. 3 mm in diam., pilosulous to perhaps glabrescent; seeds numerous, angled, reticulate. Fl. and fr. Sep.

• Mixed forests; ca. 1400 m. S Yunnan (Jinghong).

The calyx (including presumably the hypanthium) was described in the protologue as pubescent but both this and the fruit are shown in the protologue figure as glabrous.

**64. *Hedyotis wuzhishanensis*** R. J. Wang, Novon 18: 266. 2008.

五指山耳草 wu zhi shan er cao

Subshrubs or shrubs, erect, perennial, to 1 m tall; stems terete, densely villous to hirtellous. Leaves petiolate; petiole 3–10 mm, densely hirtellous; blade drying papery, elliptic, ovate, or lanceolate, 2.5–6.2 × 1.4–3.3 cm, adaxially sparsely to moderately strigose to hispidulous, abaxially densely to moderately villosulous to hispidulous, base cuneate, obtuse, or rounded, apex acute; secondary veins 4 or 5 pairs, prominent abaxially; stipules persistent or perhaps tardily deciduous, interpetiolar, triangular, 1–2.5 mm, densely hirtellous, acute to aristate. Inflorescences terminal, pseudoaxillary, and/or axillary in uppermost leaf axils, subcapitate, 0.7–1.2 cm in diam., densely hirtellous, (2–)6–15-flowered, subsessile, enclosed by lanceolate bracts 5–10 mm. Flowers sessile to subsessile, biology unknown. Calyx densely hirtellous; hypanthium portion ellipsoid, ca. 1.8 mm; limb lobed essentially to base; lobes narrowly trian-

gular, 1.5–3 mm. Corolla white, tubular-funnelform, outside glabrescent; tube 5.5–6.5 mm, inside villous in upper part and throat; lobes narrowly triangular to lanceolate, ca. 2.5 mm. Anthers exserted, 1.5–2 mm. Stigmas included, 1–2 mm. Fruit capsular, ovoid, ca. 3 × 2.5 mm, densely pilosulous or hirtellous, loculicidally dehiscent then septicidal; seeds ca. 15, black, angled, ca. 0.5 mm. Fl. and fr. Oct–Dec.

- Forests; 600–1600 m. Hainan.

**65. *Hedyotis xanthochroa*** Hance, J. Bot. 23: 324. 1885.

黄叶耳草 huang ye er cao

*Oldenlandia xanthochroa* (Hance) Kuntze.

Herbs, perennial, erect, to 40 cm tall; stems obtusely 4-angled, shallowly sulcate, sparsely tomentulose, hispid, or pilosulous becoming glabrescent. Leaves sessile; blade drying stiffly papery, elliptic-oblong to ovate, 4–5.5 × 0.6–2.6 cm, adaxially sparsely to moderately scabrous to hispid on lamina and densely hispidulous to scaberulous on principal veins, abaxially hirtellous or hispidulous throughout with pubescence denser on veins, black glandular-punctate under magnification on both surfaces, base broadly rounded and somewhat amplexicaul, apex shortly acuminate; secondary veins ca. 4 pairs; stipules fused to petiole bases, triangular-lanceolate, 4–5 mm, hispidulous on margins or throughout, marginally lacinate to setose-lobed, apex acute to acuminate. Inflorescences terminal, congested-cymose to subcapitate, 1.5–4.5 cm, sparsely to densely hispid to pilosulous, several flowered, shortly pedunculate; peduncles 0.5–1.5 cm; bracts lanceolate, ovate, or narrowly elliptic, 4–8 mm; pedicels 1–4 mm. Flowers subsessile. Calyx sparsely villous; limb lobed; lobes linear-lanceolate, ca. 6 mm. Corolla dark purple, tubular, outside villous; tube ca. 5.5 mm; lobes ca. 5.5 mm. Anthers exserted. Stigma exserted. Fruit capsular, ellipsoid-oblong to obovoid, 3.5–4.5 mm, cartilaginous to papery, densely hispid to pilosulous, loculicidally and septicidally dehiscent through apical portion then sometimes splitting septicidally throughout, beak conical, ca. 1 mm, with persistent calyx lobes narrowly triangular, 5–5.5 mm, with partially persistent septal structure spongy-cartilaginous, ellipsoid, 3–3.5 mm, deeply pitted where seeds were situated; seeds several, black, triangular to irregularly angled, ca. 1 mm. Fl. Jul–Aug, fr. Dec.

- Mountain slopes in valleys at middle elevations. Guangdong.

**66. *Hedyotis yangchunensis*** W. C. Ko & Zhang, J. S. China Agric. Univ. 16(4): 45. 1995.

阳春耳草 yang chun er cao

Herbs or subshrubs, erect, to 50 cm tall; stems 4-angled to subterete, densely scabrous to smooth. Leaves petiolate, often crowded at tops of stems; petiole 15–20 mm, glabrous; blade drying thickly papery, narrowly elliptic, oblanceolate, or elliptic-oblong, (3–)8–12 × (1–)3–4.5 cm, glabrous, base acute and decurrent, apex obtuse to broadly obtuse; secondary veins 5–7 pairs; stipules broadly triangular, ca. 16 mm, lacerate or with several narrow lobes. Inflorescences and flowers not seen. Inflorescences terminal, in a panicle of congested-cymose or capitate heads; heads 2–5, hemispherical to subglobose, 2–2.3 cm in diam., several flowered, pedunculate, enclosed by a pair of ovate reduced leaves or leaflike bracts ca. 15 mm; peduncles 5–7 cm; floral bracts linear, 5–7 mm; pedicels 2–3 mm. Fruit capsular, ellipsoid or subglobose, ca. 3 × 2–2.5 mm, membranous, septicidally dehiscent then loculicidal, with calyx lobes lanceolate to elliptic, 3–3.5 mm, longitudinally veined, long acuminate; seeds several, black, angled. Fl. Apr–Jun.

- Hills, sparse forests in valleys; ca. 400 m. Guangdong (Yangchun).

**67. *Hedyotis yazhouensis*** F. W. Xing & R. J. Wang, Acta Phytotax. Sin. 41: 87. 2003.

崖州耳草 ya zhou er cao

Herbs or subshrubs, perennial, erect, to 10 cm tall; stems weakly 4-angled. Leaves sessile or subsessile, crowded at tops of stems; blade drying papery, obovate or ovate-elliptic, 8–20 × 4–12 cm, base obtuse, apex obtuse to broadly obtuse; secondary veins 5–8 pairs; stipules obtrapezoid to spatulate, 2–6 mm, lacerate with lobes ca. 1 mm. Inflorescence terminal, capitate, hemispherical, 3–5 cm in diam., several flowered, sessile to subsessile; bracts linear-lanceolate, ca. 8 mm, acute. Flowers sessile. Calyx densely puberulent; hypanthium portion ellipsoid to obovoid, 3–4 mm; limb divided essentially to base; lobes linear, ca. 35 × 1 mm. Corolla blue-purple, slenderly funnel-form, outside sparsely puberulent; tube ca. 30 mm; lobes ovate, ca. 1 mm. Stigmas included. Fruit indehiscent, ellipsoid to obovoid, ca. 3 mm, densely pilosulous; seeds 8–12, black, papillose. Fl. and fr. Oct.

- Understories of tropical rain forests; 100–300 m. S Hainan (Sanya).

**36. *HIMALRANDIA*** T. Yamazaki, J. Jap. Bot. 45: 340. 1970.

须弥茜树属 xu mi qian shu shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs, sometimes late deciduous, often with short shoots, unarmed [sometimes with spinescent short shoots]. Raphides absent. Leaves opposite, often crowded at apices of short shoots, sometimes with domatia; stipules persistent, interpetiolar, triangular. Inflorescences terminal usually on short shoots, 1-flowered, sessile or subsessile, enclosed by stipules or perhaps stipuliform bracts. Flowers bisexual, monomorphic. Calyx limb 5-lobed. Corolla pale green to pale yellow, salverform, hirsute inside tube; lobes 5, convolute in bud. Stamens 5, inserted in corolla throat, partially to fully exserted; filaments short or reduced; anthers apparently dorsifixed. Ovary 2-celled, ovules 2 or 3 in each cell on axile placentas; stigma fusiform, 2-lobed or 2-grooved, exserted. Fruit baccate, indehiscent, globose, apparently fleshy, color unknown, with calyx limb persistent; seeds 1–4, ellipsoid, medium-sized.

About three species: Afghanistan, Bhutan, China, India, Nepal, Pakistan; one species (endemic) in China.

**1. *Himalrandia lichiangensis*** (W. W. Smith) Tirvengadam, Nordic J. Bot. 3: 462. 1983.

须弥茜树 *xu mi qian shu*

*Randia lichiangensis* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 200. 1914.

Shrubs, 0.6–3 m tall, many branched; branches stout, weakly flattened to terete, rigid, pilosulous or strigillose to glabrescent. Leaves sessile or subsessile with petiole to 1 mm; blade drying papery to thinly leathery and often black, obovate or obovate-spatulate, 1–6.5 × 0.6–3.5 cm, both surfaces moderately to densely strigillose, base cuneate to obtuse, apex acute to obtuse; secondary veins 3–5 pairs, sometimes with pilosulous

domatia in abaxial axils; stipules ovate to triangular, 2.5–5 mm, densely pilosulous, acute to acuminate, often spreading to reflexed. Calyx pilosulous; hypanthium portion ellipsoid, ca. 2 mm; limb ca. 3 mm, deeply lobed; lobes triangular, ciliate, acute. Corolla yellow; tube ca. 3 mm; lobes triangular to ovate, ca. 5 mm, acute. Berry 5–6 mm in diam.; seeds 1 or 2, ca. 3 mm in diam. Fl. May, fr. Jul–Nov.

● Forests or thickets at streamsides in valleys or on mountains; 1400–2400 m. Sichuan, N Yunnan.

The stamens are described as either partially exerted, according to the description of W. C. Chen (in FRPS 71(1): 360. 1999), or fully exerted, according to the accompanying figure (p. 359, t. 94).

### 37. **HYMENODICTYON** Wallich in Roxburgh, Fl. Ind. 2: 148. 1824, nom. cons.

土连翘属 *tu lian qiao shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees [or sometimes epiphytic or lianescent], usually deciduous, unarmed; bark notably bitter. Raphides absent. Leaves opposite, usually with domatia; margins rarely irregularly lobed and/or serrate; stipules deciduous, interpetiolar, triangular to ligulate, entire or glandular-serrate, usually strongly reflexed. Inflorescence terminal and/or axillary, spiciform to racemiform or sometimes paniculate with axes racemiform or spiciform, many flowered, erect to pendulous, pedunculate, bracteate with 1–4 leaf-like to petaloid, stipitate, veined basal bracts and other bracts usually reduced [or sometimes well developed]. Flowers sessile to shortly pedicellate, bisexual, monomorphic. Calyx limb deeply 5(or 6)-lobed. Corolla white, green, yellow, or red, funnelform or narrowly campanulate, inside glabrous; lobes 5, valvate in bud, apparently often ascending or remaining partially closed at anthesis. Stamens 5, inserted in corolla tube below throat, included; filaments short, flattened; anthers basifixed, sagittate at base. Ovary 2-celled, ovules several to numerous in each cell on axile placentas; stigma fusiform or capitate, well exerted. Infructescences with pedicels and sometimes peduncles often elongating and/or becoming reflexed. Fruit capsular, ellipsoid-oblong to obovoid or ellipsoid, loculicidally dehiscent into 2 valves, woody to cartilaginous, with calyx limb deciduous; seeds numerous, medium-sized, flattened, with broad, membranous, shortly erose, basally 2-lobed wing; endosperm fleshy; embryo small; cotyledon oblong or orbicular.

Twenty-two species: Africa, tropical Asia, and Madagascar; two species in China.

The flowers apparently all open nearly simultaneously on a plant, probably within a very few days at most. The corolla lobes appear to remain partly closed when the flower is mature and the stigma well exerted; Razafimandimbison and Bremer (Bot. J. Linn. Soc. 152: 335. 2006) reported that the flowers are protandrous, so this may be a secondary position after the anthers have released their pollen and while the stigma is receptive. Occasional irregularly lobed leaves, similar to those of plants of *Hymenodictyon*, are found in a few other Rubiaceae genera (e.g., *Simira* Aublet of the Neotropics).

W. C. Chen (in FRPS 71(1): 227. 1999) described the corolla lobes as imbricate in bud and the anthers as dorsifixed, but Bridson and Verdcourt (Fl. Trop. E. Africa, Rub. (Pt. 2), 452. 1988) and Razafimandimbison and Bremer (loc. cit.) described them as valvate and basifixed, respectively, which corresponds to observations of Chinese specimens (*Henry 12150*, MO!).

- 1a. Inflorescences axillary, at each leaf axil simple, with 1 racemiform or spiciform axis; leaf blade glabrous to glabrescent on both surfaces or sometimes pilosulous abaxially ..... 1. *H. flaccidum*  
 1b. Inflorescences axillary and sometimes also terminal, simple or at least part branched and paniculate with several spiciform to racemiform axes; leaf blade pilosulous on both surfaces ..... 2. *H. orixense*

**1. *Hymenodictyon flaccidum*** Wallich in Roxburgh, Fl. Ind. 2: 152. 1824.

土连翘 *tu lian qiao*

Trees, deciduous, 6–20 m tall; bark gray, smooth; branches rather stout, weakly flattened to terete, glabrous to puberulent. Leaves often crowded at ends of branches; petiole 2.5–9 cm, puberulent or pilosulous to glabrescent; blade drying papery or thinly leathery, ovate, obovate, elliptic, or elliptic-oblong, 10–26 × 7–15 cm, glabrous to glabrescent on both surfaces or sometimes pilosulous abaxially, base acute to obtuse, margins entire or rarely serrate or lobed in distal part, apex acute to acu-

minate or rarely rounded; secondary veins 7–11 pairs, usually with pilosulous domatia; stipules ovate-oblong or triangular, 5–20 mm, densely pilosulous to glabrescent, acute to obtuse or bilobed for up to 1/2. Inflorescences axillary, simple, densely racemiform to spiciform, 10–30 cm, pilosulous to hirtellous, often pendulous; peduncle 3–5 cm; basal bracts 1 or 2, with blade leathery, ovate to elliptic-oblong or narrowly elliptic, 4–8.5 × 2–3 cm, pilosulous to glabrescent, on stipes 3–5.5 cm; pedicels 0.5–2 mm. Calyx densely puberulent; ovary portion ellipsoid, 1.2–1.5 mm; limb lobed essentially to base; lobes triangular to elliptic, 1–1.5 mm, ciliate, acute. Corolla yellow to red, densely puberulent to glabrescent outside; tube ca. 2

mm, slender and cylindrical in basal portion then abruptly inflated just below lobes; lobes ligulate to lanceolate or ovate, 2–3.5 mm, obtuse to acute. Style exserted for 2–5 mm. Fruiting pedicels to 8 mm, reflexed. Capsules dark brown, 1.2–1.5 × 0.5–0.8 cm, woody, with several prominent whitened, ellipsoid lenticels; seeds (including wing) ca. 10 × 5 mm. Fl. May–Jul, fr. Aug–Dec.

Forests or thickets at streamsides or in valleys; 300–3000 m. Guangxi, Sichuan, Yunnan [Bhutan, N India, Nepal, N Vietnam].

The name "*Hymenodictyon yunnanense*" was written by Pitard on a specimen of this species from Yunnan, China (*Ducloux* 6767, P!) but never validly published (Razafimandimbison & Bremer, Bot. J. Linn. Soc. 152: 370. 2006).

**2. *Hymenodictyon orixense* (Roxburgh) Mabberley, Taxon 31: 66. 1982.**

毛土连翘 mao tu lian qiao

*Cinchona orixensis* Roxburgh, Bot. Descr. Swietenia, 21. 1793; *C. excelsa* Roxburgh; *Hymenodictyon excelsum* (Roxburgh) Wallich.

Trees, deciduous, to 25 m tall; bark smooth, gray; branches rather stout, weakly flattened to terete, puberulent to densely pilosulous or glabrescent. Leaves often grouped near ends of branches; petiole 2–17 cm, pilosulous; blade drying papery or membranous, ovate-elliptic, elliptic, or broadly elliptic, 9–22 × 6–14 cm, both surfaces pilosulous with pubescence sometimes denser abaxially, base acute to obtuse, margins en-

tire, apex shortly acuminate or acute; secondary veins 7–10 pairs, sometimes with pilosulous domatia; stipules ovate to triangular or lanceolate, 5–20 mm, densely pilosulous, obtuse to acute or bilobed for up to 1/2. Inflorescences terminal and in axils of uppermost leaves, 15–20 cm, simple or branched at least in part, with axes densely spiciform to racemiform, pilosulous, usually pendulous; peduncles ca. 6 cm; basal bracts 2–4, with blade papery to leathery, ovate to elliptic or elliptic-oblong, 9–17 × 2–5.5 cm, pilosulous, with stipe 3–8 cm. Flowers subsessile or with pedicels to 2 mm. Calyx densely puberulent to pilosulous; ovary portion subglobose to ellipsoid, 1–1.5 mm; limb lobed essentially to base; lobes triangular to elliptic, 1–1.5 mm. Corolla white or brown, outside densely puberulent to pilosulous; tube 2.5–3.5 mm, slenderly cylindrical then abruptly inflated at lobes; lobes ligulate to lanceolate, 2–2.5 mm, acute. Style exserted for 2–5 mm. Fruiting pedicels to 10 mm, reflexed. Capsules brown, 1.2–3 × 0.5–1.1 cm, woody, with prominent whitened, elliptic lenticels; seeds (including wing) 7–8 mm. Fl. May–Jul, fr. May–Dec.

Thickets or forests at riversides, at field edges, and in valleys; 100–1700 m. Sichuan, Yunnan [Cambodia, India, Indonesia (Java), Kashmir, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

Mabberley (loc. cit.) noted that Roxburgh studied this species in India as one of several plants (in several families) for which the bitter bark was used medicinally. In India this species is used for good quality wood for furniture and small items, and its bark as a febrifuge and a source of dye (color not noted; Razafimandimbison & Bremer, Bot. J. Linn. Soc. 152: 375–377. 2006).

### 38. *HYPTIANThERA* Wight & Arnott, Prodr. Fl. Ind. Orient. 1: 399. 1834.

藏药木属 zang yao mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, unarmed. Raphides absent. Leaves opposite, decussate, apparently without domatia; stipules persistent, interpetiolar, generally triangular with apices often twisted together at 180° in bud. Inflorescences axillary, glomerulate, several flowered, sessile, bracteate. Flowers sessile, apparently bisexual or reportedly at least sometimes unisexual, fragrant. Calyx limb 4- or 5-lobed. Corolla white, shortly funnelform to subrotate, inside pubescent in throat; lobes 4 or 5, convolute in bud. Stamens 4 or 5, inserted in corolla tube, included or partially exserted; filaments short or reduced; anthers dorsifixed, pubescent on base and outer surface, with connective apically prolonged and widened. Ovary 2-celled, ovules 6–10 in each cell on axile placentas; stigma 2-lobed with lobes oblong and pubescent, exserted. Fruit baccate, fleshy, ovoid or subglobose, at least sometimes black, with calyx limb persistent; seeds several, medium-sized, flattened, angular, with testa thickly fibrous striate, with hilum terminal and rather broad; endosperm fleshy; embryo small; cotyledons ovate, flat; radicle terete.

One or a few species: China, Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Thailand, Vietnam; one species in China.

Robbrecht and Puff (Bot. Jahrb. Syst. 108: 126–127, table 8. 1986) described the flowers as unisexual, but the corresponding condition of the plants (e.g., dioecious, polygamo-dioecious) is not noted and the specimens and figures seen seem to have bisexual flowers. W. C. Chen (in FRPS 71(1): 386. 1999) did not mention unisexual flowers for this species, and the accompanying figure apparently shows bisexual flowers (p. 387, t. 102). He described the stipules as caducous, but this has not been seen on any specimens of *Hyptianthera* nor reported by other authors, and it contradicts the figure. He also described the ovules as pendulous from the top of the cell, but Robbrecht and Puff (loc. cit.: 86–91), in a detailed morphological survey focused on gynoecium characters, described them as borne on axile placentas.

**1. *Hyptianthera stricta* (Roxburgh) Wight & Arnott, Prodr. Fl. Ind. Orient. 1: 399. 1834.**

藏药木 zang yao mu

*Randia stricta* Roxburgh, Fl. Ind. 2: 145. 1824.

Shrubs or small trees, 2–8 m tall; branches flattened be-

coming angled to subterete, glabrous. Petiole 0.4–1 cm, glabrous; leaf blade drying papery or thinly leathery and usually reddish brown, oblong-lanceolate, elliptic-oblong, or lanceolate, 5–15 × 1–5 cm, adaxially glabrous and slightly shiny, abaxially glabrous or sometimes hirtellous or pilosulous along principal veins, base cuneate to acute, apex acuminate to long acuminate; secondary veins 5–9 pairs; stipules triangular to ovate, 5–8 mm,

glabrous, abaxially smooth to weakly keeled, acuminate to shortly aristate. Inflorescences 6–10 mm in diam.; bracts triangular to ovate, 1–2.5 mm, adaxially white strigose, abaxially glabrescent, marginally ciliate, acute to acuminate. Calyx with ovary portion ellipsoid, ca. 0.5 mm, glabrescent; limb outside (i.e., abaxially) strigillose to glabrescent, inside (i.e., adaxially) densely strigillose, deeply lobed, with basal tubular portion 0.5–1 mm; lobes 5, lanceolate to narrowly triangular, 1.75–2 mm,

ciliate, shortly acuminate. Corolla abaxially glabrous; tube 1–2 mm; lobes 5, spatulate to subelliptic, 1–2 mm, adaxially white strigose, obtuse or infrequently emarginate. Stigma lobes 1–2 mm. Berry yellowish green, 8–9 × 5–6 mm, puberulent to glabrous; seeds usually 8, ca. 5 × 3 mm. Fl. Apr–Aug, fr. Aug–Feb.

Forests or thickets at streamsides or on mountains; 100–1500 m. Xizang (Mêdog), Yunnan [Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

### 39. *IXORA* Linnaeus, Sp. Pl. 1: 110. 1753.

龙船花属 long chuan hua shu

Chen Tao (陈涛); Charlotte M. Taylor

*Schetti* Adanson; *Tsiangia* But, H. H. Hsue & P. T. Li.

Shrubs or small trees or occasionally perhaps climbing (*Ixora hekouensis*), unarmed. Raphides absent. Leaves opposite or rarely ternate, decussate, without domatia; petioles articulate at base; stipules persistent to caducous, interpetiolar or shortly united around stem, triangular, acute to usually aristate. Inflorescences terminal on principal stems [or sometimes terminal on reduced lateral stems and appearing axillary], cymose to corymbiform or paniculiform, few to many flowered, sessile to pedunculate, bracteate or bracts reduced; axes often articulate; bracteoles when present often fused in pairs. Flowers pedicellate or sessile, bisexual, monomorphic, often fragrant. Calyx limb truncate or 4-lobed. Corolla yellow, orange, red, or white, sometimes becoming reddened when dry, salverform with tube slender, inside glabrous or pubescent at throat; lobes 4 [rarely to 9], convolute in bud. Stamens 4, inserted at corolla throat, partially to fully exerted; filaments short or reduced; anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, pendulous from axile placentas attached in upper part of septum; style in upper portion fusiform or clavate; stigmas 2, linear, recurved, exerted. Fruit black or red, drupaceous, leathery or fleshy, subglobose to ellipsoid or ovoid, with calyx limb persistent; pyrenes 2, 1-celled, each with 1 seed, plano-convex or concavo-concave, smooth dorsally (i.e., abaxially), leathery, papery, or crustaceous; seeds medium-sized, ellipsoid to oblanceolate, grooved and concave ventrally (i.e., adaxially); testa membranous; endosperm cartilaginous; radicle terete, hypogeous.

About 300–400 species: widespread in tropical Africa, America, Asia, Madagascar, and Pacific islands; 18 species (nine endemic) in China.

*Ixora* has been studied in SE Asia only by Bremekamp; he published several articles treating the species of several regions there (cited by De Block, *Opera Bot. Belg.* 9: 213. 1998) but not specifically treating the Chinese species, although his circumscription of the region “Burma and the Andaman Islands” included some species from Xizang (Bremekamp, *J. Bot. (London)* 75: 108–111, 169–175, 260–266, 295–298, 318–326. 1937).

Several species of *Ixora* are widely cultivated in tropical regions as ornamentals, notably *I. casei* Hance, *I. coccinea* Linnaeus, *I. finlaysonian*, and sometimes *I. chinensis*. In cultivation several of these have various forms with a wide range of flower color, flower and leaf size, and plant height, and sometimes they do not set fruit. *Ixora coccinea* and *I. casei* are not treated in this current flora but are included in the key to species below for identification. Reynolds and Forster (*Austrobaileya* 7(2): 253–278. 2006) reported that *I. coccinea* is locally adventive in some parts of Australia, which may be a possibility in China. The most commonly cultivated *Ixora* species were discussed in detail by Fosberg and Sachet (*Baileya* 23(2): 74–85. 1989).

*Ixora foonchewii* was described and illustrated as having consistently 5 corolla lobes and a stout, shortly bilobed stigma, so it does not seem to belong to *Ixora*; it is provisionally included here in *Tarenna*.

#### 1a. Calyx lobes 3–6 mm.

2a. Leaves relatively narrow, 1–4 cm wide, acute to acuminate at both ends, with secondary veins 12–15 pairs; corolla tube 30–40 mm, lobes 6–7 mm ..... 18. *I. yunnanensis*

2b. Leaves not notably narrow, 3–9 cm wide, rounded to cuneate at base, obtuse, acute, or acuminate at apex, with secondary veins 9–12 pairs; corolla tube 20–30 mm, lobes 5–6 mm.

3a. Corolla lobes obtuse to rounded ..... 2. *I. cephalophora*

3b. Corolla lobes acute to subacute ..... 5. *I. finlaysonian*

#### 1b. Calyx lobes 0.1–1.5 mm.

4a. Leaves with secondary veins 5 or 6 pairs.

5a. Petioles 0–2 mm; corolla lobes 8–15 mm; flowers variously yellow to red; plants cultivated ..... *I. coccinea* (see comment above)

5b. Petioles 2–8 mm; corolla lobes 6–7 mm; flowers white; plants native ..... 7. *I. hainanensis*

4b. Leaves with secondary veins 7–16 pairs.

6a. Petioles 10–20 mm, at least some of them more than 10 mm.

7a. Leaves shallowly bullate with principal veins impressed on puffy upper surface; corolla white to pink.

8a. Corolla tube 30–40 mm, lobes 5–7 mm ..... 12. *I. nienkui*

8b. Corolla tube 15–18 mm, lobes ca. 5 mm ..... 17. *I. tsangii*

- 7b. Leaves plane, with principal veins flat to prominent on flat upper surface; corolla red, purple, yellow-orange, pink, or white.
- 9a. Corolla red, tube ca. 10 mm, lobes ca. 5 mm ..... 13. *I. paraopaca*
- 9b. Corolla white, pink, yellow-orange, or red, tube 25–40 mm, lobes 5–15 mm.
- 10a. Stems relatively stout, youngest sections 3–5 mm in diam.; plants cultivated ..... *I. casei* (see comment above)
- 10b. Stems slender, youngest sections 1–3 mm in diam.; plants native.
- 11a. Corollas yellow-orange to red, with lobes 10–12 mm; stipule body (i.e., triangular portion) 2–3 mm ..... 6. *I. fulgens*
- 11b. Corollas white to pink, with lobes 5–7 mm; stipule body 3–10 mm ..... 12. *I. nienkui*
- 6b. Petioles 0–10 mm, at least some of them shorter than 10 mm.
- 12a. Leaves sessile or subsessile with petioles up to 4 mm, base cordate, cordulate, truncate, cuneate, rounded, or obtuse.
- 13a. Corollas red-purple, tube 8–9 mm, lobes 4–5 mm ..... 11. *I. longshanensis*
- 13b. Corollas white, red, or purple, tube 13–45 mm, lobes 5–7.2 mm.
- 14a. Corolla lobes broadly obtuse to rounded ..... 3. *I. chinensis*
- 14b. Corolla lobes acute to obtuse.
- 15a. Leaves 10–23 × 5.5–9 cm ..... 1. *I. auricularis*
- 15b. Leaves 4.5–12 × 2–7 cm.
- 16a. Corolla lobes obtuse ..... 14. *I. philippinensis*
- 16b. Corolla lobes acute ..... 15. *I. subsessilis*
- 12b. Leaves with petioles 2–10 mm, base rounded, cordulate, cuneate, obtuse, truncate, or acute.
- 17a. Peduncle ca. 14 cm ..... 10. *I. insignis*
- 17b. Peduncle 0.4–5 cm.
- 18a. Inflorescences with tertiary and often also quaternary axes well developed and spreading at 45°–90° or more; corolla tube 7–11 mm ..... 4. *I. effusa*
- 18b. Inflorescences with tertiary and quaternary axes developed to reduced and ascending at less than 45°; corolla tube 18–40 mm.
- 19a. Corolla lobes ovate, elliptic, or broadly elliptic, at apex broadly obtuse to rounded ..... 3. *I. chinensis*
- 19b. Corolla lobes elliptic-oblong, narrowly elliptic-oblong, ovate-lanceolate, narrowly spatulate, narrowly lanceolate, or oblong-lanceolate, at apex obtuse to acute.
- 20a. Calyx puberulent or glabrescent; corolla tube 18–20 mm, lobes 5–7 mm.
- 21a. Leaves 10–18 cm, at base cuneate to obtuse, at apex acuminate to acute; bracts 3.5–5 mm ..... 8. *I. hekouensis*
- 21b. Leaves 4.5–10 cm, at base truncate, rounded, or cordulate, at apex obtuse or rounded and apiculate; bracts 1.5–2 mm ..... 14. *I. philippinensis*
- 20b. Calyx glabrous; corolla tube 20–40 mm, lobes 5–7 mm.
- 22a. Leaves 15–17 × 6.5–7.5 cm; stipules villous adaxially ..... 16. *I. tibetana*
- 22b. Leaves 4–15 × 1–5 cm; stipules glabrescent adaxially.
- 23a. Low to medium-sized plants, flowering at 0.2–3 m tall; leaves rounded, obtuse, or bluntly acute at apex; corollas with tube 30–40 mm, in bud acute to rather sharply acute ..... 7. *I. hainanensis*
- 23b. Medium-sized shrubs, flowering at 1–3 m tall; leaves sharply acute to acuminate at apex; corollas with tube 20–25 mm, in bud sharply acute to acuminate ..... 9. *I. henryi*

**1. *Ixora auricularis*** Chun & F. C. How ex W. C. Ko, Guihaia 19: 99. 1999.

耳叶龙船花 *er ye long chuan hua*

Shrubs or small trees, to 6 m tall; branches glabrous. Leaves opposite, sessile or subsessile; blade drying thinly papery, brown adaxially, pale abaxially, oblanceolate, oblong-elliptic, or obovate-elliptic, 10–23 × 5.5–9 cm, glabrous on both surfaces, base cordate-auriculate, apex shortly acuminate; secondary veins 10–13 pairs; stipules ovate to broadly triangular, 7–18 mm, abruptly narrowed and aristate. Inflorescences

terminal, corymbose, 6–15 cm wide; peduncle 3–5 cm, articulate near base, at articulation with reduced leaves ca. 3 cm; bracteoles linear-lanceolate, ca. 1 mm; pedicels 2–3 mm. Flowers sessile or pedicellate. Calyx with hypanthium obconic; limb deeply lobed; lobes ligulate. Corolla purplish red; tube 20–30 mm, glabrous at throat; lobes oblanceolate-oblong, 7–7.2 × 3–3.5 mm, acute. Drupe globose, 6–8 mm in diam. Fl. May–Jun.

• Broad-leaved forests or thickets at middle elevations; ca. 1100 m. Yunnan.

The protologue text described the calyx “post anthesis” as 2–2.5 mm, but the protologue figure illustrated it as 4 mm at anthesis.

**2. *Ixora cephalophora* Merrill, J. Arnold Arbor. 23: 194. 1942.**团花龙船花 *tuan hua long chuan hua*

Shrubs, 1–2 m tall; branches glabrous. Leaves opposite; petiole 1–2 cm, glabrous; blade drying olive-green adaxially, paler abaxially, elliptic-oblong, oblanceolate, or oblong-lanceolate, 10–25(–30) × 4–6(–8) cm, base cuneate, apex obtuse to broadly acuminate; secondary veins 9 or 10 pairs; stipule broadly ligulate to ovate, 3–5 mm, obtuse to rounded with arista ca. 3 mm. Inflorescences subsessile, congested-cymose to congested-corymbiform, ca. 17 × 9 cm; secondary axes 1–1.2 cm; bracts oblong-lanceolate to lanceolate, 2.5–5 mm, acuminate; pedicels 1–2 mm. Flowers sessile or pedicellate. Calyx with hypanthium subglobose, 1.5–2 mm; limb lobed deeply; lobes oblong-lanceolate to lanceolate, 4–5 × 1.5–2 mm, obtuse to acute. Corolla white; tube 20–25 mm, glabrous at throat; lobes elliptic or elliptic-oblong, 5–6 × 2.5–4 mm, obtuse to rounded. Drupe reddish yellow to red, subellipsoid and weakly compressed, ca. 11 × 9 mm. Fl. May, fr. Sep.

Thickets or shady broad-leaved forests at low elevations, or sometimes on open sandy lands. Guangxi, Hainan, Yunnan [Indochina, Philippines].

**3. *Ixora chinensis* Lamarck, Encycl. 3: 344. 1789.**龙船花 *long chuan hua*

*Gaertnera hongkongensis* Seemann; *Ixora crocata* Lindley; *I. stricta* Roxburgh; *I. stricta* var. *incarnata* Benth; *Pavetta kroneana* Miquel; *Sykesia hongkongensis* (Seemann) Kuntze; *Tsiangia hongkongensis* (Seemann) But, H. H. Hsue & P. T. Li.

Shrubs, 0.8–2 m tall; branches glabrous. Leaves opposite, sometimes apparently in whorls of 4 due to reduced stem internodes, sessile or petiolate; petiole to 5 mm, glabrous; blade drying leathery, oblanceolate, oblong-oblanceolate, obovate, elliptic-oblong, or lanceolate, 6–18 × 3–6 cm, glabrous on both surfaces, base cuneate to shortly truncate or rounded, apex obtuse or rounded to acute; secondary veins 7–9 pairs; stipules persistent, united around stem to almost interpetiolar, triangular to broadly triangular, 3–7 mm, glabrous to glabrescent, costate, acute and with arista 2–10 mm. Inflorescence terminal, congested-cymose to congested-corymbiform, many flowered, puberulent to hirtellous, subsessile to pedunculate; peduncle to 1.5 cm, often subtended by 2 reduced leaves or leaflike bracts; branched portion 1–4 × 1–5 cm (not including corollas); bracts triangular, 0.2–1 mm; pedicels to 2 mm. Flowers subsessile to pedicellate. Calyx glabrous; hypanthium obconic to ovoid, 1–1.5 mm; limb deeply lobed; lobes triangular to ligulate, 0.5–1 mm, acute or obtuse. Corolla red or reddish yellow, outside glabrous; tube 20–30 mm, glabrous in throat; lobes ovate, elliptic, or broadly elliptic, 5–7 × 4–5 mm, broadly obtuse to rounded. Drupe reddish black, subglobose and shallowly didymous, 6–7 × 6–7 mm, glabrous. Fl. May–Jul and Dec, fr. Sep–Oct.

Thickets, sparse forests; 200–800 m. Fujian, Guangdong, Guangxi [Indonesia, Malaysia, Philippines, Vietnam; widely cultivated in tropical regions].

This is a commonly collected species of *Ixora* in China, apparently growing naturally as well as in cultivation. The occasional short stem internodes, which sometimes produce congested groups of leaves, appear to possibly be due to a change in growth pattern at the top of a seasonal spurt that includes several internodes. The circumscription and characters of this species were considered in some detail by Fosberg and Sachet (Baileya 23(2): 77. 1989), who noted that it is sometimes cultivated. Bridson (Kew Bull. 55: 1011–1012. 2000) studied the identity of *Tsiangia*, and formally synonymized its only species, *T. hongkongensis*, with *I. chinensis*.

**4. *Ixora effusa* Chun & F. C. How ex W. C. Ko, Fl. Hainan. 3: 580. 1974.**散花龙船花 *san hua long chuan hua*

Shrubs, ca. 1 m tall; branches glabrous. Leaves opposite; petiole 0.5–1 cm, glabrous; blade drying thinly papery to papery and olive-greenish brown, oblanceolate to oblong, 10–18 × 3–7 cm, both surfaces glabrous, base cuneate to obtuse, apex acute or obtuse; secondary veins 8 or 9 pairs; stipules persistent, shortly fused around stem to subinterpetiolar, triangular, 2–8 mm, glabrous, obtuse to acute with arista 2–9 mm. Inflorescence terminal, corymbiform, 7–11 cm wide, lax, with axes usually spreading at 45°–90°, glabrous; peduncle 0.5–4 cm, articulate and with reduced leaves near base; bracts linear, narrowly triangular, or ligulate, 0.5–5 mm; pedicels to 10 mm. Flowers sessile to pedicellate. Calyx glabrous; hypanthium turbinate, ca. 1 mm; limb deeply lobed; lobes lanceolate to ligulate, 1–1.4 mm, acute to rounded. Corolla white or pale purple; tube 7–11 mm, glabrous at throat; lobes narrowly lanceolate, 5–9 × ca. 2.3 mm, acute. Drupe subglobose, 8–9 mm in diam., glabrous. Fl. Apr–May.

Forests at middle elevations; ca. 500 m. Guangxi, Hainan [Vietnam].

**5. *Ixora finlaysonian* Wallich ex G. Don, Gen. Hist. 3: 572. 1834.**薄叶龙船花 *bao ye long chuan hua*

Shrubs or small trees, to 5–6 m tall; branches glabrous. Leaves opposite; petiole 4–10 mm, glabrous; blade drying rather leathery, elliptic-oblong, elliptic, oblanceolate, obovate, or oblong-lanceolate, 10–17(–20) × 3–6(–9) cm, glabrous on both surfaces, base cuneate to obtuse, apex obtuse to acute; secondary veins 8–12 pairs; stipules usually persistent, interpetiolar or usually united around stem, broadly ovate to triangular, 3–6 mm, glabrous, acute or with arista 0.3–3.5 mm. Inflorescences terminal, corymbiform to densely cymose, puberulent, subsessile to pedunculate; peduncle to 4.5 cm; branched portion 2.5–4 × 3–5 cm (not including corollas); bracts lanceolate, elliptic, or narrowly ligulate, 8–10 mm, obtuse to acute. Flowers sessile or subsessile. Calyx glabrous; hypanthium ellipsoid to subglobose, 1–1.5 mm; limb deeply lobed; lobes elliptic, narrowly elliptic, or oblanceolate, 4–6 mm, acute. Corolla white, outside glabrous; tube 20–30 mm, glabrous at throat; lobes narrowly elliptic to oblanceolate, 5–6 × 1.2–3 mm, acute to subacute. Drupe subglobose and often weakly didymous, 6–8 mm in diam., glabrous. Fl. Apr–Oct, fr. Sep.

Sparse forests at low elevations; 100–1100 m. Guangdong, Hainan, Yunnan [NE India (Assam), Indochina, Philippines, Thailand; widely cultivated in tropical zones worldwide].

The name of this species is sometimes spelled incorrectly as "*findlaysoniana*." This species is native in our region and also widely cultivated in warm tropical regions worldwide.

**6. *Ixora fulgens* Roxburgh, Hort. Bengal. 10. 1814.**

亮叶龙船花 liang ye long chuan hua

*Pavetta fulgens* (Roxburgh) Miquel.

Shrubs; branches glabrous. Leaves opposite; petiole 10–18 mm, glabrous; blade drying dark brown, shiny, oblong-lanceolate, lanceolate, elliptic, or narrowly elliptic, (9–)15–22 × (2–) 3–4 cm, both surfaces glabrous, base cuneate to obtuse, apex acute to long acuminate; secondary veins 8–10 pairs; stipules persistent, shortly united around stem, ovate, 2–3 mm, acute with arista 3–5 mm. Inflorescences terminal, corymbose, 12–17 cm wide, puberulent to hirtellous; peduncle ca. 1 cm; bracts narrowly triangular, 1–1.5 mm; pedicels 0.5–3 mm. Flowers pedicellate. Calyx glabrescent; hypanthium ellipsoid, ca. 1.5 mm; limb lobed for up to ca. 1/2; lobes subtriangular, 0.5–1 mm, obtuse. Corolla orange-yellow to dark red, outside glabrous; tube 25–30 mm, in throat glabrous; lobes ovate, lanceolate, or elliptic, 10–12 mm, acute. Drupe globose, 9–10 mm in diam., glabrescent. Fl. Jul–Sep.

On wet soil in sparse forests. Yunnan [India, Indonesia, Myanmar, Philippines, Vietnam].

The application of this name has apparently varied among authors. Bremekamp (J. Bot. (London) 75: 111. 1937) discussed the differing usage, noting that the original description was based on a plant cultivated in the Calcutta Botanical Garden and of incorrectly attributed (in his view) provenance. Plants from the Philippines have petioles as short as 5 mm and corolla lobes up to 40 mm.

W. C. Ko (in FRPS 71(2): 42. 1999) described the branches as sometimes with epidermis strips peeling off; this has not been reported by others nor seen on specimens. Ko also described the secondary leaf veins as 18–25 pairs (p. 43); that count seems to include the often rather well-developed intersecondary veins together with the secondary veins.

**7. *Ixora hainanensis* Merrill, Lingnan Sci. J. 6: 287. 1930.**

海南龙船花 hai nan long chuan hua

*Ixora pygmaea* Merrill & F. P. Metcalf.

Shrubs, 0.2–3 m tall; branches glabrous. Leaves opposite; petiole 2–8 mm, glabrous; blade drying papery to subleathery, dry dark green, slightly shiny to matte, elliptic-oblong, elliptic, or oblanceolate, 4–10(–14) × 1–5 cm, glabrous on both surfaces, base cuneate, rounded, or subcordate, apex rounded, obtuse, or bluntly acute; secondary veins 5–10 pairs; stipules persistent, shortly united around stem or subinterpetiolar, triangular to ovate, 4–10 mm, glabrous, long acute with apical portion 3–10 mm, at least sometimes glandular at tip. Inflorescence terminal, corymbiform to cymose, many flowered, glabrous; peduncle 1–4 cm; branched portion 2–3 × 2–5 cm (not including corollas); bracts linear-oblong, 1–3.5 mm; pedicels 0.5–3 mm. Flowers pedicellate. Calyx glabrous; hypanthium ellipsoid to obconic, 1–1.5 mm; limb deeply lobed; lobes triangular to ovate or lanceolate, 1–1.5 mm, acute to acuminate. Corolla white, outside glabrous; tube 30–40 mm, villous in throat; lobes narrowly spatulate to oblanceolate, 6–7 × 1–2 mm, acute. Drupe red, subglobose to ellipsoid, weakly compressed and didymous, ca. 6 × 6–8 mm, glabrous. Fl. May–Dec, fr. Jan, Oct–Dec.

• On sandy soil at streamsides in dense forests; 100–1100 m. Guangdong, Hainan.

The name *Ixora pygmaea* was synonymized by W. C. Ko in FRPS (71(2): 43. 1999); Merrill and Metcalf in fact suggested in the protologue that it might only be a depauperate form of *I. hainanensis*. The leaves are rather variable in shape, usually on the same plant as noted in the protologue.

**8. *Ixora hekouensis* Tao Chen, nom. nov.**

河口龙船花 he kou long chuan hua

Replaced synonym: *Ixora gracilis* W. C. Ko, Guihaia 19: 103. 1999, not *Ixora gracilis* R. Brown ex Fawcett in H. O. Forbes, Nat. Wand. E. Archip. 508. 1885, nor *Ixora gracilis* (A. Richard ex Candolle) Kuntze, Revis. Gen. Pl. 1: 286–287. 1891 [*Pavetta gracilis* A. Richard ex Candolle, Prodr. 4: 492. 1830].

Climbing shrubs. Stems glabrous. Leaves opposite; petiole 4–6 mm; blade drying papery and grayish brown, elliptic-oblong to obovate, 10–18 × 3–7 cm, base cuneate to obtuse, apex rather abruptly contracted and acute to acuminate; secondary veins 7–9 pairs; stipules persistent, ovate, 6–7 mm, with arista slightly longer than stipule. Inflorescences terminal, corymbose, 7–8 × 3.5–5 cm, several flowered, puberulent; peduncle 3–5 cm; bracts narrowly lanceolate, 3.5–5 mm; pedicels 2–3 mm. Flowers pedicellate. Calyx puberulent; hypanthium subglobose, ca. 2 mm; limb deeply lobed; lobes triangular, 1–1.2 mm. Corolla white; tube 18–20 mm, glabrous at throat; lobes narrowly elliptic-oblong, 5–6 mm, obtuse. Drupe unknown. Fl. Jun–Aug.

• Dense forests at riversides; ca. 200 m. Yunnan (Hekou).

The reported climbing habit of this species is highly unusual in *Ixora*; however, W. C. Ko did not use that character in the protologue to help distinguish this species.

**9. *Ixora henryi* H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 178. 1914.**

白花龙船花 bai hua long chuan hua

Shrubs, 1–3 m tall; branches glabrous. Leaves opposite; petiole 3–7 mm, glabrous; blade drying papery, elliptic-oblong, lanceolate, lanceolate-oblong, or elliptic, 5–15 × 1.5–4 cm, glabrous on both surfaces, base cuneate, obtuse, or rounded, apex sharply acute to usually acuminate; secondary veins 7 or 8 pairs; stipules persistent or sometimes fragmenting, triangular to ovate, 5–8 mm, glabrous, shortly obtuse to narrowed and prolonged into arista 3–11 mm. Inflorescence terminal, corymbiform to congested-cymose, many flowered, glabrous; peduncle 0.4–1.5 cm; branched portion 1.5–4 × 2–7 cm (not including corollas); bracts linear or linear-lanceolate, 0.8–3 mm; pedicels to 2.5 mm. Flowers subsessile to pedicellate. Calyx glabrous; hypanthium ellipsoid, 1–1.8 mm; limb deeply lobed; lobes triangular, 0.5–1 mm, acute. Corolla white sometimes becoming dark red when dry, outside glabrous; tube 20–25 mm, glabrous in throat; lobes narrowly oblong to narrowly lanceolate, 5–6 × 1.6–2 mm, acute. Drupe subglobose, 8–10 mm in diam. Fl. Apr–Dec, fr. May–Jul.

Broad-leaved forests, streamsides at forest margins; 200–2000 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Thailand, Vietnam].

**10. *Ixora insignis*** Chun & F. C. How ex W. C. Ko, Guihaia 19: 97. 1999.

长序龙船花 chang xu long chuan hua

Small trees, height not noted; branches glabrous. Leaves opposite; petiole 7–10 mm; blade drying membranous, elliptic-oblong to oblong-oblongate, 10–14 × 4–5 cm, glabrous, base cuneate, obtuse, or rounded, apex abruptly shortly acuminate; secondary veins 10–12 pairs; stipules triangular, 5–8 mm, with arista almost as long as sheath. Inflorescence terminal, corymbiform, puberulent; peduncle ca. 14 cm, articulate below middle, at articulation with pair of reduced leaves (or leaflike bracts) ovate to oblong-ovate, ca. 4 × 2.5 cm; branched portion 6–7 cm wide; secondary axes 1.5–1.8 cm; bracts linear-subulate, 0.5–3 mm; pedicels to 1.5 mm. Flowers sessile or pedicellate. Calyx puberulent; hypanthium obconic to ellipsoid, ca. 0.5 mm; limb deeply lobed; lobes narrowly elliptic-oblong, 1.3–1.5 mm, obtuse. Corolla in bud up to 2 cm with lobes up to 6 mm, obtuse. Drupe not seen. Fl. May.

• Mountains; ca. 1600 m. Yunnan (Hekou).

The “reduced leaves” borne on the peduncle that were mentioned in the protologue to characterize this species are called by some authors “foliaceous bracts.”

**11. *Ixora longshanensis*** Tao Chen, *nom. nov.*

龙山龙船花 long shan long chuan hua

Replaced synonym: *Ixora amplexicaulis* C. Y. Wu & W. C. Ko, Guihaia 19: 98. 1999, not *Ixora amplexicaulis* Gillespie, Bull. Bernice P. Bishop Mus. 74: 30. 1930.

Small trees, to 6 m tall; branches glabrous, drying brown. Leaves opposite, sessile; blade drying thinly leathery or thickly papery, brown, paler abaxially, elliptic to oblanceolate, (2–)13–15 × (1–)5–6 cm, glabrous on both surfaces, base cordulate and amplexicaul, apex acute to acuminate; secondary veins 10–15 pairs; stipules subulate to triangular, ca. 7 mm, glabrous, acute to acuminate. Inflorescence terminal, corymbiform, puberulent, red to purple-red; peduncle 1.5–3.5 cm, often articulate near base, at articulation bearing reduced leaves ca. 2 × 0.5–0.7 cm; secondary axes 2.5–3 cm; bracts subulate, 1.5–2 mm. Flowers subsessile to pedicellate. Calyx with hypanthium obconic, ca. 2 mm; limb deeply lobed; lobes triangular, obtuse. Corolla in bud red-purple; tube 8–9 mm or longer, glabrous at throat; lobes lanceolate, 4–5 mm or longer, cuneate. Drupe unknown.

• Dense forests in valleys or at streamsides. S Yunnan.

**12. *Ixora nienkui*** Merrill & Chun, Sunyatsenia 2: 324. 1935.

泡叶龙船花 pao ye long chuan hua

Shrubs, 1–3 m tall; branches glabrous. Leaves opposite; petiole 10–15 mm, glabrous; blade drying papery, oblong-lanceolate, elliptic-oblong, or oblong-oblongate, 10–23 × 3–7 cm, both surfaces glabrous, sometimes shallowly bullate, base rounded, obtuse, or cordulate, apex acuminate to rather long acuminate; secondary veins 10–15 pairs; stipules deciduous, united around stem, 3–10 mm, glabrous, acute with arista 2–5 mm. Inflorescences terminal, corymbiform, many flowered, pu-

berulent, dark red, subsessile to shortly pedunculate; peduncle to 0.6 cm; secondary axes 1–2.5 cm; bracts linear-lanceolate to linear, 1–3 mm; pedicels 1–6 mm. Flowers pedicellate. Calyx glabrous; hypanthium ellipsoid, tube 1.5–1.8 mm; limb lobed nearly to base; lobes triangular, ca. 1 mm. Corolla white or pink, outside glabrous; tube 30–40 mm, glabrous at throat; lobes lanceolate, 5–7 mm, acute. Drupe bright red, globose, 7–8 mm in diam., glabrous. Fl. Jul–Oct, fr. Jun–Oct.

Woods, forested ravines, streamsides; 400–1000 m. Guangdong, Guangxi, Hainan [Vietnam].

**13. *Ixora paraopaca*** W. C. Ko, Guihaia 19: 101. 1999 [*“paraopara”*].

版纳龙船花 ban na long chuan hua

Shrubs, to 2 m tall; branches glabrous, lenticellate, striate. Leaves opposite; petiole 1–1.5 cm; blade drying thickly papery, opaque, dark green, oblong-lanceolate, 10–16 × 3–4.5 cm, base obtuse, apex cuneate, acute, or acuminate; secondary veins 14–16 pairs; stipules triangular, ca. 10 mm, acute with arista ca. 3 mm. Inflorescence terminal, corymbiform-cymose, 8–9 × 9–10 cm, puberulent; peduncle 0.1–0.5 cm; bracts linear-lanceolate to linear, 3–5 mm. Flowers sessile to subsessile. Calyx puberulent; hypanthium turbinate, ca. 2 mm; limb deeply lobed; lobes broadly triangular, ca. 1 mm, obtuse. Corolla red, outside glabrous; tube ca. 10 mm, glabrous inside; lobes narrowly oblong, 4–5 mm, obtuse to subrounded. Drupe unknown. Fl. Apr–Jun.

• Sparse forests on gentle hill slopes. Yunnan (Xishuangbanna).

This name was originally published with the spelling “*paraopara*,” a correctable typographical error as evidenced by the diagnosis, which states that this new species is related to *Ixora opaca* R. Brown ex G. Don. The protologue text described the corolla tube as 1 mm long, but this seems to be shown as 1 cm in the protologue figure.

**14. *Ixora philippinensis*** Merrill, Philipp. J. Sci., C, 5: 238. 1910.

小仙龙船花 xiao xian long chuan hua

Shrubs or small trees; branches glabrous [to densely puberulent in Philippine plants]. Leaves opposite, sessile to shortly petiolate; petiole to 0.4 cm, glabrous [to densely puberulent in Philippine plants]; blade drying thinly papery and dark brown, elliptic, elliptic-oblong, or elliptic-ovate, 4.5–10 × 2–7 cm, glabrous [or puberulent along midrib abaxially in Philippine plants], base truncate, rounded, or cordulate, apex obtuse to rounded and usually apiculate; secondary veins 8–11 pairs; stipules deciduous, very shortly united around stem, lanceolate to broadly triangular, 2–5 mm, glabrous, acuminate. Inflorescences terminal, congested-cymose, 1–2 cm wide (not including corollas), few flowered, puberulent to glabrous; peduncle 1–1.5 cm, usually subtended by a pair of reduced, ovate or subovate, cordate leaves 0.5–3 cm; bracts ovate-lanceolate to narrowly triangular, 1.5–2 mm, acuminate. Flowers subsessile to sessile. Calyx puberulent to glabrescent; hypanthium ellipsoid, ca. 1 mm; limb 0.5–1 mm, shallowly lobed; lobes dentiform. Corolla white to pink, outside puberulent; tube 18–20 mm; lobes elliptic-oblong, ca. 7 × 3.5 mm, obtuse. Drupe ovoid, didymous, weakly compressed, ca. 1 cm, red when dry. Fl. Jun–Aug.

Broad-leaved forests. Taiwan [Philippines].

**15. *Ixora subsessilis*** Wallich ex G. Don, Gen. Hist. 3: 572. 1834.

囊果龙船花 nang guo long chuan hua

Shrubs or small trees, 2–2.5 m tall; branches glabrous. Leaves opposite, subsessile; blade drying thinly leathery, lanceolate, elliptic, or oblanceolate, 10–12 × 3–4 cm, glabrous on both surfaces, base obtuse, apex long acuminate; stipules glabrous, long acuminate with apex subulate or linear, longer than sheath. Inflorescences subsessile, corymbiform and trichotomous, several flowered; axes slender; bracts subulate or linear. Calyx with hypanthium ca. 1 mm; lobes linear, 0.8–1.3 mm. Corolla tube 13–45 mm, glabrous in throat; lobes narrowly elliptic-oblong, acute. Drupe saccate, 8–8.4 mm in diam.

Sparse forests; 1200–1500 m. Xizang (Mêdog) [India, S Thailand].

W. C. Ko (in FRPS 71(2): 33. 1999) described this species as highly variable, in particular in leaf shape, in the corolla tubes ranging 13–45 mm, and in the stigma varying from bilobed to entire; this range of variation is indeed rather unusual.

**16. *Ixora tibetana*** Bremekamp, J. Bot. 75: 261. 1937.

西藏龙船花 xi zang long chuan hua

Shrubs or small trees; branches glabrous, 2–2.5 mm in diam. Leaves opposite; petiole 0.65–0.8 cm, glabrous; blade drying green or markedly discolorous, opaque, elliptic or ovate, 15–17 × 6.5–7.5 cm, glabrous on both surfaces, base cuneate to acute, apex acuminate; secondary veins ca. 11 pairs; stipules shortly fused around stem, triangular, glabrescent except adaxially villous, aristate. Inflorescence terminal, corymbiform, tripartite, sparsely puberulent, 75–100-flowered; peduncle 0.7–0.8 cm, with reduced leaves at base; secondary axes 4.5–5 cm; bracts filiform, reduced; pedicels to 1 mm. Flowers sessile to shortly pedicellate. Calyx glabrous; limb lobed to base; lobes lanceolate, ca. 1.5 mm, subacute. Corolla white, glabrous throughout; tube ca. 24 mm; lobes ovate-lanceolate, ca. 5.5 × 2.5 mm, acute. Drupe unknown.

● 1200–1500 m. SE Xizang.

**17. *Ixora tsangii*** Merrill ex H. L. Li, J. Arnold Arbor. 24: 456. 1943.

上思龙船花 shang si long chuan hua

Small shrubs, to 1 m tall; branches glabrous. Leaves opposite; petiole 1–1.8 cm, glabrous; blade olive-green when fresh, drying papery and dark brown, oblong-lanceolate to elliptic, 7–20 × 2.5–6 cm, glabrous on both surfaces, shallowly bullate, base cuneate to obtuse, apex acute to long acuminate; secondary veins 9–16 pairs; stipules deciduous through fragmentation, interpetiolar or shortly united around stem, ovate to ligulate-triangular, 2–8 mm, glabrous, rounded with arista 2–6 mm. Inflorescences terminal, corymbiform, trichotomous, lax, sessile to subsessile, sparsely to densely puberulent; branched portion 3–3.5 × 3–3.5 cm; bracts linear-lanceolate to narrowly triangular, 1–3 mm, acuminate; pedicels 3–5 mm. Flowers pedicellate. Calyx glabrous; hypanthium ellipsoid, ca. 1.5 mm; limb deeply lobed; lobes ovate to triangular, ca. 1 mm, acute to acuminate. Corolla white, outside glabrous; tube 15–18 mm, glabrous at throat; lobes elliptic, ca. 5 mm, obtuse to subrounded. Drupe unknown. Fl. Sep.

● Shady thickets. Guangxi (Shangsi).

**18. *Ixora yunnanensis*** Hutchinson in Sargent, Pl. Wilson. 3: 412. 1916.

云南龙船花 yun nan long chuan hua

Shrubs, to 1 m tall, little branched; branches glabrous. Leaves opposite or ternate; petiole 2–10 mm, glabrous; blade drying papery, grayish green, narrowly oblanceolate or narrowly elliptic-oblong, 7–22 × 1–3(–4) cm, glabrous on both surfaces, base acute and decurrent, apex acute to long acuminate; secondary veins 12–15 pairs; stipules persistent, shortly united around stem, triangular to broadly ovate, 3–5 mm, glabrous, acute with arista 2–4.5 mm inserted below top of stipule, sometimes shortly bilobed. Inflorescences terminal, subsessile, corymbiform to congested-cymose, 2–4 × 2.5–4 cm (not including corollas), puberulent to glabrescent, subsessile to pedunculate; peduncle to 0.5 cm; bracts lanceolate to narrowly triangular, 2–6 mm, acute; pedicels to 2 mm. Flowers sessile to shortly pedicellate. Calyx puberulent; hypanthium turbinate, 1.5–2 mm; limb deeply lobed; lobes linear-lanceolate, 3–4 mm, subacute to acute. Corolla white; tube 30–40 mm; lobes narrowly elliptic-oblong, 6–7 × 2–2.5 mm, obtuse. Drupe red, ellipsoid-oblong, somewhat compressed and didymous, ca. 10 × 8 mm. Fl. May.

● Dense forests at humid riversides. Yunnan.

#### 40. *KEENANIA* J. D. Hooker, Fl. Brit. India 3: 101. 1880.

溪楠属 xi nan shu

Chen Tao (陈涛); Charlotte M. Taylor

Herbs or subshrubs, unarmed. Raphides apparently present. Leaves opposite, perhaps without domatia; stipules caducous or usually persistent, interpetiolar, triangular, usually aristate, sometimes somewhat inflated. Inflorescences terminal or sometimes pseudoaxillary, capitate, several to many flowered, pedunculate, bracteate with basalmost bracts usually involucrate and remaining bracts often well developed and paired. Flowers sessile, presumably bisexual, biology unknown. Calyx limb 4-, 5-, or sometimes 6-lobed with lobes sometimes unequal, sometimes imbricate in bud, sometimes gland-tipped. Corolla white or yellow, funnelform with tube sometimes inflated, inside pubescent in upper part and throat; lobes 4, 5, or sometimes 6, ovate and acuminate, valvate in bud. Stamens 5, inserted at corolla base, included or partially exserted; filaments short to developed; anthers dorsifixed near base. Ovary 2-celled, ovules numerous in each cell on globose, peltate, axile placentas; stigma 2-lobed, included or exserted. Fruit unknown.

About five species: Cambodia, S China, India, Laos, Myanmar, Thailand, Vietnam; two species (one endemic) in China.

This genus is not well known or documented. Puff et al. (Rubiaceae of Thailand, 180. 2005) described the flowers as “unisexual (?)” though they did not say whether the plants are dioecious, and suggested that the fruit of *Keenania* will eventually be found to be capsular. The absence of raphides was implied by the placement of this genus in the Iseriaceae in FRPS (71(1): xiii. 1999), but raphides are clearly evident on specimens referred to *K. ophiorrhizoides* Drake from Vietnam (MO!) and thus are provisionally cited for the genus.

- 1a. Peduncles less than 0.5 cm; involucre bracts narrowly lanceolate or linear, 10–15 mm ..... 1. *K. flava*  
 1b. Peduncles 1–3.5 cm; involucre bracts orbicular, elliptic-oblong, or subovate, 6–7 mm ..... 2. *K. tonkinensis*

### 1. *Keenania flava* H. S. Lo, sp. nov.

黄溪楠 huang xi nan

Type: China. Guangxi: Napo, Xiahua, Baikan, on slope, 21 Apr 1977, C. X. Luo 3-5491 (holotype, GXMI – bar code 050450).

Validating Latin description: that of “*Koenania* [sic!] *flava* Lo” (H. S. Lo, Bull. Bot. Res., Harbin 18: 282–283. 1998).

Suffrutescent unbranched herbs, to 50 cm tall; stems terete, sparsely to densely villous. Petiole 0.8–2.5 cm, villous; leaf blade drying papery, adaxially black, and abaxially pale, lanceolate to ovate, 5–12 × 2.5–4 cm, glabrous except pilose on principal veins, base cuneate to obtuse, apex acuminate or acute; secondary veins 5–9 pairs; stipules caducous, not seen. Peduncle less than 0.5 cm; involucre bracts several, narrowly lanceolate or linear, 10–15 mm, acuminate; bracteoles narrowly lanceolate or linear, 5–6 mm. Calyx with hypanthium portion ca. 1 mm; lobes 5, narrowly lanceolate, 1.4–2 mm, slightly unequal. Corolla in bud yellow, tubular, and with 5 sharp longitudinal ridges; tube ca. 3 mm; lobes 5, triangular, ca. 1 mm, winged abaxially, apex rostrate-incurved. Fruit not seen. Fl. Apr.

- Valleys. Guangxi (Napo).

This name was previously published by H. S. Lo (loc. cit.) but not validly so because no type was indicated (*Vienna Code*, Art. 37.1).

### 2. *Keenania tonkinensis* Drake, Bull. Mus. Hist. Nat. (Paris) 1: 118. 1895.

溪楠 xi nan

Suffrutescent herbs, to 30 cm tall; stems villosulous. Petiole 1–1.5(–4) cm, glabrescent; leaf blade drying thinly papery and abaxially yellowed, elliptic-oblong or elliptic, 4–6(–12) × 2–2.5(–5) cm, adaxially glabrous, abaxially glabrous or often sparsely villosulous, base acuminate or cuneate, apex acute; secondary veins 8–10 pairs; stipules triangular, ca. 8 mm, long acuminate. Peduncle 1–3.5 cm; involucre bracts orbicular, elliptic-oblong, or subovate, 6–7 mm. Calyx with hypanthium portion broadly obconical, ca. 1 mm; lobes 5, triangular, 4–5 × ca. 1.5 mm, veined. Corolla white; tube ca. 6 mm, slightly swollen at base, slightly constricted in throat; lobes 5, ca. 1 mm. Fruit not seen.

Dense forests in valleys. Guangxi (Longzhou) [N Vietnam].

This species name was published twice, first and validly in the place cited above, then later by Drake (in J. Bot. (Morot) 9: 217. 1895); this later work is sometimes incorrectly cited as the place of first publication.

## 41. *KELLOGGIA* Torrey ex Benthams & J. D. Hooker, Gen. Pl. 2: 137. 1873.

钩毛草属 gou mao cao shu

Chen Tao (陈涛); Friedrich Ehrendorfer

Herbs, perennial, sometimes slightly woody at base; rootstock slender, with short rhizomatous and somewhat woody branches and with ascending or erect stems. Raphides present. Leaves opposite, decussate, subsessile, without domatia; stipules persistent, interpetiolar, hardly fused to petioles, triangular to linear or ± irregularly divided and often mutifid to fimbriate. Inflorescences thyrsoid, with terminal and axillary branches at uppermost nodes, pedunculate cymes often with umbelliform flower groups, not rarely with new axes developing and older axes elongating making inflorescences expansive, lax, few to many flowered and bracteate; uppermost bracts often reduced to multifid or fimbriate stipules. Flowers pedicellate, bisexual, monomorphic. Calyx teeth 4 or 5, narrowly lanceolate, hardly fused at base. Corolla white to pink or red, funnelform, divided to ca. 1/2 into 4 or 5 lobes, glabrous inside and valvate in bud. Stamens 4 or 5, inserted in corolla throat, finally slightly exerted; filaments flattened; anthers dorsifixed near base. Ovary inferior, densely covered with hooked trichomes, 2-celled, ovules 1 in each cell, erect, basal; style with 2 short, linear stigmas, exerted. Fruit with calyx teeth ± persistent, schizocarpous, dividing into 2 oblong to ellipsoid, leathery and indehiscent mericarps, densely covered with hooked trichomes; each mericarp with 1 medium-sized, ellipsoid and plano-convex seed; endosperm fleshy; embryo large; cotyledons leaflike; radicle hypogeous.

Two species: disjunct, one in China and Bhutan, the other in W North America (Mexico, United States); one species in China.

In general aspect, *Kelloggia* resembles *Galium*, particularly with respect to the inferior ovary (hypanthium) developing into dry schizocarps covered with hooked trichomes. Presumably, these fruit disperse similarly to those of *Galium* as “stick-tights,” by attaching to animals. In contrast to *Galium* and other Rubiaceae, *Kelloggia* has 3-colpate (and not polycolpate) pollen grains, calyx teeth, and not leaflike interpetiolar stipules, making sterile plants resemble *Nertera* and *Neanotis*. In spite of these differences, Robbrecht and Manen (Syst. & Geogr. Pl. 76: 85–146. 2006) have transferred *Kelloggia* from the tribe Paederieae to the tribe Rubieae as a monotypic and basal subtribe Kelloggiinae. We concur with this transfer but not with the inclusion of the totally different *Theligonum* into the Rubieae, which should be left in a separate tribe, Theligonaceae (see also Bremer & Eriksson, Int. J. Pl. Sci. 170: 766–793. 2009). *Kelloggia* and all other Chinese Rubieae taxa have been briefly discussed and keyed out under *Galium* in the present volume.

All generic descriptions of *Kelloggia* give the number of calyx and corolla lobes as "4 or 5," implying that both conditions are equally common as apparently is the case in the North American species. However, all the Asian specimens studied have 5 calyx and corolla lobes, as shown in the FRPS illustration (71(2): 157, t. 41. 1999) and described by Springate et al. (Fl. Bhutan 2(2): 822. 1999).

The morphology, circumscription, biogeography, and molecular phylogeny of *Kelloggia* were studied by Nie et al. (Amer. J. Bot. 92: 642–452. 2005). They concluded that the two species of the genus are most closely related to each other, that *Kelloggia* arrived in North America through long-distance dispersal from Asia, and that it occupies a basal position within Rubieae.

**1. *Kelloggia chinensis* Franchet, J. Bot. (Morot) 6: 11. 1892.**

云南钩毛草 *yun nan gou mao cao*

*Galium aberrans* W. W. Smith.

Herbs, perennial, to 30 cm tall. Stems flattened to subterete, puberulent to villosulous or hirtellous. Leaves subsessile or with petiole to 1 mm; blade drying thinly papery and blackish, narrowly lanceolate to narrowly elliptic, oblanceolate, or ovate, 5–15 × 2–5 mm, adaxially sparsely strigillose to villosulous, abaxially glabrous except sparsely to densely puberulent to hirtellous along midrib, base cuneate to acute, apex obtuse to acute; 1 main vein, secondary veins not or hardly visible; stipules 1.5–4 mm, often irregularly 3–7-lobed, triangular to linear, tomentulose or villosulous to glabrescent. Inflorescences

1–12 cm, axes strigillose to villosulous, 3–20-flowered; bracts stipuliform, 1–2 mm; pedicels 2–3 mm. Calyx split essentially to base, lobes 5, narrowly triangular, 0.5–1 mm. Corolla white to pink or red, outside puberulent or hispidulous; tube 2–2.5 mm; lobes 5, lanceolate, 2–2.5 mm, acute. Ovary ellipsoid, 1–1.5 mm, densely hairy with hooked trichomes 0.5–1 mm. Mericarps ovoid, ca. 2.5 mm, densely covered with hooked trichomes of 0.5–1 mm. Fl. Jul, fr. Jul–Sep.

Dry to wet mountain grasslands, along trails, forest and thicket openings; 3000–3700 m. Sichuan, Xizang, Yunnan [Bhutan].

Springate et al. (Fl. Bhutan 2(2): 822. 1999) noted that this species was collected once in Bhutan, at 3680 m, and that it is known from Xizang also. We have seen no material or other citations from Xizang, but this distribution seems reasonable and is added here.

**42. *KNOXIA* Linnaeus, Sp. Pl. 1: 104. 1753.**

红芽大戟属 *hong ya da ji shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Vissadali* Adanson.

Annual or perennial herbs or subshrubs, unarmed. Raphides present. Leaves opposite or sometimes ternate, without domatia; stipules persistent or deciduous, interpetiolar and fused to petioles and/or shortly united around stem, 2–6-lobed or -setose, with apices of segments or setae usually glandular. Inflorescences terminal, thyriform, subcapitate, cymose, or often corymbiform with axes sometimes elongating and becoming racemiform with age, several to many flowered, pedunculate or sessile, bracteate. Flowers sessile or pedicellate, bisexual, distylous. Calyx limb 4-lobed; lobes sometimes unequal. Corolla white, pink, lilac, or violet, funnel-form, salverform, or tubular, with shape sometimes differing between long-styled and short-styled forms, lanate inside tube; lobes 4, valvate in bud. Stamens 4, inserted in corolla throat or near middle of corolla tube, included or exserted; filaments short; anthers dorsifixed. Ovary 2-celled, ovules 1 in each cell, pendulous, apical; stigma 2-lobed, exserted or included. Fruit schizocarpous, ovoid to ellipsoid, sometimes laterally compressed and/or didymous, dry, with calyx limb persistent; mericarps 2, ellipsoid, indehiscent, with 1 seed, early to tardily separating from base upward and falling together with or separately from a carpophore, with carpophore variously filiform and basal to comprising entire enlarged septum; seeds medium-sized, oblong-ellipsoid, compressed; testa thin; endosperm fleshy; cotyledons thin; radicle ascending.

Seven to nine species: tropical Asia and Oceania; two species in China.

*Knoxia* was revised by Bhattacharjee and Deb (J. Econ. Taxon. Bot. 6(1): 73–96. 1985), who recognized seven species. Then, it was reviewed anecdotally by Puff and Robbrecht (Bot. Jahrb. Syst. 110: 511–558. 1989), who circumscribed it differently and included nine species. The treatment by W. C. Ko (in FRPS 71(2): 3–7. 1999) differed markedly from these others; it did not cite these authors so presumably Ko had not seen their works. In particular, these other authors considered *K. sumatrensis* to be a wide-ranging, morphologically variable species and included as synonyms of var. *sumatrensis* two species that were separated by Ko, *K. corymbosa* and *K. mollis*. Because it was based on geographically broader studies of more literature and many more specimens from the type regions, Puff and Robbrecht's taxonomy is used here.

W. C. Ko (loc. cit.: 4) described the fruit as capsules and the seeds as having a thick stipe, but the fruit of *Knoxia* have more often been described within Rubiaceae as schizocarps with carpophores, as noted here.

- 1a. Herbs with rather large, fleshy, fusiform roots; leaves sessile or subsessile, blade lanceolate or oblong-lanceolate, 7–10 × 3–5 cm, with secondary veins 5–7 pairs; peduncles 3–12 cm; corolla tube 3–4 mm; fruit oblong-ellipsoid and somewhat didymous ..... 1. *K. roxburghii*
- 1b. Herbs or subshrubs with slender fibrous roots; leaves subsessile to petiolate with petioles to 12 mm, blade elliptic-oblong, elliptic, or lanceolate, 3–12 × 0.8–3.5 cm, with secondary veins 6–9 pairs; peduncles 0.3–2 cm; corolla tube 1.5–2 mm; fruit ellipsoid ..... 2. *K. sumatrensis*

**1. *Knoxia roxburghii* (Sprengel) M. A. Rau, Bull. Bot. Surv. India 10(Suppl. 2): 40. 1969.**

红大戟 *hong da ji*

*Spermacoce roxburghii* Sprengel, Syst. Veg. 1: 404. 1824;  
*Knoxia valerianoides* Thorel ex Pitard.

Erect herbs, 30–70 cm tall; root sometimes purple, rather

enlarged, fleshy, fusiform; branches subquadrate, becoming channeled, puberulent or villosulous becoming glabrescent. Leaves sessile or subsessile, opposite or often ternate; blade drying papery, lanceolate or oblong-lanceolate,  $7-10 \times 3-5$  cm, both surfaces glabrescent or usually hispidulous to pilosulous or strigillose at least on principal veins, base acute to rounded, apex obtuse to acuminate; secondary veins 5-7 pairs, usually indistinct; stipules persistent, shortly fused to petioles or united around stem, linear to narrowly triangular or sometimes shortly to deeply 2- or 3-lobed, 8-10 mm, villosulous to glabrescent, acute. Inflorescences congested-cymose to subcapitate, puberulent or villosulous to glabrescent, ebracteate; peduncles 3-12 cm; dense flower groups  $1-1.5 \times 1-2.5$  cm, borne singly or 3-5 on cymose axes; pedicels 0.5-1 mm. Calyx glabrescent; ovary portion ellipsoid, ca. 0.5 mm; limb deeply lobed; lobes triangular, 0.1-0.5 mm, often unequal on an individual flower. Corolla red, purplish red, or white, salverform or tubular, externally densely villosulous or glabrous; tube 3-4 mm; lobes triangular to ovate, ca. 1 mm. Schizocarps oblong-ellipsoid, somewhat didymous, laterally somewhat flattened, ca. 1.5 mm; mericarps separating from each other and carpophore; carpophore persistent, linear, ca. 1.3 mm.

Grasslands on mountain slopes. Fujian, Guangdong, Guangxi, Hainan, Yunnan, Zhejiang [Cambodia, India, Myanmar, Nepal, Thailand].

Bhattacharjee and Deb (J. Econ. Taxon. Bot. 6(1): 85. 1985) apparently included the Chinese plants within their circumscription of *Knoxia roxburghii* var. *brunonis* (Wallich ex G. Don) R. Bhattacharjee & Deb, which falls into *K. roxburghii* as circumscribed by Puff and Robbrecht (Bot. Jahrb. Syst. 110: 511-558. 1989). This name is based on *Spermacece brunonis* Wallich ex G. Don (Gen. Hist. 3: 621. 1834). W. C. Ko (in FRPS 71(2): 4. 1999, as *K. valerianoides*) described the corollas of this species as salverform and densely pubescent externally; however, the corollas of Thai plants of this species are more tubular and are glabrous externally.

## 2. *Knoxia sumatrensis* (Retzius) Candolle, Prodr. 4: 569. 1830.

红芽大戟 hong ya da ji

*Spermacece sumatrensis* Retzius, Observ. Bot. 4: 23. 1786; *Knoxia corymbosa* Willdenow; *K. mollis* Wight & Arnott.

Herbs or subshrubs, 20-90(-100) cm tall; roots slender, fibrous; branches terete to weakly quadrate, puberulent or villosulous to densely tomentulose. Leaves opposite, subsessile or petiolate with petiole to 12 mm, puberulent or villosulous to glabrescent; blade papery to membranous, elliptic, lanceolate, or elliptic-oblong,  $3-12 \times 0.8-3.5$  cm, both surfaces hispid-pilosulous to villosulous or sometimes glabrescent adaxially, base acute to cuneate, apex acuminate to cuspidate; secondary veins 6-9 pairs; stipules persistent, shortly fused to petioles, deeply 3-5-lobed, 3-7 mm, villosulous to glabrescent, lobes sometimes setose. Inflorescences congested-cymose to corymbiform, sometimes trichotomous, 1-6 cm, densely strigillose to villosulous, ebracteate; peduncle 0.3-2 cm; pedicels 0.1-1 mm. Calyx puberulent or strigillose to glabrous; ovary portion ellipsoid, 0.5-0.8 mm; limb lobed essentially to base; lobes triangular, 0.1-0.3 mm, equal to subequal on an individual flower. Corolla white or purplish red, funnelform, outside glabrous; tube 1.5-2 mm; lobes triangular, ca. 1 mm. Schizocarps ovoid to ellipsoid, 2-3 mm, weakly 4-8-ribbed, strigillose or puberulent to glabrescent; mericarps coherent at dispersal; carpophore persistent, linear, ca. 2.5 mm. Fl. Jul-Aug, fr. Oct-Nov.

Thickets in open fields of low elevations. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; Australia].

W. C. Ko (in FRPS 71(2): 5. 1999) reported several unusual features for *Knoxia mollis* in China: calyx lobes ca. 1 mm, corolla bright green or rarely white, and corolla tube ca. 1 mm. These features have not been confirmed on any specimens studied for this treatment nor reported by other authors for *Knoxia* in SE Asia.

## 43. LASIANTHUS Jack, Trans. Linn. Soc. London 14: 125. 1823, nom. cons., not Adanson (1763).

粗叶木属 cu ye mu shu

Zhu Hua (朱华); Charlotte M. Taylor

*Dasus* Loureiro; *Litosanthes* Blume; *Mephitidia* Reinwardt ex Blume.

Erect subshrubs, shrubs, or rarely small trees, unarmed, with tissues sometimes fetid. Branches and branchlets terete, sometimes compressed, rarely fistulous; lenticels inconspicuous or conspicuous. Raphides present. Leaves opposite, distichous, usually thinly leathery or papery, base acute to rounded or cordate, apex acuminate, acute or cuspidate; midrib plane, depressed or slightly prominent adaxially, usually prominent abaxially; veins generally prominent abaxially, ascending at an angle of more than  $45^\circ$ , curved to margin or joining nerves above at margin; tertiary nervules parallel or reticulate; stipules caducous or usually persistent at least near stem apex, interpetiolar, well developed or reduced, triangular, lanceolate, ovate, or oblong, acute or obtuse. Inflorescence axillary, several flowered and glomerulate, capitate, cymose, or with flowers solitary, sessile or pedunculate, ebracteate or bracteate with bracts persistent or not, well developed, sometimes fused. Flowers bisexual, small, sessile or pedicellate. Calyx with hypanthium portion obovoid, ovoid, or campanulate; limb 3-6-dentate or lobed or rarely truncate. Corolla white, funnelform or salverform to urceolate (*Lasianthus biflorus*), from several millimeters long up to 2.5 cm, glabrous or hairy outside, inside glabrous or usually villous in throat; lobes 4-6, valvate or imbricate in bud. Stamens 4-6, inserted in corolla throat; filaments short; anthers linear or oblong, dorsifixed, included or exserted. Style linear; stigma lobes 3-9, linear or lanceolate, included or exserted. Ovary 3-9-celled, ovules 1 in each cell, basal, erect. Fruit blue or rarely white, black, or red, drupaceous, small, pulpy or fleshy, usually globose, smooth or warty, rounded or ridged, with calyx limb persistent; pyrenes 3-9 (sometimes fewer than that developing), thick walled,

smooth, warty or sulcate on abaxial face, usually triangular in transverse section, with preformed germination slits; seed black, with abundant endosperm; embryo straight; cotyledon short, flattened; radicle long clavate.

About 184 species: 160 species in tropical Asia, ca. 20 in Africa, three in tropical America, and one in Australia; 33 species (seven endemic) in China.

*Lasianthus* is commonly collected in China. This genus has been studied in detail by H. Zhu for both China (Acta Phytotax. Sin. 32: 49–81. 1994; Syst. & Geogr. Pl. 72: 63–110. 2002; Acta Bot. Yunnan. 30: 308–314. 2008) and Thailand (Acta Phytotax. Sin. 39: 116–150. 2001: 53 species included). As Zhu detailed (loc. cit. 2002: 63), the characters that distinguish species of *Lasianthus* are mostly small and/or subtle, frequently ephemeral, and often difficult to see; and, consequently, the taxonomy of this genus is complicated. *Lasianthus* can be confused with some species of *Damnacanthus*, *Diplospora*, *Prismatomeris*, *Saprosma*, and *Urophyllum*, especially when collected only with young flower buds. *Lasianthus* (Chinese species) is rather distinctive vegetatively in its combination of leaf blades that are completely glabrous adaxially, petioles that are usually densely pubescent even when other parts of the plant are glabrescent or only sparsely pubescent, and small stipules that are usually persistent and also densely pubescent.

The leaf venation of *Lasianthus* frequently has a characteristic regular pattern, comprising subparallel or exceptionally regularly oriented tertiary veins (“nervules”). This is different, however, from the lineolate quaternary venation found in *Antirhea*, *Timonius*, and some other genera. A similar arrangement is found in some species of *Urophyllum*. Cai et al. (Acta Bot. Yunnan. 29: 497–512. 2007) studied leaf details of *Lasianthus* and [broadly] related genera, and Cai et al. (J. Syst. Evol. 46(1): 62–72. 2008) studied the pollen of a similar group.

The genus *Litosanthes* has been variously treated as a genus with one to several species, or included in *Lasianthus*. H. S. Lo (in FRPS 71(2): 106–108. 1999) treated *Litosanthes* as a separate genus of one or two species, as did Puff et al. (Rubiaceae of Thailand, 102. 2005). However, H. Zhu (loc. cit. 2002: 69) included it as a synonym of *Lasianthus*, as done here, based on morphological and molecular evidence.

*Lasianthus verrucosus* H. S. Lo (Bot. J. S. China 2: 2. 1993; type specimen: China. Hainan: Ledong, *Q. Huang 820468*, SCBI) was not seen. From H. S. Lo’s description and figure of this species, it has leaves with a looped venation, glabrous and fuscous when drying; inflorescence sessile or subsessile; calyx limb with 4 small, broadly triangular lobes; and pyrenes 4, verrucose on the abaxial face. Many *Lasianthus* specimens from Hainan were examined, but none was found matching the description of *L. verrucosus*. Consequently, this species is excluded from this account. From the original description it appears to be most similar to *Saprosma merrillii* and thus would likely key out as that species.

The phylogenetic relationships among species of *Lasianthus* and related genera were studied based on molecular data by Xiao and Zhu (Bot. Stud. (Taipei) 48: 227–232. 2007). Their results supported the inclusion of *Litosanthes biflora* and *Saprosma crassipes* within *Lasianthus*. *Litosanthes* is accordingly included here. However, *S. crassipes* has a 2-locular ovary and 2-pyrene drupes, which do not match the current circumscription of *Lasianthus*. *Saprosma merrillii* seems similar to *S. crassipes*, and their systematic position needs further study.

*Lasianthus cyanocarpus* Jack was reported from China by the *Flora of Japan*. However, true *L. cyanocarpus* has a restricted distribution in S Thailand and Malesia. This name is therefore misapplied in China and Japan, where the correct name for the species is *L. hirsutus*.

The following species was recorded from China but could not be treated here because no material was seen by the present authors: *Lasianthus areolatus* Dunn (J. Bot. 47: 376. 1909), recorded from Guangdong by Merrill and Chun (Sunyatsenia 1(1): 49. 1930).

- 1a. Flowers in pedunculate congested cymes or subcapitate groups (though shortly pedunculate in *L. chunii* and sometimes subsessile in *L. japonicus*).
- 2a. Peduncles slender, 0.5–3 cm.
  - 3a. Leaves more than 3 cm; flowers 5-merous; pyrenes 5 ..... 12. *L. filipes*
  - 3b. Leaves less than 3 cm; flowers 4-merous; pyrenes 2 or 4 ..... 5. *L. biflorus*
- 2b. Peduncles short, 0.1–0.4 cm, or if more than 0.6 cm then robust.
  - 4a. Peduncles very short, 1–2 mm.
    - 5a. Branches and leaves abaxially appressed pubescent; leaves usually elliptic, acute or acuminate at apex, with nervules conspicuously elevated abaxially; fruit with 5 or 6 longitudinally elevated angles or ribs, strigillose ..... 10. *L. chunii*
    - 5b. Branches and leaves glabrous, or branches sparsely strigose when young and leaves abaxially strigose or hirtellous; leaves usually lanceolate, long caudate at apex, with nervules slightly prominent abaxially; fruit smooth, glabrous ..... 20. *L. japonicus*
  - 4b. Peduncles conspicuous, 1.5–20 mm.
    - 6a. Bracts numerous, linear, 6–12 mm ..... 26. *L. rhinocerotis*
    - 6b. Bracts 2 and less than 1 cm, or reduced and apparently absent.
      - 7a. Branches depressed pubescent or subglabrous; peduncles relatively robust, 5–20 mm; bracts linear, 3–10 mm; calyx more than 5 mm with ovate-lanceolate lobes; corolla more than 1.5 cm ..... 4. *L. biermannii*
      - 7b. Branches sparsely puberulent to glabrous; peduncles slender, 1.5–5 mm; bracts 2 mm or shorter, usually inconspicuous; calyx less than 2.5 mm with triangular or subulate lobes; corolla 8.5 mm or shorter ..... 24. *L. micranthus*
- 1b. Flowers solitary or in sessile fascicles or glomerules (though sometimes pedunculate in *L. henryi*).
- 8a. Bracts conspicuous.

- 9a. Leaves slightly cordate to rounded and often oblique at base.
- 10a. Branches and leaves tomentose or setose; leaves 5–12 cm; stipules inconspicuous or to ca. 3 mm ..... 1. *L. attenuatus*
- 10b. Branches and leaves glabrous, except very young branches subglabrous and leaves sparsely hairy on nerves abaxially; leaves 11–18 cm; stipules 5–6 mm ..... 27. *L. rigidus*
- 9b. Leaves cuneate or subrounded and not oblique at base.
- 11a. Branches and leaves hirsute; bracts large, leaflike ..... 16. *L. hirsutus*
- 11b. Branches and leaves glabrous or villous or appressed pubescent; bracts not leaflike.
- 12a. Branches glabrous or thinly puberulent, leaves glabrous; bracts orbicular, leathery ..... 19. *L. inodorus*
- 12b. Branches and leaves abaxially tomentose, villous, or densely appressed pubescent; bracts not orbicular, papery.
- 13a. Leaves usually no more than 10 cm; bracts small, subulate; fruit with 4 pyrenes ..... 28. *L. schmidtii*
- 13b. Leaves more than 12 cm; bracts ovate, lanceolate or linear; fruit with 5 or 6 pyrenes.
- 14a. Stipules not conspicuous; bracts linear to lanceolate, up to 2 cm; fruit glabrous ..... 30. *L. sikkimensis*
- 14b. Stipules triangular, up to 8 mm; outer bracts ovate and inner ones lanceolate, none more than 5 mm; fruit hairy.
- 15a. Pubescence appressed on branches, leaves abaxially, stipules, bracts, and calyx, drupes subglabrous ..... 9. *L. chrysoneurus*
- 15b. Tomentum dense and spreading on branches, leaves abaxially, stipules, bracts, calyx, and drupes ..... 25. *L. obscurus*
- 8b. Bracts inconspicuous or absent.
- 16a. Calyx lobes linear, longer than 5 mm.
- 17a. Leaves 11–16 × 3.5–5.5 cm; lateral veins more than 10 pairs; branches and nerves abaxially densely yellow villous; calyx lobes equal in length and 9–14 mm ..... 7. *L. chevalieri*
- 17b. Leaves 7–11 × 2.5–3 cm; lateral veins 5 or 6 pairs; branches and nerves abaxially hirsute; calyx lobes unequal in length, with longer ones up to 8 mm ..... 22. *L. linearisepalus*
- 16b. Calyx lobes not linear, no more than 5 mm.
- 18a. Calyx lobes longer than calyx tube or as long as tube.
- 19a. Leaves more than 12 cm.
- 20a. Branches, leaf nerves abaxially, calyx, corolla, and fruit strigillose to glabrescent; calyx lobes linear-lanceolate ..... 6. *L. calycinus*
- 20b. Branches, leaf nerves abaxially, and fruit tomentose with relatively long brown or fuscous hairs, calyx and corolla densely brown tomentose; calyx lobes oblong ..... 33. *L. wardii*
- 19b. Leaves less than 12 cm.
- 21a. Branches and leaf nerves abaxially glabrous or sparsely strigose; fruit glabrous ..... 23. *L. lucidus*
- 21b. Branches and leaves abaxially very hairy; fruit pubescent.
- 22a. Calyx limb divided nearly to base, lobes lanceolate or oblong and much longer than tube.
- 23a. Young branches and leaves abaxially appressed pubescent; calyx lobes oblong to elliptic or oblanceolate, obtuse at apex ..... 2. *L. austrosinensis*
- 23b. Branches and leaves abaxially densely spreading villous; calyx lobes lanceolate, acuminate at apex ..... 11. *L. curtisii*
- 22b. Calyx limb not divided to base, lobes linear-lanceolate, slightly longer than or almost as long as tube.
- 24a. Branches and leaves abaxially densely spreading villous ..... 14. *L. formosensis*
- 24b. Branches and leaves abaxially densely appressed pubescent ..... 15. *L. henryi*
- 18b. Calyx lobes clearly shorter than tube.
- 25a. Calyx lobes or teeth small, ovate and reflexed; leaves usually with more than 10 pairs of nerves, veinlets conspicuously reticulate ..... 8. *L. chinensis*
- 25b. Calyx lobes or teeth not ovate and not reflexed; leaves usually with less than 10 pairs of nerves, veinlets parallel or subparallel or subreticulate.
- 26a. Calyx cupulate, with limb truncate or minutely dentate; fruit crowned by enlarged calyx limb ..... 32. *L. verticillatus*
- 26b. Calyx with conspicuous lobes; fruit crowned by persistent calyx lobes but these not enlarged.
- 27a. Stipules triangular-lanceolate to linear-lanceolate, equal to or more than 3 mm, strigillose or hirsute; young branches strigillose or hirsute.
- 28a. Stipules 3–5 mm; flowers 5-merous; fruit smooth, pyrenes 5 ..... 29. *L. simizui*

- 28b. Stipules usually more than 5 mm; flowers 4-merous; fruit verrucose, pyrenes 4 ..... 31. *L. trichophlebus*
- 27b. Stipules triangular, less than 3 mm, puberulent; young branches puberulent or pubescent.
- 29a. Leaves more than 12 cm, lanceolate or oblong, lateral veins 6-9 pairs.
- 30a. Leaves oblong, lateral veins 6-8 pairs, veinlets subparallel, conspicuously elevated abaxially; branches densely appressed pubescent, leaves abaxially at nerves and margins puberulent or ciliate ..... 18. *L. hookeri*
- 30b. Leaves lanceolate to elliptic-lanceolate, lateral veins ca. 9 pairs, veinlets subreticulate with forks very slender; branches and leaf nerves abaxially sparsely appressed puberulent ..... 21. *L. lancifolius*
- 29b. Leaves less than 11 cm, ovate or ovate-oblong, lateral veins 4-6 pairs.
- 31a. Leaves 4-6 cm, less than 3 cm wide; branches and leaf nerves abaxially densely appressed hirsute ..... 3. *L. austroyunnanensis*
- 31b. Leaves 6-10 cm, as narrow as 2 cm but usually more than 3 cm wide; branches and leaf nerves abaxially glabrous or pubescent or villous.
- 32a. Branches and leaf nerves abaxially glabrous or sparsely appressed pubescent; calyx sparsely pubescent, with 5 triangular teeth; fruit glabrous ..... 13. *L. fordii*
- 32b. Branches and leaves abaxially densely villous; calyx densely strigillose, with 5 minute and broadly triangular teeth; fruit strigillose ..... 17. *L. hispidulus*

**1. *Lasianthus attenuatus*** Jack, Trans. Linn. Soc. London 14: 126. 1823.

斜基粗叶木 xie ji cu ye mu

*Lasianthus densifolius* Miquel; *L. setosus* Craib; *L. wallichii* Wight; *L. wallichii* var. *hispidocostatus* H. Zhu.

Shrubs, 1-2 m tall; branches and branchlets densely tomentose to hirsute or sometimes setose. Petiole 1-3 mm, tomentose to hirsute; leaf blade leathery or subleathery, oblong, elliptic-lanceolate, or oblong-ovate, 5-12 × 2.5-5 cm, glabrous adaxially, strigillose to hirtellous or tomentose abaxially, base slightly cordate or rarely rounded, slightly to markedly oblique, apex acute to cuspidate-acuminate; lateral veins 6-8 pairs; nervules subparallel, conspicuous abaxially; stipules triangular or ovate-lanceolate, 2-3 mm, tomentose to hirsute, apparently persistent. Inflorescence cymose or glomerulate, sessile, densely hirsute to hirtellous; bracts subulate to lanceolate, 6-15 mm, persistent. Flowers sessile. Calyx densely hirsute; hypanthium portion campanulate, ca. 1 mm; limb 1-2 mm, with 5 triangular teeth. Corolla sparsely hirtellous, puberulent to glabrescent outside, villous inside; tube 8-10 mm; lobes 5, spatulate, 4-5 mm. Fruit globose or ovoid, 5-10 mm in diam., densely hirsute, smooth; pyrenes 5 or 6. Fl. Apr, fr. Aug-Sep.

Forests, shaded and wet places; 200-1800 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bhutan, Cambodia, NE India, Indonesia, S Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Thailand, Vietnam].

**2. *Lasianthus austrosinensis*** H. S. Lo, Bot. J. S. China 2: 4. 1993.

华南粗叶木 hua nan cu ye mu

Shrubs, 1-2 m tall; branches and branchlets densely appressed strigillose. Petiole 3-8 mm, densely strigillose; leaf

blade papery, ovate, 5-8 × 2.5-3 cm, glabrous adaxially, appressed strigillose on midrib and nerves abaxially, base obtuse or subrounded, apex shortly cuspidate; lateral veins ca. 5 pairs; nervules subparallel; nerves and nervules elevated abaxially; stipules generally persistent, triangular to broadly triangular, 1-1.5 mm, densely strigillose. Inflorescences glomerulate to subcapitate, sessile; bracts absent. Flowers sessile or subsessile. Calyx densely strigillose; hypanthium portion obconic, ca. 1 mm; limb deeply lobed; lobes 5, oblong to elliptic or oblanceolate, 3-3.5 mm, nerved, obtuse. Corolla ca. 5 mm, densely hirsute outside, villous in upper half inside; lobes 5, triangular. Fruit subglobose, 4-5 mm in diam., strigillose; pyrenes 5.

• Forests, shaded and wet places; 300-500 m. Guangdong, Guangxi, Hainan.

H. Zhu (Syst. & Geogr. Pl. 72: 85. 2002) noted that the relatively well-developed calyx lobes with evident venation are distinctive for this species; the calyx lobes are also distinctive in being widest near the middle rather than at the base as in most other *Lasianthus* species.

**3. *Lasianthus austroyunnanensis*** H. Zhu, Syst. & Geogr. Pl. 72: 96. 2002.

滇南粗叶木 dian nan cu ye mu

Shrubs, to 1 m tall; branchlets densely appressed hirsute. Petiole 5-8 mm, hirsute; leaf blade papery to membranous, ovate-elliptic, 4-6 × 2-3 cm, glabrous adaxially, appressed hirsute on midrib and nerves abaxially, base acute or obtuse, apex cuspidate-acuminate or acuminate; lateral veins 4 or 5 pairs; nervules subparallel; nerves and nervules elevated conspicuously abaxially; stipules ?persistent, triangular, minute, hirsute. Inflorescences glomerulate, sessile; bracts minute, hirsute. Flowers sessile. Calyx hirsute; hypanthium portion campanulate, ca. 1 mm; limb 1-1.5 mm, toothed; teeth 5. Corolla 8-10 mm, pubescent outside, villous inside. Fruit globose, 4-5 mm in diam., subglabrous; pyrenes 5.

- Forests, shaded and wet places; 1000–1300 m. Taiwan, Yunnan.

This species has been often misidentified as *Lasianthus microphyllus* Elmer. After examining type specimens of *L. microphyllus* from the Philippines (Elmer 13790, isotypes in A, CAS, E, K, L, MO), it is clear that the Chinese populations differ from *L. microphyllus* by having appressed-hirsute hairs on the branches, leaf midrib and nerves abaxially, and the outside of the calyx and corolla. The leaves are ovate-elliptic with a cuspidate-acuminate or acuminate apex. In contrast, *L. microphyllus* has subglabrous or glabrous branches, leaves, and flowers, and the leaves are ovate with a caudate apex. Therefore, the Chinese taxon represents a separate species. The name *L. microphyllus* has also been sometimes misapplied in Taiwan to plants of *L. micranthus*.

**4. *Lasianthus biermannii* King ex J. D. Hooker, Fl. Brit. India 3: 190. 1880.**

梗花粗叶木 geng-hua cu ye mu

Shrubs, 2–5 m tall; branchlets sparsely pubescent to densely appressed pubescent to strigose, or subglabrous. Petiole 7–14 mm, pubescent to strigose; leaf blade membranous or papery, elliptic, elliptic-ovate, or elliptic-lanceolate, 8–20 × 3–5 cm, glabrous adaxially, sparsely pubescent to densely appressed pubescent on midrib, lateral veins, and nervules abaxially, base acute to obtuse or rounded, apex cuspidate-acuminate; lateral veins 5–7 pairs; nervules reticulate, slender and inconspicuous to parallel and conspicuously elevated abaxially; stipules triangular or lanceolate, 3–5 mm, pubescent to strigillose, apparently caducous. Inflorescences congested-cymose to subcapitate, densely strigillose, pedunculate; peduncles slender to robust, 5–15 mm; bracts linear, 2–10 mm. Flowers sessile or subsessile. Calyx purple when fresh, strigillose; hypanthium portion turbinate, 1–1.5 mm; limb 4–5 mm; lobes 4–6, narrowly lanceolate to oblanceolate, 2–4 mm. Corolla light purple when fresh, 7–8 mm, villous inside; tube 3–5 mm, glabrous outside; lobes 4–6, oblong-ovate, 3–4 mm, pilosulous outside. Fruit globose, 0.3–1.5 cm in diam., smooth or with ca. 5 ridges; pyrenes 5. Fl. Apr, Oct–Nov, fr. Jul.

Montane forests, shaded and wet places; 1000–2500 m. Guizhou, Hainan, Xizang, Yunnan [Bhutan, NE India, Myanmar].

The well-developed calyx lobes that are usually broadest near the apex are distinctive.

- 1a. Branches usually sparsely pubescent or subglabrous and leaf nerves abaxially sparsely pubescent; nervules reticulate, slender and inconspicuous; calyx lobes relatively narrow and short; peduncles slender, longer or shorter than petioles ..... 4a. subsp. *biermannii*
- 1b. Branches and leaf nerves abaxially densely appressed strigose; leaf nervules parallel and conspicuously elevated abaxially; calyx lobes relatively wide and long; peduncles robust and usually longer than petioles ..... 4b. subsp. *crassipedunculatus*

**4a. *Lasianthus biermannii* subsp. *biermannii***

梗花粗叶木(原亚种) geng-hua cu ye mu (yuan ya zhong)

Branches sparsely pubescent or subglabrous. Leaf blade with nerves abaxially sparsely pubescent; nervules reticulate, slender and inconspicuous. Peduncles slender, longer or shorter than petioles. Calyx lobes relatively narrow and short.

Montane forests, shaded and wet places; 1200–2500 m. Yunnan [Bhutan, NE India, Myanmar].

**4b. *Lasianthus biermannii* subsp. *crassipedunculatus* C. Y. Wu & H. Zhu, Acta Phytotax. Sin. 32: 75. 1994.**

粗梗粗叶木 cu geng cu ye mu

*Lasianthus esquirolii* H. Léveillé.

Branches densely appressed strigose. Leaf blade with nerves densely appressed strigose abaxially; nervules parallel and conspicuously elevated abaxially. Peduncles robust and usually longer than petioles. Calyx lobes relatively wide and long.

- Forests, shaded and wet places; 1000–1700 m. Guizhou, Hainan, Yunnan.

Rehder (J. Arnold Arbor. 16: 323. 1935) considered that *Henry 11148* from Yunnan province of China, cited by Hutchinson as *Lasianthus biermannii*, matched the type specimen of *L. esquirolii* (J. Esquirol 648) from Guizhou province of China, so he reduced *L. esquirolii* to a synonym of *L. biermannii*. However, Ferguson (Notes Roy. Bot. Gard. Edinburgh 32(1): 109. 1972) contended that the type of *L. esquirolii* did not sufficiently match the type of *L. biermannii* and again recognized *L. esquirolii* as a separate species. Many specimens from SE Yunnan and Hainan are closely related to *L. biermannii* but clearly differ from it and have been treated as a geographic subspecies of *L. biermannii*. When the type of *L. esquirolii* was checked, it was concluded that *L. esquirolii* is the same as *L. biermannii* subsp. *crassipedunculatus*.

**5. *Lasianthus biflorus* (Blume) M. Gangopadhyay & Chakrabarty, J. Econ. Taxon. Bot. 16: 338. 1992.**

石核木 shi he mu

*Litosanthes biflora* Blume, Catalogus, 22. 1823; *Lasianthus gracilis* King & Gamble.

Shrubs, 1–2.5 m tall; branchlets terete, densely hirsute to pilosulous. Petiole 0.5–2 mm, hirsute to pilosulous; leaf blade thinly to thickly papery, subrhombic or elliptic-obovate, elliptic, or subovate, 1.5–3 cm × 7–15 mm, glabrous adaxially, hirtellous to pilosulous abaxially, base cuneate, margin flat, often undulate, apex acute, often mucronulate; midrib depressed adaxially, prominent abaxially, hirsute or pilosulous abaxially; lateral veins plane adaxially, prominent abaxially, 6–9 pairs, hirsute or pilosulous abaxially, extending to unite with margin; nervules obscure on both surfaces; stipules ± inconspicuous, narrowly triangular, 0.5–2 mm, densely pilosulous to hirtellous, at apex acute sometimes with 2–4 very small lateral projections or lobes. Inflorescence congested-cymose or with solitary flowers, pedunculate; peduncles 0.5–1.7 cm, sparsely hirsute to pilosulous; bracts inconspicuous, lanceolate to linear, 0.3–1.2 mm. Flowers pedicellate; pedicels 0.2–1 mm. Calyx glabrous to sparsely hirtellous; hypanthium portion campanulate, 1.2–1.5 mm; limb deeply 5-toothed; teeth triangular, ca. 0.5 mm. Corolla 2–4 mm, glabrous outside, villous in throat and on inside of lobes; lobes ovate, shorter than tube, rostriform-incurved at

apex. Fruit ovoid or depressed globose, 3–5 mm in diam., glabrous, verrucose, 4-grooved; pyrenes 4.

Forests, shaded and wet places; 600–700 m. Hainan, Taiwan, S Yunnan [Indonesia, Malaysia, Philippines, Thailand, Vietnam].

**6. *Lasianthus calycinus*** Dunn, Bull. Misc. Inform. Kew 1912: 367. 1912.

黄果粗叶木 huang guo cu ye mu

Shrubs, 1.5–3 m tall; branchlets appressed pubescent or strigillose to glabrescent. Petiole 8–10 mm, appressed pubescent or strigillose to glabrescent; leaf blade thickly papery, oblong-elliptic, 13–15 × 4–6 cm, glabrous adaxially, sparsely appressed pubescent to strigillose on nerves abaxially, base broadly cuneate or subrounded, apex acute to shortly acuminate; lateral veins 7–9 pairs, extending to unite with margin; nervules parallel; nerves and nervules conspicuous abaxially; stipules generally persistent, broadly triangular, ca. 2 mm, strigillose, acute. Inflorescences glomerulate to subcapitate, sessile, 4–6-flowered; bracts absent. Flowers subsessile. Calyx strigillose; hypanthium portion 1.5–2 mm; limb deeply lobed; lobes 5, linear-lanceolate to narrowly triangular, 2.5–5 mm, acute. Corolla 7–9 mm, strigillose outside; lobes 5, ovate. Fruit orange or red-orange, subglobose, 6–7 mm in diam., sparsely strigillose to glabrescent, with longitudinal elevated angles. Fl. Apr–May, fr. Sep–Oct, Dec.

• Forests, shaded and wet places; 600–700 m. Hainan.

H. Zhu (Syst. & Geogr. Pl. 72: 83. 2002) noted that this species is similar to and may even be conspecific with the poorly known species *Lasianthus latifolius* (Blume) Miquel of Borneo, Java, and Sumatra.

**7. *Lasianthus chevalieri*** Pitard in Lecomte, Fl. Indo-Chine 3: 384. 1924.

长萼粗叶木 chang e cu ye mu

*Lasianthus longisepalus* Geddes; *L. longisepalus* var. *jianfengensis* H. S. Lo.

Shrubs, to 2 m tall; branches and branchlets densely yellow villous. Petiole 1–1.5 cm, long, yellow villous; leaf blade subleathery, elliptic-oblong, 11–16 × 3.5–5.5 cm, glabrous adaxially, yellow villous abaxially, base cuneate, apex acuminate; lateral veins ca. 11 pairs, prominent abaxially; nervules parallel, prominent abaxially; stipules generally persistent, narrowly triangular, ca. 3 mm, spreading yellow villous. Inflorescences glomerulate, sessile; bracts inconspicuous. Flowers sessile. Calyx densely pilose; hypanthium portion obconic, 1.5–3 mm; limb with tubular portion 1.5–3 mm; lobes 5–7, linear, 9–14 mm. Corolla tube 12–13 mm; lobes 5–7, lanceolate, 7–8 mm, densely pilose. Fruit subglobose, 6–7 mm in diam., pilose; pyrenes 5–7.

Forests, shaded and wet places; 800–1500 m. Hainan [Thailand, Vietnam].

The sessile flowers with relatively long calyx lobes are quite distinctive.

**8. *Lasianthus chinensis*** (Champion ex Benth) Benth, Fl. Hongk. 160. 1861.

粗叶木 cu ye mu

*Mephitidia chinensis* Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 4: 196. 1852; *Lasianthus dinhensis* Pierre ex Pitard; *M. odajimae* Masamune.

Shrubs, 1–4 m tall; branches and branchlets terete, densely pubescent or puberulent to strigillose. Petiole 0.5–1.5 cm, densely pubescent or puberulent to strigillose; leaf blade subleathery, oblong to elliptic, 11–25 × 2.5–7 cm, glabrous adaxially, thinly to densely pubescent or puberulent to strigillose abaxially, base acute or obtuse, margin plane or usually reflexed, apex acute or acuminate; lateral veins 9–15 pairs; nervules reticulate, slightly elevated abaxially; stipules generally persistent, triangular to narrowly triangular, 1.5–3 mm, densely pubescent or puberulent to strigillose. Inflorescences subcapitate to congested-cymose, sessile to subsessile; bracts reduced. Flowers sessile or subsessile. Calyx puberulent to strigillose; hypanthium portion globose to ellipsoid, 1.5–3 mm; limb 1.5–2.5 mm, lobed for 1/2–2/3; lobes 4–6, triangular, ovate, or orbicular, becoming reflexed. Corolla 10–15 mm, densely strigillose to sericeous outside; lobes 5 or 6, lanceolate. Fruit globose to depressed globose, 5–8 mm in diam., pubescent to strigillose, with 5 or 6 conspicuous longitudinal angles; pyrenes 5 or 6. Fl. May–Jun, fr. Sep–Oct.

Forests, shaded and wet places; below 100–900 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Cambodia, Laos, Malaysia, Philippines, Thailand, Vietnam].

The relatively large flowers with the large globose to ellipsoid hypanthium (i.e., ovary) portion is distinctive; *Lasianthus verticillatus* is similar in these characters but can be distinguished by its truncate to denticulate calyx limb and smooth fruit. The calyx limb often enlarges as the fruit develops.

**9. *Lasianthus chrysoneurus*** (Korthals) Miquel, Fl. Ned. Ind. 2: 322. 1857.

库兹粗叶木 ku zi cu ye mu

*Mephitidia chrysoneura* Korthals, Ned. Kruidk. Arch. 2(2): 222. 1851; *Lasianthus hoaensis* Pierre ex Pitard; *L. kurzii* J. D. Hooker; *L. kurzii* var. *howii* H. S. Lo.

Shrubs, to 3 m tall; branchlets appressed pubescent to densely velutinous. Petiole 5–10 mm, appressed pubescent to densely velutinous; leaf blade membranous, elliptic-oblong to elliptic-lanceolate, 12–20 × 3–5 cm, glabrous adaxially, appressed pubescent to puberulent abaxially, base cuneate to acute, apex acuminate; lateral veins 7–10 pairs; nervules parallel, ± inconspicuous; stipules deciduous, triangular or oblong-lanceolate, 3–8 mm, pubescent to densely velutinous, strigillose on margin. Inflorescences glomerulate to subcapitate, sessile; bracts persistent, outer bracts ovate, inner bracts lanceolate, all 1–5 mm, pubescent to densely strigillose, especially on margin. Flowers sessile or subsessile. Calyx densely strigillose; hypanthium portion campanulate, 1–1.5 mm; limb deeply lobed; lobes 4–6, triangular, 1.5–2 mm. Corolla 5–6 mm, puberulent outside on upper part, pubescent inside in throat. Fruit blue-black, subglobose, 4–6 mm in diam., pubescent to strigillose or puberulent; pyrenes 5 or 6.

Forests, shaded and wet places; 500–1200 m. S Yunnan [Cam-

bodia, India, Indonesia (Java), Laos, Myanmar, Papua New Guinea, Thailand, Vietnam].

H. Zhu (Syst. & Geogr. Pl. 72: 80. 2002) noted that this species is very similar to *Lasianthus obscurus*.

**10. *Lasianthus chunii*** H. S. Lo, Bot. J. S. China 2: 10. 1993.

焕铺粗叶木 huan yong cu ye mu

Shrubs, 1–3 m tall; branchlets dark brown, densely hirsute or strigose. Petiole 0.5–1 cm, densely hirsute to strigillose; leaf blade subleathery or thickly papery, lanceolate or oblong-lanceolate, 8–15 × 2–5.5 cm, glabrous adaxially, hirsute or strigillose on midrib, nerves, and nervules abaxially, base cuneate or obtuse to rounded, apex acuminate; lateral veins 7 or 8 pairs; nervules subparallel; veins and nervules conspicuously elevated abaxially; stipules 1–1.5 mm, densely hirsute to strigillose, apparently caducous. Inflorescence congested-cymose, shortly pedunculate, 2–4-flowered, densely strigillose; peduncle 1–2 mm; bracts narrowly triangular, 1–2 mm. Flowers subsessile to pedicellate; pedicels to 1 mm. Calyx strigillose; hypanthium portion campanulate, 1–1.5 mm; limb ca. 2 mm; lobes 6, subtriangular, ca. 1 mm. Corolla ca. 1 cm, hirsute or strigillose outside, villous in upper half inside; lobes 6, lanceolate. Fruit depressed globose, ca. 5 mm in diam., hirsute or strigillose, with 5 or 6 longitudinal elevated angles or ridges; pyrenes 5 or 6. Fl. Apr, fr. Jun–Jul, Sep.

• Forests, shaded and wet places. SE Fujian, Guangdong, SE Guangxi, S Jiangxi.

**11. *Lasianthus curtisii*** King & Gamble, J. Asiatic Soc. Bengal, Pt. 2, Nat. Hist. 73: 128. 1904.

广东粗叶木 guang dong cu ye mu

*Lasianthus condorensis* Pierre ex Pitard; *L. formosensis* Matsumura var. *hirsutus* Matsumura; *L. kwangtungensis* Merrill.

Shrubs, 1–2 m tall; branches and branchlets densely spreading villous. Petiole 4–8 mm, densely villous; leaf blade papery or subleathery, ovate-lanceolate or elliptic-lanceolate, 5–9 × 2–3 cm, glabrous adaxially, densely soft villous abaxially, base cuneate or obtuse, apex cuspidate-acuminate; lateral veins 4–6 pairs; nervules subparallel; stipules generally persistent, narrowly triangular, 1–1.5 mm, densely strigose. Inflorescences glomerulate to subcapitate, sessile; bracts absent. Flowers sessile to subsessile. Calyx densely villous to hirsute; hypanthium portion obconic, 1–1.5 mm; limb divided nearly to base; lobes 5, lanceolate to narrowly triangular, 2–5 mm, acuminate. Corolla 7–8 mm, outside hispid, inside villous; lobes 5. Fruit ovoid-globose, 4–5 mm in diam., hirsute to villous; pyrenes 5. Fl. Aug–Sep, fr. Jun–Dec.

Forests, shaded and wet places; 300–900 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Indonesia (Sumatra), Japan (Kyushu, Ryukyu Islands), Malaysia, Thailand, Vietnam].

**12. *Lasianthus filipes*** Chun ex H. S. Lo, Bot. J. S. China 2: 8. 1993.

长梗粗叶木 chang geng cu ye mu

Shrubs, 1–2 m tall; branchlets slender, densely strigose. Petiole 1–5 mm, densely hirsute or strigillose; leaf blade pa-

pery, ovate or ovate-oblong, 5–8 × 2–3 cm, glabrous adaxially, appressed pubescent to strigillose on midrib, veins, and nervules abaxially, base obtuse, rounded, or rarely subcordate, apex shortly acuminate or cuspidate-acuminate; lateral veins 4 or 5 pairs; nervules subparallel, conspicuous abaxially; stipules minute, densely appressed hirsute or strigose, apparently caducous. Inflorescence congested-cymose or subcapitate, pedunculate, few flowered; peduncles slender, 1–3 cm, densely hirsute or strigose; bracts subulate, 1–2.5 mm, hirsute or strigose. Flowers subsessile to shortly pedicellate. Calyx hirsute or strigillose; hypanthium portion campanulate, ca. 1 mm; limb 1.5–2 mm; lobes 5, subulate, 1–1.5 mm. Corolla ca. 5 mm; tube puberulent outside, densely villous in upper half inside; lobes 5, ovate, ca. 1.5 mm, villous inside. Fruit globose, 7–8 mm in diam., subglabrous; pyrenes 5. Fl. Apr.

Forests, shaded and wet places; 500–1500 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [N Vietnam].

**13. *Lasianthus fordii*** Hance, J. Bot. 23: 324. 1885.

罗浮粗叶木 luo fu cu ye mu

*Lasianthus kamputensis* Pierre ex Pitard; *L. tashiroi* Matsumura; *L. zambalensis* Elmer.

Shrubs, 1–2 m tall; branches and branchlets glabrous to thinly appressed pubescent or strigose. Petiole 0.4–1 cm, subglabrous to hirsute or strigillose; leaf blade subleathery or papery, ovate-oblong, 6–10 × 2–5 cm, glabrous adaxially, thinly appressed strigillose or subglabrous abaxially, base acute or obtuse, apex acuminate or cuspidate-acuminate; lateral veins 4–6 pairs; nervules subparallel, elevated abaxially; stipules generally persistent, triangular to narrowly triangular, 0.5–1.2 mm, strigillose. Inflorescences glomerulate, sessile; bracts absent. Flowers sessile. Calyx sparsely to densely strigillose; hypanthium portion campanulate to obconic, ca. 1 mm; limb 1–1.5 mm, shallowly toothed; teeth 5, triangular. Corolla 6–10 mm, glabrous to puberulent outside, villous inside; lobes 5. Fruit globose or subglobose, 5–6 mm in diam., glabrous to strigillose; pyrenes 5 or 6.

Forests, shaded and wet places; 200–1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Cambodia, Indonesia (Java), Japan (Kyushu, Ryukyu Islands, Yakushima), Papua New Guinea, Philippines, Thailand, Vietnam].

*Lasianthus fordii* var. *trichocladus* H. S. Lo (Bot. J. S. China 2: 7. 1993) was described from SE China (Guangdong, Guangxi, and Hainan) but could not be treated here because no material was seen by the present authors.

**14. *Lasianthus formosensis*** Matsumura, Bot. Mag. (Tokyo) 15: 17. 1901.

台湾粗叶木 tai wan cu ye mu

*Lasianthus kwangsiensis* Merrill ex H. L. Li; *L. tashiroi* Matsumura var. *pubescens* Matsumura; *L. tenuicaudatus* Merrill.

Shrubs, 1–2 m tall; branches and branchlets densely villous or villosulous. Petiole 5–8 mm, villous to villosulous; leaf blade papery or subleathery, oblong or ovate-elliptic, 7–12 × 2.5–5 cm, glabrous adaxially, villous or villosulous at least on

veins abaxially, base acute or obtuse, apex acuminate or cuspidate-acuminate; lateral veins 6 or 7 pairs; nervules subparallel, slightly elevated abaxially; stipules generally persistent, triangular, ca. 2 mm, villous to villosulous. Inflorescences glomerulate to congested-cymose, sessile to shortly pedunculate; bracts absent. Flowers sessile. Calyx pilosulous to villosulous; hypanthium obconic to campanulate, ca. 1 mm; limb 3–4 mm, deeply lobed; lobes 5, linear-lanceolate. Corolla 6–8 mm, villous outside, tomentose inside; lobes 5, oblong-lanceolate. Fruit ovoid-globose, ca. 5 mm in diam., subglabrous; pyrenes 5. Fl. Oct–Dec, fr. Apr.

Forests, shaded and wet places; 500–1000 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Japan (Kyushu, Ryukyu Islands, Yakushima), Thailand, Vietnam].

**15. *Lasianthus henryi* Hutchinson** in Sargent, Pl. Wilson. 3: 401. 1916.

西南粗叶木 xi nan cu ye mu

*Lasianthus appressihirtus* Simizu; *L. appressihirtus* var. *maximus* Simizu ex T. S. Liu & J. M. Chao; *L. inconspicuus* J. D. Hooker var. *hirtus* Hutchinson.

Shrubs, 1–1.5 m tall; branches and branchlets densely appressed pubescent or strigillose. Petiole 3–8 mm, appressed strigillose; leaf blade subleathery or papery, oblong-lanceolate, 6–12 × 1.5–3.5 cm, glabrous adaxially, appressed pubescent abaxially on nerves or strigillose on veins, base acute or cuneate, apex cuspidate-acuminate; lateral veins 7 or 8 pairs; nervules subparallel; nerves and nervules conspicuously elevated abaxially; stipules generally persistent, triangular, 0.5–1.2 mm, densely strigillose. Inflorescences glomerulate to subcapitate, sessile or subsessile or very shortly pedunculate; bracts minute, strigillose. Flowers sessile. Calyx densely strigillose; hypanthium portion campanulate to obconic, ca. 1 mm; limb 1–1.5 mm, lobed for 1/3–3/4; lobes 5, linear-lanceolate. Corolla ca. 8 mm, glabrous or strigillose on lobes outside, villous inside; lobes 5. Fruit globose, ca. 5 mm in diam., strigillose; pyrenes 5. Fl. Jun, fr. Jul–Oct.

• Forests, shaded and wet places; 200–1900 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, E Xizang, Yunnan.

**16. *Lasianthus hirsutus* (Roxburgh) Merrill, J. Arnold Arbor. 33: 229. 1952.**

鸡屎树 ji shi shu

*Triosteum hirsutum* Roxburgh, Fl. Ind. 2: 180. 1824.

Shrubs, 1–2 m tall; branchlets stiffly spreading rusty hirsute to glabrescent. Petiole 10–15 mm, hirsute; leaf blade subleathery or leathery, oblong or oblanceolate-oblong, 13–25 × 5–7.5 cm, glabrous adaxially, densely hirtellous or hirsute to strigose abaxially, base acute to obtuse, apex shortly acuminate; lateral veins 7–10 pairs; nervules subparallel, elevated abaxially; stipules lanceolate to deltoid, 8–10 mm, hirsute, generally persistent at least on apical nodes. Inflorescences glomerulate, sessile, hirsute; bracts leaflike, numerous, persistent, outer ones ovate-lanceolate, 2–3 cm, with distinct nerves, inner ones linear, much smaller. Flowers sessile. Calyx densely hirsute; hypanthium portion obconical, ca. 1 mm; limb 5-lobed; lobes linear-

lanceolate, ca. 2.5 mm. Corolla 11–15 mm; tube 8–12 mm, outside glabrous in lower half and hirsute in upper half, glabrous inside; lobes 5, ovate, ca. 3 mm. Fruit ovoid-globose, 4–5 mm in diam., hirsute to glabrescent, with ca. 5 rounded ridges; pyrenes 5. Fr. Nov.

Forests, shaded and wet places; 100–1500 m. Guangdong, Guangxi, Hainan, Taiwan [Bangladesh, India (including Andaman and Nicobar Islands), Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam].

*Lasianthus hirsutus* is a widely distributed species. It was mistakenly called "*L. cyanocarpus*" by most authors until Merrill (loc. cit.) showed the correct application of the name. *Lasianthus cyanocarpus* has relatively smaller leaves with cordate and slightly oblique bases and usually fewer and relatively smaller bracts; *L. hirsutus* differs from it in relatively larger leaves with cuneate, slightly unequal bases, relatively longer petioles, conspicuous triangular stipules, more numerous bracts with the outer ones ovate-oblong and leaflike and the inner ones gradually narrower and smaller, as well as usually long rusty hirsute hairs on most parts of the plants.

**17. *Lasianthus hispidulus* (Drake) Pitard** in Lecomte, Fl. Indo-Chine 3: 393. 1924.

文山粗叶木 wen shan cu ye mu

*Mephitidia hispidula* Drake, J. Bot. (Morot) 9: 239. 1895; *Lasianthus brevidens* Craib; *L. bunzanensis* Simizu.

Shrubs, 1–1.5 m tall; branches and branchlets densely villous or strigose. Petiole 4–7 mm, densely hirsute or strigose to strigillose; leaf blade thinly leathery to papery, elliptic or ovate-oblong, 7–10 × 3–5 cm, glabrous adaxially, densely villous abaxially, base acute or obtuse, apex cuspidate-acuminate or acuminate; lateral veins 4–6 pairs; nervules subparallel; midrib and veins elevated abaxially, nervules slightly elevated abaxially, strigose to strigillose; stipules generally persistent, 0.5–1 mm, densely hirsute or strigillose. Inflorescences glomerulate, sessile; bracts absent. Flowers sessile. Calyx strigillose; hypanthium campanulate, 1–1.5 mm; limb 1–1.5 mm, shortly toothed; teeth 5, broadly triangular. Corolla 6–7 mm, pilose outside, villous inside; lobes 5. Fruit globose, 3–6 mm in diam., strigillose; pyrenes 5.

Forests, shaded and wet places; 300–600 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Indonesia (Sumatra), Japan (Ryukyu Islands), Malaysia (Borneo), Thailand, Vietnam].

**18. *Lasianthus hookeri* C. B. Clarke** ex J. D. Hooker, Fl. Brit. India 3: 184. 1880.

虎克粗叶木 hu ke cu ye mu

Shrubs, up to 5 m tall; branches and branchlets densely appressed pubescent to sericeous. Petiole 5–10 mm, appressed puberulent to strigose or sericeous; leaf blade papery or subleathery, oblong, 12–24 × 3–6 cm, glabrous adaxially, puberulent or ciliate on nerves and margins abaxially, base obtuse or cuneate, apex caudate-acuminate; lateral veins 6–8 pairs, outermost pair extending to tip of leaf; nervules subparallel, conspicuously elevated abaxially; stipules generally persistent, triangular to broadly triangular, 2–3 mm, appressed puberulent to strigose or sericeous. Inflorescences glomerulate, sessile; bracts absent or few, linear, 3–4 mm. Flowers sessile. Calyx subgla-

brous to puberulent; hypanthium campanulate, 1.5–2 mm; limb lobed for 1/2–3/4; lobes 4–6, lanceolate to narrowly triangular, 1–2 mm. Corolla 6–7 mm, puberulent outside; tube 4–5 mm; lobes 4–6, ovate-lanceolate, ca. 2 mm. Fruit subglobose, 4–5 mm in diam., glabrous or puberulent, smooth; pyrenes 5.

Forests, shaded and wet places; 300–1500 m. Guangxi, Guizhou, Xizang, Yunnan [NE India, Myanmar, Thailand, Vietnam].

- 1a. Leaf margins densely ciliate; bracts subulate; calyx limb plus hypanthium ca. 2 mm, with minute subulate teeth ..... 18a. var. *dunnianus*  
 1b. Leaf margins sparsely ciliate; bracts absent; calyx limb plus hypanthium ca. 3 mm, with lanceolate, ca. 1 mm lobes ..... 18b. var. *hookeri*

**18a. *Lasianthus hookeri* var. *dunnianus*** (H. Léveillé) H. Zhu, Acta Phytotax. Sin. 32: 71. 1994 [*"dunniana"*].

睫毛虎克粗叶木 *jie mao hu ke cu ye mu*

*Lasianthus dunnianus* H. Léveillé, Repert. Spec. Nov. Regni Veg. 11: 64. 1912 [*"dunniana"*].

Leaf blade with margin densely ciliate. Bracts subulate. Calyx limb plus hypanthium ca. 2 mm, with minute subulate teeth.

Forests, shaded and wet places; 300–1500 m. Guangxi, Guizhou, Yunnan [N Myanmar].

**18b. *Lasianthus hookeri* var. *hookeri***

虎克粗叶木(原变种) *hu ke cu ye mu (yuan bian zhong)*

Leaf blade with margin sparsely ciliate. Bracts absent. Calyx limb plus hypanthium ca. 3 mm; lobes lanceolate, ca. 1 mm.

Forests, shaded and wet places; 600–1500 m. Xizang, Yunnan [NE India, Myanmar, Thailand, Vietnam].

**19. *Lasianthus inodorus*** Blume, Bijdr. 998. 1826–1827.

革叶粗叶木 *ge ye cu ye mu*

*Lasianthus poilanei* Pitard; *L. tubiferus* J. D. Hooker.

Shrubs, 2–3 m tall; branches and branchlets glabrous or thinly puberulent. Petiole 6–10 mm, glabrous or sparsely puberulent; leaf blade leathery, elliptic to elliptic-lanceolate, 10–20 × 2.5–6 cm, glabrous adaxially, glabrous or sparsely puberulent abaxially, base acuminate, apex acuminate; lateral veins 6 or 7 pairs; nervules parallel; nerves and nervules conspicuous abaxially; stipules persistent, triangular or ovate-lanceolate, 3–5 mm, glabrous, leathery. Inflorescences sessile, glomerulate; bracts persistent, orbicular or ovate-orbicular, 3–6 mm, thickly leathery, glabrous or pubescent. Flowers sessile. Calyx puberulent; hypanthium portion ca. 1 mm; limb 5-lobed; lobes ovate-lanceolate. Corolla ca. 10 mm, puberulent outside, villous inside. Fruit red, ovoid, ca. 10 mm, glabrous; pyrenes 5.

Montane forests, shaded and wet places; 1000–1800 m. S Yunnan [E Bangladesh, Cambodia, NE India, Indonesia (Java, Sumatra), Thailand, Vietnam].

**20. *Lasianthus japonicus*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 110. 1867.

日本粗叶木 *ri ben cu ye mu*

Shrubs, 1–2 m tall; branches and branchlets glabrous or subglabrous to sparsely strigose on young branches. Petiole 3–10 mm, sparsely strigillose to strigose or subglabrous; leaf blade leathery or papery, lanceolate, lanceolate-oblong, or oblong, 9–15 × 2–3.5 cm, glabrous adaxially, glabrous to strigose or hirtellous abaxially, especially on lateral veins and nervules, base acute to obtuse, apex cuspidate or cuspidate-acuminate to long caudate; lateral veins 5–7 pairs or numerous; nervules reticulate; stipules generally persistent, triangular, 1–3 mm, glabrous to minutely hirsute to strigillose. Inflorescences congested-cymose, pedunculate to subsessile, densely strigillose; peduncle 1–2 mm; bracts 0.2–1 mm. Flowers sessile or subsessile. Calyx strigillose to glabrescent; hypanthium portion campanulate, 1–1.5 mm; limb 1–2 mm, 4- or 5-dentate; teeth short to well developed, linear. Corolla 13–14 mm at anthesis, glabrous outside or sometimes puberulent on lobes, villous inside; tube 9–10 mm; lobes 4 or 5, spatulate, 4–4.5 mm. Fruit globose, 5–6 mm in diam., glabrous; pyrenes 4 or 5. Fl. Apr–May, fr. Jun–Oct.

Forests, shaded and wet places; 200–2300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [NE India, S Japan (Kyushu, Ryukyu Islands, Shikoku), Laos, N Vietnam].

This species is commonly collected in China. The leaf margin is often finely irregular, not crisped but actually undulate parallel to the looping tertiary venation that is near it. The leaves generally flush in a characteristic fashion, elongating but remaining rolled up and narrow, and are covered with notable sericeous pubescence on the exposed lower surfaces of the midrib and principal veins. This pubescence is often deciduous, leaving the mature lower leaf surface glabrous.

*Lasianthus japonicus* is a widely distributed species from E Asia to the Himalaya. *Lasianthus japonicus* subsp. *japonicus* occurs in SE China to Japan, below 1800 m, and basically in the Sino-Japanese floristic region delineated by C. Y. Wu (Bull. Univ. Mus. Univ. Tokyo 37: 1–9. 1998). *Lasianthus japonicus* subsp. *longicaudus* occurs in SW China and NE India in the Himalaya, at 1000–2300 m, i.e., in the Sino-Himalayan floristic region of Wu. They are a typical vicariant pair of subspecies. It may be surprising that *L. lucidus* var. *caudisepalus* from Assam, NE India, is found to be conspecific with *L. japonicus* subsp. *japonicus*. However, the geological history of E Asia gives an explanation. The formation of the vicarious distribution patterns of the Sino-Himalayan and Sino-Japanese regions is supposed to be related to the uplift of Himalaya in the Tertiary. *Lasianthus japonicus* subsp. *longicaudus* could have differentiated with the uplift of Himalaya becoming an altitudinal vicariant taxon of *L. japonicus*.

- 1a. Leaves usually long caudate at apex, lateral veins numerous, slender, very similar to nervules or subparallel secondary nerves; calyx and corolla 4-merous; calyx teeth reduced, limb almost truncate at apex ..... 20b. subsp. *longicaudus*  
 1b. Leaves cuspidate or cuspidate-acuminate at apex, lateral veins 5–7 pairs, ascending at an oblique angle, conspicuously

different from reticulate nervules;  
calyx and corolla 4-merous or  
usually 5-merous; calyx with  
well-developed triangular or  
lanceolate teeth ..... 20a. subsp. *japonicus*

**20a. *Lasianthus japonicus* subsp. *japonicus***

日本粗叶木(原亚种) ri ben cu ye mu (yuan ya zhong)

*Lasianthus caudatifolius* Merrill; *L. hartii* Franchet; *L. japonicus* var. *satsumensis* (Matsumura) Makino; *L. lancilimbus* Merrill; *L. lucidus* Blume var. *caudisepalus* Deb & M. Gangopadhyay; *L. satsumensis* Matsumura.

Leaf blade cuspidate or cuspidate-acuminate at apex; lateral veins 5–7 pairs, ascending at an oblique angle, conspicuously different from reticulate nervules. Calyx 4- or usually 5-lobed, with triangular or lanceolate teeth. Corolla 4- or usually 5-lobed.

Forests, shaded and wet places; 200–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [NE India, S Japan (Kyushu, Ryukyu Islands, Shikoku)].

Two varieties are recognized within *Lasianthus japonicus* subsp. *japonicus*; their morphological characters and geographic distribution are presented below.

*Lasianthus japonicus* var. *japonicus*: Leaf blade lanceolate, less than 3.5 cm wide. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang [NE India, S Japan (Kyushu, Ryukyu Islands, Shikoku)].

*Lasianthus japonicus* var. *latifolius* H. Zhu (Acta Phytotax. Sin. 32: 79. 1994; 宽叶日本粗叶木 kuan ye ri ben cu ye mu): Leaf blade oblong-lanceolate, more than 3.5 cm wide. Guangxi, Guizhou, Sichuan, Yunnan.

**20b. *Lasianthus japonicus* subsp. *longicaudus* (J. D. Hooker) C. Y. Wu & H. Zhu, Acta Phytotax. Sin. 32: 80. 1994.**

云广粗叶木 yun guang cu ye mu

*Lasianthus longicaudus* J. D. Hooker, Fl. Brit. India 3: 190. 1880 [“*longicauda*”]; *L. pseudojaponicus* Masamune.

Leaf blade usually long caudate at apex; lateral veins numerous, slender, very similar to nervules or subparallel secondary nerves. Calyx 4-lobed, almost truncate at apex. Corolla 4-lobed.

Montane forests, shaded and wet places; 1000–2300 m. Guangxi, Guizhou, Sichuan, Xizang, Yunnan [NE India, Laos, N Vietnam].

**21. *Lasianthus lancifolius* J. D. Hooker, Fl. Brit. India 3: 187. 1880.**

美脉粗叶木 mei mai cu ye mu

Shrubs, 1.5–3 m tall; branches and branchlets puberulent. Petiole 5–10 mm, appressed pubescent; leaf blade papery, lanceolate to elliptic-lanceolate, 13–20 × 2.5–4 cm, glabrous adaxially, puberulent on nerves and nervules as well as margin abaxially, base acute to obtuse, apex long acuminate; lateral veins ca. 9 pairs, faint adaxially; nervules subreticulate, forked, very slender; stipules generally persistent, triangular, 2–3 mm, pu-

bescent. Inflorescences glomerulate, sessile; bracts absent. Flowers sessile. Calyx puberulent; hypanthium portion campanulate, 1–1.5 mm; limb 1–1.5 mm; teeth subulate. Corolla 12–13 mm, puberulent outside, pubescent inside at upper half; lobes 5, ovate, ca. 2 mm. Fruit globose, 4–5 mm in diam., glabrous or sparsely puberulent, smooth; pyrenes 5.

Forests, shaded and wet places; 500–1700 m. Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, Bhutan, NE India, NE Thailand, N Vietnam].

**22. *Lasianthus linearisepalus* C. Y. Wu & H. Zhu, Acta Phytotax. Sin. 32: 61. 1994.**

线萼粗叶木 xian e cu ye mu

Shrubs, ca. 1 m tall; branchlets hirsute to subglabrous. Petiole ca. 5 mm, sparsely hirsute; leaf blade papery, oblong, 7–11 × 2.5–3 cm, glabrous adaxially, hirsute on nerves abaxially, base unequally cuneate, apex caudate; lateral veins 5 or 6 pairs; nervules subparallel; nerves and nervules elevated conspicuously abaxially; stipules ca. 1 mm, hirsute. Inflorescences glomerulate, sessile, 1–3-flowered; bracts subulate, 2–3 mm, hirsute. Flowers sessile. Calyx hirsute; lobes 5 or 6, linear, unequal, longest to 8 mm. Corolla strigose-villous outside. Fruit globose, sparsely hirsute; pyrenes 5.

• Montane forests, shaded and wet places; 1800–2100 m. SW Yunnan.

**23. *Lasianthus lucidus* Blume, Bijdr. 997. 1826–1827.**

无苞粗叶木 wu bao cu ye mu

Shrubs, 1–1.5 m tall; branches and branchlets glabrous or sparsely strigose on very young parts. Petiole 2.5–8 mm, strigillose or usually strigose; leaf blade membranous or subleathery, ovate, elliptic, or ovate-elliptic, 4–9 × 1.5–3 cm, glabrous adaxially, sparsely strigose or hirsute on nerves and nervules abaxially, base cuneate to obtuse, apex acuminate or cuspidate-acuminate; lateral veins 3–6 pairs, elevated abaxially; nervules parallel, conspicuous abaxially; stipules generally persistent, triangular, 1–1.5 mm, strigose. Inflorescences glomerulate to subcapitate, sessile; bracts absent. Flowers sessile or subsessile. Calyx with hypanthium portion obconic to widely campanulate, 1–1.5 mm, glabrescent; limb deeply lobed; lobes 5, narrowly triangular, 2–3 mm, usually somewhat unequal on an individual flower, strigose. Corolla 8–12 mm, glabrous or strigillose outside, villous at throat and on lobes inside; lobes 5, triangular, 2–2.5 mm. Fruit globose or ovoid, 4–5 mm in diam., glabrous; pyrenes 5.

Montane forests, shaded and wet places; 900–2400 m. Hainan, Yunnan [Bangladesh, NE India, Indonesia, Myanmar, Philippines, Thailand, Vietnam].

1a. Leaves elliptic, with lateral veins  
5 or 6 pairs ..... 23a. var. *inconspicuus*

1b. Leaves ovate or ovate-elliptic, with  
lateral veins 3 or 4 pairs ..... 23b. var. *lucidus*

**23a. *Lasianthus lucidus* var. *inconspicuus* (J. D. Hooker) H. Zhu, Acta Bot. Yunnan. 20: 154. 1998.**

椭圆叶无苞粗叶木 tuo yuan ye wu bao cu ye mu

*Lasianthus inconspicuus* J. D. Hooker, Fl. Brit. India 3: 187. 1880.

Leaves elliptic; lateral veins 5 or 6 pairs.

Montane forests, shaded and wet places; 900–1800 m. Yunnan [Bangladesh, NE India, N Thailand].

**23b. *Lasianthus lucidus* var. *lucidus***

无苞粗叶木(原变种) wu bao cu ye mu (yuan bian zhong)

Leaves ovate or ovate-elliptic; lateral veins 3 or 4 pairs.

Montane forests, shaded and wet places; 1200–2400 m. Hainan, Yunnan [NE India, Indonesia, Myanmar, Philippines, Thailand, Vietnam].

**24. *Lasianthus micranthus*** J. D. Hooker, Fl. Brit. India 3: 190. 1880.

小花粗叶木 xiao hua cu ye mu

*Lasianthus balansae* (Drake) Pitard; *L. microstachys* Hayata; *Mephitidia balansae* Drake.

Shrubs, 1–2 m tall; branches and branchlets slender, sparsely puberulent to glabrous, smooth. Petiole 4–9 mm, hirsute or strigillose; leaf blade papery or subleathery, ovate, ovate-oblong, or oblong-lanceolate, 5–10 × 2.5–3.5 cm, glabrous adaxially, sparsely to densely hirsute or strigillose to strigose on midrib and nerves abaxially, base obtuse or rounded to subacute, apex acute or acuminate; lateral veins 5 or 6 pairs; nervules parallel or subparallel; stipules triangular or lanceolate, 1–1.5 mm, densely strigillose. Inflorescences congested-cymose to capitate, pedunculate, densely strigillose; peduncles 1.5–5 mm, slender; bract reduced or linear and up to 2 mm; bracteoles minute. Flowers sessile. Calyx densely strigillose or villous to glabrescent; hypanthium portion campanulate, ca. 1 mm; limb 1–1.5 mm; teeth 5, subulate or triangular. Corolla 5–6.5 mm, glabrous to puberulent outside, villous inside; tube 3–6 mm; lobes 5, spatulate, 2–2.5 mm. Fruit globose to depressed globose, ca. 5 mm in diam., glabrous, smooth or with ca. 5 low ridges; pyrenes 5. Fl. Aug–Nov, fr. Sep–Oct.

Forests, shaded and wet places; 100–1800 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Xizang, Yunnan, Zhejiang [NE India, Thailand, N Vietnam].

The glabrous stems with strigillose rings at the nodes and the narrowly triangular, rather well-developed calyx lobes are distinctive.

**25. *Lasianthus obscurus*** (Blume ex Candolle) Miquel, Fl. Ned. Ind. 2: 317. 1857.

林生粗叶木 lin sheng cu ye mu

*Mephitidia obscura* Blume ex Candolle, Prodr. 4: 453. 1830; *Lasianthus kurzii* J. D. Hooker var. *fulvus* C. Y. Wu & H. Zhu; *L. kurzii* var. *sylicola* H. S. Lo.

Shrubs, to 3 m tall; branchlets spreading tomentose or densely pilosulous. Petiole 5–10 mm, spreading tomentose or pilosulous to villous; leaf blade membranous, elliptic-oblong to oblong, 12–20 × 3–5 cm, glabrous adaxially, spreading tomentose or villous abaxially, base cuneate to acute, apex acuminate; lateral veins 7–10 pairs; nervules parallel, distinct on both sur-

faces; stipules generally persistent, triangular or oblong-lanceolate, 4–8 mm, tomentose or pilosulous to strigillose. Inflorescences glomerulate or subcapitate, sessile; bracts persistent, outer bracts ovate, inner bracts lanceolate, all 1–5 mm, tomentose or pilosulous to villous. Flowers sessile or subsessile. Calyx densely tomentose or strigose; hypanthium portion campanulate, 1–1.5 mm; limb deeply lobed; lobes 4–6, triangular, ca. 2 mm. Corolla 5–6 mm, puberulent outside on upper part, pubescent inside at throat. Fruit subglobose, 4–6 mm in diam., tomentose; pyrenes 5 or 6.

Forests, shaded and wet places; 300–1200 m. Hainan, Yunnan [India (S Andaman Islands), Indonesia (Java, Sumatra), Myanmar, Thailand, Vietnam].

H. Zhu (Syst. & Geogr. Pl. 72: 80. 2002) noted that this species is very similar to *Lasianthus chrysoneurus*.

**26. *Lasianthus rhinocerotis*** Blume, Bijdr. 996. 1826–1827 [*“rhinozerotis”*].

黄毛粗叶木 huang mao cu ye mu

Shrubs, 1–3 m tall; branches and branchlets densely villous. Petiole 5–10 mm, densely brown villous; leaf blade leathery, oblong-lanceolate or lanceolate, 15–21 × 4–7 cm, glabrous adaxially, densely villous abaxially, base broadly cuneate to truncate, subrounded, rounded, or slightly cordate, apex caudate-acuminate; lateral veins 7–12 pairs; nervules parallel to subreticulate; veins and nervules elevated conspicuously abaxially; stipules generally persistent, triangular, 2.5–4 mm. Inflorescences congested-cymose to subcapitate, shortly pedunculate, densely villous to strigose or pilose; peduncles 3–10[–25] mm; bracts numerous, narrowly triangular, linear, or filiform, 6–12 mm, densely brown villous. Flowers sessile. Calyx densely strigose to pilose; hypanthium portion 1.5–2 mm; limb ca. 4 mm, usually 6-lobed; lobes linear-lanceolate, 1.5–3 mm. Corolla ca. 7 mm, densely strigose to pilose outside; tube ca. 4 mm; lobes 5, oblong, ca. 3 mm. Fruit subglobose or obovoid, ca. 4 mm in diam., strigillose or subglabrous, slightly longitudinally angled, crowned with calyx lobes; pyrenes 4 or 5. Fl. Apr, May.

Forests, shaded and wet places; 300–1600 m. Guangxi, Hainan, Yunnan [Indonesia (Java, Sumatra), Malaysia, Thailand, N Vietnam].

*Lasianthus rhinocerotis* subsp. *rhinocerotis* occurs in Indonesia (Java, Sumatra), Malaysia, and Thailand. The description is as follows: young branches and leaf abaxially densely hairy; leaf blade leathery, base rounded or slightly cordate, lateral veins 9–12 pairs, nervules densely anastomosing, parallel, stipules triangular, ca. 3 mm; bracts slender, filiform.

- 1a. Leaf bases broadly cuneate to truncate or subrounded; stipules ± inconspicuous; bracts relatively thick, linear to narrowly triangular; young branches and leaf abaxially densely hairy; leaf blade papery to leathery with 8–12 pairs of lateral veins and with densely anastomosing, parallel nervules ..... 26a. subsp. *pedunculatus*
- 1b. Leaf bases rounded or slightly cordate; stipules triangular, ca. 3 mm; bracts slender, filiform; young branches and leaf

abaxially sparsely hairy; leaf blade papery with 7 or 8 pairs of lateral veins and with loosely anastomosing, subreticulate nervules ..... 26b. subsp. *xishuangbannaensis*

**26a. *Lasianthus rhinocerotis* subsp. *pedunculatus*** (Pitard) H. Zhu, Acta Bot. Yunnan. 20: 154. 1998.

有梗粗叶木 you geng cu ye mu

*Lasianthus rhinocerotis* var. *pedunculatus* Pitard in Lecomte, Fl. Indo-Chine 3: 395. 1924; *L. koi* Merrill & Chun.

Young branches and leaf abaxially densely hairy. Leaf blade papery to leathery, base broadly cuneate to truncate or subrounded; lateral veins 8–12 pairs; nervules densely anastomosing, parallel; stipules  $\pm$  inconspicuous. Bracts relatively thick, linear to narrowly triangular.

Forests, shaded and wet places; 300–1000 m. Guangxi, Hainan, Yunnan [N Vietnam].

**26b. *Lasianthus rhinocerotis* subsp. *xishuangbannaensis*** H. Zhu & H. Wang, Acta Phytotax. Sin. 38: 282. 2000.

版纳粗叶木 ban na cu ye mu

Young branches and leaf abaxially sparsely hairy. Leaf blade papery, base rounded or slightly cordate; lateral veins 7 or 8 pairs; nervules loosely anastomosing, subreticulate; stipules triangular, ca. 3 mm. Bracts slender, filiform.

Montane forests, shaded and wet places; 1500–1600 m. S Yunnan [Thailand].

**27. *Lasianthus rigidus*** Miquel, Fl. Ned. Ind. 2: 321. 1857.

大叶粗叶木 da ye cu ye mu

*Lasianthus humilis* Elmer; *L. tentaculatus* J. D. Hooker.

Shrubs, height unknown; branchlets glabrous or subglabrous. Petiole 4–7 mm, sparsely hirsute; leaf blade papery or leathery, obovate-oblong, obovate, or oblong, 12–18  $\times$  5–7 cm, glabrous adaxially, hirsute on midrib, lateral veins, and nervules abaxially, base  $\pm$  oblique, obtuse, slightly cordate, or rounded, margin thinly recurved, apex shortly cuspidate-acuminate; lateral veins 8 or 9 pairs, elevated abaxially; nervules parallel, conspicuous abaxially; stipules persistent, triangular or subulate, 5–6 mm, hirsute. Inflorescences glomerulate, sessile, hirsute to hirtellous; bracts numerous, linear or linear-lanceolate to lanceolate, 9–12 mm, hirsute. Flowers sessile. Calyx sparsely hirsute; hypanthium portion campanulate, ca. 2 mm; limb ca. 2 mm; teeth 5, triangular, ca. 1 mm. Corolla ca. 1 cm, puberulent outside, pubescent inside in upper part; lobes 5. Fruit globose, 4–5 mm in diam., glabrous; pyrenes 5.

Forests, shaded and wet places; 500–700 m. Hainan, S Yunnan [NE India, Indonesia (Java, Sumatra), Philippines].

**28. *Lasianthus schmidtii*** K. Schumann, Bot. Tidsskr. 24: 340. 1902.

泰北粗叶木 tai bei cu ye mu

*Lasianthus kerrii* Craib.

Shrubs, 1–1.5 m tall; branches and branchlets densely tomentose to strigose. Petiole 4–9 mm, tomentose or strigose; leaf blade papery or rigid-papery, oblanceolate, elliptic-oblanceolate, or oblong, 5–10  $\times$  2–4 cm, glabrous adaxially, tomentose or strigillose on midrib, nerves, and nervules abaxially, base cuneate, obtuse, or rounded, apex shortly acuminate or acute; lateral veins 5–7 pairs; nervules subreticulate; nerves and nervules elevated conspicuously abaxially; stipules subulate-triangular, 2–3 mm, tomentose or strigose. Inflorescence glomerulate, sessile; bracts subulate, 4–6 mm, tomentose or strigose. Flowers sessile. Calyx tomentose or strigose; hypanthium portion obconic, 1–1.5 mm; limb deeply lobed; lobes 4, triangular-subulate to lanceolate, 1.5–2 mm. Corolla ca. 9 mm; tube ca. 7 mm, sparsely strigillose outside; lobes 4, ca. 2 mm. Fruit blue, subglobose, 4–5 mm in diam., tomentose or strigillose; pyrenes 4.

Montane forests, shaded and wet places; 1000–1200 m. S Yunnan [N Thailand].

H. Zhu (Syst. & Geogr. Pl. 72: 79. 2002) noted that this species is rare and very similar to *Lasianthus sikkimensis*.

**29. *Lasianthus simizui*** (T. S. Liu & J. M. Chao) H. Zhu, Syst. & Geogr. Pl. 72: 92. 2002 [*"shimizui"*].

清水氏鸡屎树 qing shui shi ji shi shu

*Lasianthus obliquinervis* Merrill var. *simizui* T. S. Liu & J. M. Chao, Taiwania 10: 143. 1964; *L. trichophlebus* Hemsley var. *simizui* (T. S. Liu & J. M. Chao) H. Zhu.

Shrubs; branches and branchlets densely hirsute. Petiole 3–5 mm, hirsute; leaf blade leathery or subleathery, oblong or elliptic-oblong, 6–10  $\times$  2.5–4 cm, glabrous adaxially, hirsute on midrib, nerves, and nervules abaxially, base acute, apex cuspidate or acute; lateral veins 6–8 pairs; nervules parallel; nerves and nervules elevated abaxially; stipules triangular-lanceolate, 3–5 mm, hirsute. Inflorescences sessile; bracts subulate, reduced. Flowers sessile. Calyx hirsute; hypanthium portion campanulate; limb ca. 2 mm, toothed for ca. 1/2; teeth 5, ca. 1 mm. Corolla not seen. Fruit subglobose, 5–6 mm in diam., subglabrous; pyrenes 5.

• Forests, shaded and wet places. Taiwan.

This species is similar to *Lasianthus trichophlebus* and *L. verticillatus*. It has stipules longer than in *L. verticillatus* and shorter than in *L. trichophlebus*, indumentum and a dentate calyx similar to *L. trichophlebus*, but 5-merous flowers and smooth fruit like *L. verticillatus*.

**30. *Lasianthus sikkimensis*** J. D. Hooker, Fl. Brit. India 3: 180. 1880.

锡金粗叶木 xi jin cu ye mu

*Lasianthus langkokensis* Drake ex Pitard; *L. sikkimensis* subsp. *langkokensis* (Drake ex Pitard) H. Zhu; *L. tsangii* Merrill ex H. L. Li.

Shrubs, 1–3 m tall; branches and branchlets densely brown tomentose or -villous. Petiole 6–14 mm, densely tomentose to villous; leaf blade subleathery or thinly leathery, elliptic-lanceolate or elliptic, 12–20  $\times$  2.5–5 cm, glabrous adaxially, densely to moderately brown tomentose or villous to hirtellous abaxially, base acute or obtuse, margin usually thinly recurved,

apex cuspidate-acuminate; lateral veins 8–10 pairs; midrib and nerves elevated conspicuously abaxially; nervules subparallel, conspicuous abaxially; stipules generally persistent, triangular, 2–3 mm, densely tomentose to villous. Inflorescences glomerulate, sessile, 1–3-flowered, densely strigose to villous; bracts persistent, linear to lanceolate, 0.3–2 cm. Flowers sessile or subsessile. Calyx with hypanthium portion obconic, 1–2 mm, glabrous; limb 1–2 mm, hirtellous to strigillose, 5-lobed; lobes triangular. Corolla ca. 1 cm, puberulent outside. Fruit ellipsoid, 6–8 mm, glabrous, smooth or with ca. 5 low ridges; pyrenes 5. Fr. Jun, Oct.

Forests, shaded and wet places; 300–1600 m. Fujian, Guangdong, Guangxi, Taiwan, Yunnan, Zhejiang [Bangladesh, NE India, Philippines, Thailand, N Vietnam].

The combination of the glabrous fruit body and densely pubescent persisting calyx limb and the well-developed bracts on the sessile glomerulate inflorescences are distinctive for this species. H. Zhu (Syst. & Geogr. Pl. 72: 80. 2002) noted that the two subspecies of *Lasianthus sikkimensis* that were previously recognized have become difficult or impossible to separate now that more collections are available. Zhu (loc. cit.: 79) also noted that this species is very similar to *L. schmidtii*.

**31. *Lasianthus trichophlebus*** Hemsley, J. Linn. Soc., Bot. 23: 388. 1888.

钟萼粗叶木 zhong e cu ye mu

Shrubs, 1–2 m tall; branchlets strigillose to hirtellous. Petiole 5–8 mm, strigillose to hirsute; leaf blade leathery, oblong or elliptic-oblong, 8–15 × 3–5 cm, glabrous adaxially, strigillose or hirsute on midrib and nerves abaxially, base cuneate, apex cuspidate or acute; lateral veins 7–9 pairs; nervules parallel; nerves and nervules elevated abaxially; stipules triangular-lanceolate to narrowly triangular, 5–8 mm, densely strigillose. Inflorescences glomerulate, sessile; bracts absent. Flowers subsessile. Calyx strigillose to hirsute; hypanthium obconic to campanulate, ca. 2 mm; limb 1–1.5 mm, deeply 4-lobed; lobes narrowly triangular, ca. 1 mm. Corolla 6–8 mm, densely strigillose in upper half outside; lobes 4. Fruit subglobose, 5–6 mm in diam., verrucose, strigillose; pyrenes 4. Fl. Apr–May, fr. Sep–Oct.

Forests, shaded and wet places; ca. 100 m. Guangdong, Hainan, Taiwan [Indonesia, Malaysia (Peninsular), Philippines, Singapore, Thailand, Vietnam].

*Lasianthus trichophlebus* was often confused with both *L. chinensis* and *L. verticillatus*. However, it differs from *L. chinensis* by having leathery leaves with 7–9 pairs of lateral veins and parallel veinlets; stipules triangular-lanceolate, strigillose, 5–8 mm; flowers 4-merous; and pyrenes 4. It differs from *L. verticillatus* by having strigillose hairs on young branches and leaf nerves abaxially; stipules triangular-lanceolate, strigillose, 5–8 mm; flowers 4-merous; calyx with strigillose triangular lobes; and drupes with 4 pyrenes and verrucose on external surface.

- 1a. Branches densely hirsute, leaves pubescent abaxially ..... 31a. var. *latifolius*
- 1b. Branches sparsely strigillose; leaves abaxially glabrous except strigillose or hirsute on midrib and nerves ..... 31b. var. *trichophlebus*

**31a. *Lasianthus trichophlebus* var. *latifolius*** (Miquel) H.

Zhu, Syst. & Geogr. Pl. 72: 93. 2002.

栖兰钟萼粗叶木 qi lan zhong e cu ye mu

*Lasianthus sylvestris* Blume f. *latifolius* Miquel, Ann. Mus. Bot. Lugduno-Batavi 4: 248. 1869 [*"latifolia"*]; *L. hiiranensis* Hayata; *L. lei* Merrill & F. P. Metcalf ex H. S. Lo.

Branches densely hirsute. Leaves pubescent abaxially.

Forests, shaded and wet places. Hainan, Taiwan [Indonesia (Java, Sumatra), Malaysia (Peninsular), Philippines, Singapore, Thailand, Vietnam].

This taxon was treated as *Lasianthus tomentosus* Blume by King and Gamble (J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 73: 130. 1904), Ridley (Fl. Malay Penin. 2: 161. 1923), Craib (Fl. Siam. 2(2): 219. 1934), and H. Zhu (Acta Bot. Yunnan. 20: 155. 1998), which may be due to the authors following two misidentified sheets in K. These two specimens, which are labeled as *Horsfield s.n.* [Rub. 50] from Java, are indicated as "*L. tomentosus* Blume" with Miquel's handwriting and also were cited as such in print (Miquel, Fl. Ned. Ind. 2: 318. 1857). Miquel (loc. cit. 1869) later changed his mind and considered that they were not the same as *L. tomentosus*. The type materials of *L. tomentosus* are only in Leiden and there are no overseas duplicates. After examining Malaysian specimens and carefully comparing with the type of *L. tomentosus*, it is recognized that the taxon that was mistaken for *L. tomentosus* has conspicuous, strigose, linear-lanceolate stipules, 4-merous flowers, hirsute and verrucose drupes with 4 pyrenes, and is more closely related to *L. trichophlebus* than *L. tomentosus*. The taxon differs from *L. trichophlebus* by having only dense hirsute hairs on the branches and pubescent hairs on the abaxial leaf surface. It is better, therefore, to treat this taxon as a variety of *L. trichophlebus*.

**31b. *Lasianthus trichophlebus* var. *trichophlebus***

钟萼粗叶木(原变种) zhong e cu ye mu (yuan bian zhong)

*Lasianthus barbellatus* Ridley; *L. cupreus* Pierre ex Pitard.

Branches sparsely strigillose. Leaves glabrous except strigillose or hirsute on midrib and nerves abaxially.

Forests, shaded and wet places. Guangdong [Indonesia, Malaysia (Peninsular), Philippines, Thailand, Vietnam].

**32. *Lasianthus verticillatus*** (Loureiro) Merrill, Trans. Amer. Philos. Soc., n.s., 24: 372. 1935.

斜脉粗叶木 xie mai cu ye mu

*Dasus verticillatus* Loureiro, Fl. Cochinch. 1: 142. 1790; *Lasianthus andamanicus* J. D. Hooker; *L. taitoensis* Simizu; *L. tamirensis* Pierre ex Pitard.

Shrubs, 1.5–3 m tall; branches and branchlets appressed pubescent or strigillose to glabrescent. Petiole 7–10 mm, densely pubescent or strigillose to strigose; leaf blade leathery, oblong to elliptic-oblong, 8.5–18 × 3.5–7 cm, glabrous adaxially, thinly pubescent or strigillose abaxially, base acute to broadly obtuse, margins usually undulate, often thinly revolute, apex acute or acuminate; lateral veins 7–9 pairs; nervules parallel; nerves and nervules elevated conspicuously abaxially; stipules generally persistent, triangular to narrowly triangular, 3–5 mm, densely puberulent to strigillose. Inflorescences subcapitate to congested-cymose, sessile; bracts absent or reduced. Flowers sessile to subsessile. Calyx subglabrous or puberulent;

hypanthium portion campanulate to subglobose, 2.5–3 mm; limb 2–2.5 mm, truncate or minutely dentate. Corolla 10–12 mm, hirtellous to villous outside, villous inside; lobes 5, ovate. Fruit blue, ellipsoid, up to 10 mm in diam., strigillose to glabrescent, smooth; pyrenes 4 or 5. Fl. Apr–May, fr. Oct–Nov.

Forests, shaded and wet places; 100–1000 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Cambodia, India (Andaman and Nicobar Islands), Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

The relatively large flowers with the large globose to ellipsoid hypanthium (i.e., ovary) portion are distinctive; *Lasianthus chinensis* is similar in these characters but can be distinguished by its deeply lobed calyx limb and angled to ridged fruit.

Specimens from mainland SE China, Taiwan, and Ryukyu Islands that have been treated as "*Lasianthus obliquinervis* Merrill" are clearly conspecific with *L. verticillatus*. In Merrill's description (Philipp. J. Sci. 1(Suppl. 1): 136. 1906), *L. obliquinervis* is described as having oblong-ovate stipules ca. 5 mm and fruit with 6 triquetrous pyrenes, which does not match *L. verticillatus*. *Lasianthus obliquinervis* represents a different species with distribution in the Philippines and Papua New Guinea. The so-called "*L. obliquinervis*" from China, Taiwan, and the

Ryukyus in Chinese and Japanese literature is a misidentification of the species *L. verticillatus*.

**33. *Lasianthus wardii*** C. E. C. Fischer & Kaul, Bull. Misc. Inform. Kew 1940: 292. 1941.

滇西粗叶木 *dian xi cu ye mu*

Shrubs, height unknown; branchlets fuscous tomentose. Petiole 5–10 mm, tomentose; leaf blade papery, dark olivaceous adaxially, elliptic-oblong to oblanceolate-oblong, 12–17 × 3.5–6 cm, glabrous adaxially, brown- or fuscous tomentose abaxially especially on nerves, base cuneate; apex caudate-acuminate; lateral veins ca. 7 pairs, elevated abaxially; nervules subreticulate; stipules broadly ovate, cuspidate. Inflorescences glomerulate, sessile; bracts absent. Flowers sessile. Calyx brown tomentose; hypanthium portion campanulate, very short; limb deeply lobed; lobes 5, oblong, ca. 3 mm, obtuse. Corolla shortly brown tomentose outside; tube up to 1.6 cm, whitish- or brownish pilose in upper half inside; lobes 5, triangular-ovate, ca. 4.5 mm. Fruit not seen.

Forests, shaded and wet places. Yunnan [Myanmar].

H. Zhu (Syst. & Geogr. Pl. 72: 83–84. 2002) cited only three specimens in total of this species, which suggests that it is rare.

#### 44. LEPTODERMIS Wallich in Roxburgh, Fl. Ind. 2: 191. 1824.

野丁香属 *ye ding xiang shu*

Chen Tao (陈涛)

Shrubs, sometimes low or reduced, unarmed, usually with short shoots. Raphides present. Leaves opposite, apparently without domatia; stipules persistent, interpetiolar, triangular, often aristate to spinescent. Inflorescences terminal on main stems and/or axillary short shoots (and then appearing axillary), capitate to congested-fasciculate or -cymose and several flowered or sometimes reduced to 1 flower, bracteate with bracts often fused in pairs. Flowers sessile to shortly pedicellate, bisexual, distylous. Calyx limb (4 or)5(or 6)-lobed. Corolla white to pink or purple, funnelform, inside glabrous to pubescent; lobes (4 or)5(or 6), valvate or valvate-induplicate in bud. Stamens (4 or)5(or 6), inserted in corolla throat, exserted or included; filaments short; anthers dorsifixed. Ovary 5-celled, ovules 1 in each cell, basal, erect, anatropous; stigmas (2 or)3–5(or 6), linear, exserted or included. Fruit capsular, ellipsoid to ovoid, opening through an apical operculum then splitting longitudinally into 5 valves, cartilaginous to woody, calyx limb persistent; aril reticulate, free or adherent to seed; seeds few, medium-sized, ellipsoid, straight, with thin testa; cotyledons rounded; radicle short, inferior.

About 40 species: Himalaya to Japan; 34 species (30 endemic) in China.

1a. Aril free from testa (fruit of *L. brevisepala* and *L. dielsiana* not seen).

2a. Bracteoles free.

3a. Stipules compressed triangular, shortly acuminate; bracteole longer than calyx ..... 5. *L. dielsiana*

3b. Stipules long triangular, acuminate; bracteole shorter than calyx or subequal in length ..... 26. *L. scissa*

2b. Bracteoles connate.

4a. Bracteoles connate from base to middle.

5a. Bracteoles longer than calyces or nearly as long as calyces.

6a. Flowers mostly terminal on branches or laterally arranged; calyx lobes lanceolate-subulate, acuminate or shortly acuminate, glabrous; corolla funnelform, lobes not incurved at apex; stamens inserted in corolla tube throat ..... 8. *L. glomerata*

6b. Flowers 3 terminal on branches; calyx lobes short or long triangular or subovate, very acute, ciliate; corolla narrowly funnelform, lobes incurved at apex; stamens inserted below corolla tube throat.

7a. Calyx lobes short or long triangular ..... 14. *L. limprichtii*

7b. Calyx lobes subovate ..... 21. *L. pumila*

5b. Bracteoles shorter than calyces.

8a. Leaves thickly papery, glabrous; stipules subtriangular; calyx lobes not ciliate ..... 2. *L. brevisepala*

8b. Leaves papery, pilose; stipules broadly triangular, glandular on margins; calyx lobes ciliate.

- 9a. Stipules with stiff acicular apiculus, sometimes with stipitate glands on margins; corolla lobes triangular-oblate, apex obtuse; stamens inserted in corolla tube throat ..... 29. *L. velutiniflora*
- 9b. Stipules with acicular apiculus, with 2 glandular teeth; corolla lobes ovate-triangular, apex reflexed; stamens inserted below corolla tube throat ..... 20. *L. potaninii*
- 4b. Bracteoles 1/2–2/3 connate.
  - 10a. Bracteoles equal or subequal in length to calyces; corolla lobes inflexed at apex.
    - 11a. Flowers with pedicels, 3–9 mm ..... 28. *L. umbellata*
    - 11b. Flowers sessile or subsessile.
      - 12a. Corolla small, 11–14 mm; free portion of bracteole triangular ..... 16. *L. oblonga*
      - 12b. Corolla large, to ca. 16 mm; free portion of bracteole broadly triangular ..... 9. *L. gracilis*
  - 10b. Bracteoles longer than calyces; corolla lobes not inflexed at apex.
    - 13a. Stigmas 3-lobed, filiform.
      - 14a. Leaves thickly papery; bracteoles sparsely ciliate; calyx lobes shortly acuminate; corolla purplish red, lobes 4 or 5, ovate-lanceolate; stamens inserted above corolla tube throat ..... 17. *L. ordosica*
      - 14b. Leaves leathery; bracteoles pilose; calyx lobes obtuse; corolla white, lobes 5, sublanceolate; stamens inserted below corolla tube throat ..... 24. *L. scabrida*
    - 13b. Stigmas 5-lobed, linear.
      - 15a. Leaves papery, 3–10 cm, petioles ca. 24 mm; calyx lobes triangular-ovate; corolla lobes with 3 obtuse teeth, incurved ..... 12. *L. kumaonensis*
      - 15b. Leaves subleathery or leathery, to 4 cm, petioles 4–7 mm; calyx lobes broadly oblong to suborbicular; corolla lobes obtuse.
        - 16a. Leaves ovate to broadly lanceolate, whitish or pale yellow abaxially when dry, veinlets indistinct abaxially ..... 4. *L. coriaceifolia*
        - 16b. Leaves ovate, ovate-oblong, elliptic, or suborbicular, pale green or iron-gray abaxially when dry, veinlets conspicuous abaxially.
          - 17a. Flowers 3–7 fascicled, terminal or in axils of upper 3–6 pairs of leaves, subsessile or pedicels 0.3–2.6 mm ..... 30. *L. vestita*
          - 17b. Flowers (1–)3–5 fascicled, terminal on ultimate branches of inflorescence, forming a thyrses, pedicels to 8 mm ..... 33. *L. yangshuoensis*
- 1b. Aril adherent to testa.
  - 18a. Bracteoles separated, scaly ..... 1. *L. beichuanensis*
  - 18b. Bracteoles connate.
    - 19a. Bracteoles nearly as long as corolla.
      - 20a. Stigmas 2-lobed ..... 13. *L. lanata*
      - 20b. Stigmas 5-lobed.
        - 21a. Bracteoles tomentose.
          - 22a. Bracteoles slightly longer than calyces; calyx lobes ovate, acuminate ..... 10. *L. handeliana*
          - 22b. Bracteoles shorter than calyces; calyx lobes ovate-oblong, slightly obtuse ..... 27. *L. tomentella*
        - 21b. Bracteoles pubescent or ciliate on upper portion.
          - 23a. Leaves 1–4 × ca. 2 cm, petioles to 1 cm; bracteoles subulate-acuminate at apex .... 23. *L. rehderiana*
          - 23b. Leaves 4–9 × 1.25–2 mm, petioles very short or subsessile; bracteoles rounded at apex, apiculate ..... 25. *L. schneideri*
    - 19b. Bracteoles obviously longer or shorter than calyces.
      - 24a. Bracteoles obviously longer than calyces.
        - 25a. Stigmas usually 3-lobed ..... 32. *L. xizangensis*
        - 25b. Stigmas usually 5-lobed.
          - 26a. Leaves glabrous on both surfaces.
            - 27a. Stipules triangular, glabrous; flowers subsessile; calyx lobes densely fimbriate-ciliate; corolla pallid purple, narrowly funnelform, lobes lanceolate; stamens inserted above corolla tube throat ..... 3. *L. buxifolia*
            - 27b. Stipules ovate-triangular, covered with soft hairs; flowers with pedicel 3–5(–8) mm; calyx lobes shortly ciliate; corolla purplish blue, funnelform, lobes broadly ovate; stamens inserted below corolla tube throat ..... 6. *L. diffusa*
          - 26b. Leaves hairy on both surfaces, at least ciliate along margins.
            - 28a. Stipules compressed triangular or triangular, acuminate, apiculus rarely with 1 or 2 lateral glandular teeth; calyx lobes acuminate ..... 10. *L. handeliana*
            - 28b. Stipules broadly triangular, cuspidate-apiculate; calyx lobes obtuse to truncate ..... 19. *L. pilosa*

- 24b. Bracteoles obviously shorter than calyces.
- 29a. Stigmas more than 3-lobed.
- 30a. Corolla lobes subovate, apex inflexed and beaked ..... 11. *L. hirsutiflora*
- 30b. Corolla lobes ovoid-lanceolate, apex mucronate or slightly obtuse.
- 31a. Leaves slightly thick; bracteoles abruptly acuminate at apex; calyx lobes triangular-lanceolate; corolla lobes acute, margins revolute ..... 18. *L. parvifolia*
- 31b. Leaves papery, margins obviously recurved; bracteoles abruptly acute; calyx lobes oblong-ovate; corolla lobes slightly obtuse ..... 22. *L. purdomii*
- 29b. Stigmas 2- or 3-lobed.
- 32a. Corolla broadly funnelform; stamens inserted below corolla tube throat.
- 33a. Stipules apiculate at apex, sparsely pilose at base; bracteole lobes triangular; corolla white, pallid pink, or purple, lobes apically inflexed and beaked ..... 15. *L. ludlowii*
- 33b. Stipules lacerate at apex, with glandular hairs along margins; bracteole lobes lanceolate or ensiform-lanceolate; corolla purple, lobes shallowly 3-parted at apex, margins wavy ..... 34. *L. yui*
- 32b. Corolla funnelform; stamens inserted in corolla tube throat.
- 34a. Stipules with fimbriate collaters along margins; corolla pallid blue or purplish or purplish red; stigmas 2-lobed ..... 7. *L. forrestii*
- 34b. Stipules usually glandular along margins; corolla white or pallid red, stigmas 3-lobed ..... 31. *L. wilsonii*

**1. *Leptodermis beichuanensis*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 19. 1999.

北川野丁香 *bei chuan ye ding xiang*

Shrubs, ca. 2 m tall; branches slender, terete, gray or grayish brown, with 2 bands of soft hairs. Petiole 1–3 mm; leaf blade papery, olive-green when dry, narrowly lanceolate or oblong-lanceolate, sometimes subovate or elliptic, 0.8–3.5 × 0.3–1 cm, slightly scabrous adaxially, midrib strigose abaxially, base cuneate, apex acuminate or acute; midrib and lateral veins slightly prominent on both surfaces, lateral veins 3 or 4 pairs; stipules small, subtriangular, ca. 1 mm, stiffly apiculate, usually caducous. Flowers 1–3 terminal, sessile; bracteoles scaly, shorter than 1 mm, stiffly apiculate. Calyx tube ca. 1.8 mm; lobes broadly triangular, width longer than length, ca. 0.6 mm, sometimes margins denticulate. Immature fruit subobovate, ca. 3 mm; seed aril adherent to testa.

• About 1400 m. NC Sichuan (Beichuan).

**2. *Leptodermis brevisejala*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 21. 1999.

短萼野丁香 *duan e ye ding xiang*

Shrubs, ca. 40 cm tall; branchlets terete, erect and long, ferruginous, pubescent or puberulent. Leaves sparsely arranged or 4 fascicled at tips of branchlets; petiole 1–2 mm or sometimes leaves subsessile; blade thickly papery, nearly black adaxially and dark brown abaxially when dry, ovate or lanceolate, 6–10 × 3–5 mm, both surfaces glabrous, margins slightly revolute, apex shortly acuminate or subacute, rarely obtuse; lateral veins 3 or 4 pairs, together with midrib conspicuously prominent abaxially; stipules subtriangular, ca. 1.6 mm, subglabrous, with a long stiff apiculus. Cymes almost sessile, terminal on short branches, sometimes axillary, 5–7-flowered. Flowers subsessile or shortly pedicellate; bracteoles transparent, connate below middle portion, subequal to calyx tube in length, subglabrous or puberulent, with a stiff acicular apiculus. Calyx tube black when dry, 1.4–1.7 mm; lobes 5, ovate-orbicular or ovate-triangular,

length subequal to width, ca. 0.4 mm, not ciliate, obtuse or subacute. Corolla white, funnelform, 8–10 mm, puberulent outside, densely white villous inside; lobes 5, suborbicular, margins wavy or erose. Stamens 5, inserted below throat of corolla tube; anthers linear, included. Style exserted; stigmas usually 3-lobed, involute.

• About 1800 m. Sichuan (Huili).

**3. *Leptodermis buxifolia*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 20. 1999.

黄杨叶野丁香 *huang yang ye ye ding xiang*

*Leptodermis buxifolia* f. *strigosa* H. S. Lo.

Shrubs, 0.5–2 m tall; branches terete, slightly stout, black or dark gray, glabrous, branches slightly elongate or abbreviated. Leaves sparse or fascicled in axils of short branches; petiole short or nearly absent; blade thickly leathery, ovate, lanceolate, elliptic, or oblong, 5–8(–12) × 2–5(–8) mm, both surfaces glabrous, shiny, margins recurved, apex obtuse or rounded, sometimes subacute; midrib raised abaxially, lateral veins inconspicuous; stipules triangular, ca. 1.2 mm, glabrous. Cymes terminal or axillary, usually 3-flowered, sometimes in narrow thyrses. Flowers subsessile; bracteoles transparent, ca. 2 mm, ca. 3/4 connate, lobes short, with prominent tip, glabrous. Calyx small; tube ca. 1 mm; lobes oval, 0.4–0.5 mm, densely fimbriate-ciliate. Corolla light purple, narrowly funnelform, 9–10(–14) mm; tube slender, pulverulent pubescent outside, pilose inside, often pendulous; lobes 5, lanceolate, ca. 2 mm. Stamens 5, inserted above corolla tube throat; anthers filiform, exserted. Style ca. 1/2 as long as corolla; stigmas (2 or) 5-lobed, lobes filiform, included. Fruit 4–4.5 mm; seed aril reticulate, adherent to testa. Fl. Jul–Aug, fr. Aug–Sep.

• Thickets, dry mountain slopes; 1100–2100 m. Gansu, SW Shaanxi, Sichuan.

**4. *Leptodermis coriaceifolia*** Tao Chen, *sp. nov.*

革叶野丁香 *ge ye ye ding xiang*

Type: China. Yunnan: Xichou Xian (西畴县) ["Si-chourhsien"], Fadou (法斗) ["Faa-doou"], 1500 m, in open thickets on rock hill, 26 Sep 1947, K. M. Feng 12065 (holotype, A; isotypes, IBSC, KUN).

*Haec species Leptodermidi vestitae Hemsley similis, sed ab ea folii lamina ovata vel late lanceolata crassa in sicco coriacea ac abaxialiter albida vel pallide lutea, venis lateralibus abaxialiter indistinctis vel parum prominentibus, venulis adaxialiter plerumque distinctis abaxialiter indistinctis, pedunculo hirsuto vel glabrescente, pedicellis dense hirsutis, bracteolis crassiusculis plerumque non hyalinis margine prope apicem conspicue ciliato, corolla extus sparsim minuteque hirsuta trichomatibus sparsis longioribus prope alabastris apicem atque stylo 3-lobato differt.*

Shrubs to 1.2(–3) m tall. Stems dark brown, glabrescent, lenticellate; branches many, young branches pale yellow when dry, with 2 bands of sparse hairs decurrent from stipules; bark gray, fissured and peeling off when old. Leaves decussate; petiole short, to 0.7 mm, sparsely hairy to glabrous; blade dark green adaxially, whitish or pale yellow abaxially when dry, ovate to broadly lanceolate, 1–6 × 0.5–2.5 cm, thick, leathery when dry, glabrous on both surfaces or sparsely hairy along midvein, base attenuate, cuneate, margins sparsely hairy, apex acuminate to acute; midvein impressed adaxially, prominent abaxially, lateral veins distinct adaxially, indistinct or slightly prominent abaxially, with 4–8 veins per side, veinlets usually distinct adaxially, indistinct abaxially; stipules rigid, broadly triangular, ca. 1 mm, hairy abaxially, cuspidate, mucronate at apex. Inflorescences terminal on new shoots with all upper nodes bearing 2–4 lateral shoots with axillary and terminal clusters of cymes 3–9-flowered, forming a narrow thyse with an elongate central axis and short lateral branches; peduncle hairy or glabrescent; bracts of cymes ligulate or leaflike, 1–4.5 mm or longer, with a midvein slightly prominent abaxially, margins hairy, apex acuminate to acute. Flowers heterostylous, subsessile or shortly pedicellate; pedicel densely hairy; bracteole pairs rigid, slightly thick, usually not transparent, obovate, ca. 3 mm, longer than or subequal to calyx at anthesis, connate for ca. 3/4 length, few veined, minutely short and sparsely hairy abaxially, margins conspicuously ciliate near apex, apex acute to obtuse, shortly mucronulate. Calyx tube absent; lobes 5, ovate, ca. 1 mm, margins long ciliate, apex acute. Corolla purplish white; tube narrowly funnelform, ca. 10 mm, outside sparsely minutely hairy, with sparse longer hairs near apex of flower buds, inside villous above middle of tube; lobes 5, ovate-oblong, ca. 3 mm, veined, lower part with thinner margins, upper part triangular, apex shortly acuminate, hooked. Long-styled flower: stamens inserted at throat ca. 1.5 mm from sinus, filaments attached to lower 1/3 of anthers, free part shorter than lower portion of anthers, anthers ca. 1.5 mm, introrse; style ca. 12 mm, glabrous, 3(–5)-lobed, lobes ca. 1 mm, papillose. Capsule ca. 6 mm; seeds with reticulate aril free from testa. Fl. Sep–Oct, fr. Nov–Dec.

Open thickets on limestone hills; 300–1700 m. Guangxi, Yunnan [Vietnam].

**5. *Leptodermis dielsiana*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. 18: 151. 1922.

丽江野丁香 li jiang ye ding xiang

Small shrubs, 8–50 cm tall, with rootlike flagella; young branches not lignified, red, puberulent, old branches glabrescent, with gray bark, short branches 3–10 mm, sometimes longer, with 2 or 3 pairs of leaves. Leaves sparsely arranged on long branches, crowded on lateral short branches, smaller on lower part of both short and long branches; petiole 2–6 mm, pubescent; blade sometimes suborbicular, 6–15 × 4–12 mm, on upper part of branches ovate or oblong, 10–30 × 5–15 mm, covered with conical hairs except pubescent on midrib adaxially, glabrous or sparsely hairy on nerves abaxially, base attenuate to petiole, apex acute or slightly obtuse, apiculate; lateral veins 3–5 pairs, confluent in arcs; stipules membranous, ca. 1.5 mm, with 2 dominate veins parallel to margins and confluent at apex, stipules on upper part, especially on inflorescences, compressed triangular, shortly acuminate, with 2 glandular teeth near apex, 2 others slightly apart, stipules on lower part usually without glandular teeth, ciliate at base, very shortly puberulent. Flowers 1–3 terminal on very short branches, sometimes 1 or 2 flowers axillary in axils of upper leaf pair; pedicels covered with papillose scabrid hairs; bracteoles 2, free, sessile, transparent, ovate-oblong or oblong, 2.5–3.5 mm, longer than calyx, puberulent, ciliate on upper part, with veins percurrent, apiculate. Calyx lobes 5(or 6), submembranous, oblong, veined, ciliate, apiculate or slightly obtuse. Corolla large, 15–17 mm; tube funnelform, shortly papillose near base outside, villous, glabrous at base inside; lobes 3–4 × shorter than corolla tube, ovate-orbicular, 4–5 mm, glabrous outside, villous inside, not reflexed, margins wavy. Stamens inserted in corolla tube throat; filaments attached to middle of anthers, slightly longer than base of anthers; anthers linear, included or semi-exserted. Style 5-lobed, glabrous, lobes relatively long, with long papilla, included or exserted. Fl. May.

• NW Yunnan (Dali, Lijiang, Yongning).

**6. *Leptodermis diffusa*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 373. 1894.

文水野丁香 wen shui ye ding xiang

Shrubs, 1–1.5 m tall; branchlets often diffuse, together with peduncles and pedicels puberulent, terete. Petiole to 4 mm; leaf blade silver-gray or grayish yellow adaxially when dry, pale abaxially, ovate-lanceolate to elliptic, 18–40 × 8–15 mm, both surfaces glabrous, base attenuate or cuneate, apex acute or obtuse; midrib prominent below, lateral veins 4 pairs, slightly conspicuous; stipules ovate-triangular, ca. 1.5 mm, with soft hairs. Flowers terminal and in axils of upper leaves, subumbellate, usually many in a terminal, large, much-flowered panicle; pedicels usually 3–5(–8) mm; bracts purplish blue, turning brown on margins, longer than calyces, 3–3.5 mm, glabrous or hairy, membranous, connate to above middle, free portion very shortly bilabiate, labellum short, apiculate. Flowers dimorphic, heterostylous. Calyx lobes orbicular, shortly ciliate. Corolla purplish blue, funnelform, 16–18 mm, puberulent outside, sparsely pubescent inside; lobes more than 3 × shorter than tubes, broadly ovate, ca. 3.5 × 3.2 mm, abruptly acute, spreading. Anthers ca. 2.5 mm, slightly exserted in short-styled flowers; filaments as long as anthers, inserted in upper portion of calyx

tube. Style exerted in long-styled flowers, filiform, glabrous; stigmas 5-lobed, linear. Immature capsule broader and longer than bracts. Fl. Aug, fr. Sep–Oct.

• Rocks at streamsides; 600–1300 m. S Gansu (Wenxian), S Sichuan.

**7. *Leptodermis forrestii*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 274. 1912.

高山野丁香 gao shan ye ding xiang

Shrubs, 0.6–1.2 m tall, much branched; old branches gray or slightly reddish, bark peeling off, young branches slender, with 2 opposite shallow longitudinal channels, densely covered with short soft hairs. Leaves petiolate or sometimes subsessile; petiole shorter than 2 mm; blade membranous-papery, ± black or sometimes brownish when dry, ovate or lanceolate, rarely oblong or broadly ovate, 1–3 × 0.6–1.5 cm, dispersedly strigose adaxially, glabrous or with crinkled long soft hairs on midrib and lateral veins abaxially, rarely entirely hairy, base usually sharply contracted, attenuate into short stalk, apex acute to subacuminate; lateral veins 4–6 pairs, slender, obvious abaxially; stipules triangular or compressed triangular, 2–2.5 mm, pubescent outside, margins with fimbriate collaters, with 2 nerves arching upward and joining at apiculate apex. Flowers usually solitary, terminal, sessile, dimorphic, heterostylous; short-styled flowers: bracts 2, small, ca. 1.5 mm, usually connate, awned apiculate. Calyx black when dry, shiny; lobes 5, narrowly and long triangular, 3.8–4 mm, slightly thick, glabrous or sparsely ciliate on upper portion, equal to calyx in length or slightly shorter. Corolla light blue or slightly reddish, funnelform, 20–22 mm, glabrous outside, white villous inside; limb broad, spreading; lobes 5, induplicate, elliptic, ca. 6 mm, with an incrassate area in center, lateral areas thin, soft, equal to incrassate area in length, with branched venation, margins with erose teeth, apex apiculate. Stamens 5, inserted in throat of corolla tube; filaments ca. 1.5 mm; anthers linear, ca. 2.7 mm, apex slightly exerted from tube. Style ca. 10 mm; stigmas 2-lobed, lobes linear, ca. 2.7 mm. Capsules ca. 5 mm; seeds black; aril reticulate, adherent to testa.

• Forests; 3200–3400 m. Sichuan, SE Xizang (Bomi, Nyingchi), NW Yunnan (Lijiang).

**8. *Leptodermis glomerata*** Hutchinson in Sargent, Pl. Wilson. 3: 406. 1916.

聚花野丁香 ju hua ye ding xiang

Small shrubs, up to 60 cm or slightly taller; stems branched at base, branches erect, slender, usually purplish red, with hairs in 2 opposite bands, internode 3–4 cm or longer. Leaves opposite; petiole 1–2 mm or longer; blade thinly papery, lanceolate or ovate-lanceolate, sometimes ovate, 1–5 × 0.6–2 cm, glabrous or scabrid at margins adaxially, subglabrous abaxially, reticulately veined, base very pointed, apex acute or acuminate; lateral veins 4–6 pairs, arched, prominent abaxially; stipules broad at base, long cuspidate upward, 2.5–4 mm, sparsely hairy near base or subglabrous outside. Flowers congested at tips of branches, sessile or conspicuously petiolate for lateral flowers, dimorphic, heterostylous; long-styled flowers with bracteoles membranous, opposite, connate at

base, 2.5 mm or slightly shorter, glabrous, abruptly subulate-acuminate. Calyx turning black when dry; tube 2–2.2 mm, glabrous; lobes 5, lanceolate-subulate, ca. 2 mm, stiff, glabrous, usually not ciliate, acuminate or acute. Corolla tube slightly curved, ca. 1 cm, dilated upward, pubescent outside, sparsely pubescent on throat; lobes 5, ovate, ca. 3.5 × 2.5 mm, obtuse and apiculate. Stamens 5, inserted in throat of corolla tube; filaments ca. 2.8 mm; anthers ca. 3 mm, slightly exerted. Style glabrous, 10–11 mm; stigmas 5-lobed, lobes ca. 1 mm; short-styled flowers: style ca. 5 mm, stigmas 3–5-lobed, lobes linear, 2.5–5 mm. Capsule narrowly ellipsoidal, persistent calyx lobes ca. 9 mm, 5-ridged, pale brown, glabrous, 5-valved when mature, with 5 utricle-like pyrenes; seeds linear, embedded in reticulate aril; aril free from testa.

• Sparse forests, hill slopes; 1800–2500 m. Yunnan.

**9. *Leptodermis gracilis*** C. E. C. Fischer, Bull. Misc. Inform. Kew 1940: 293. 1941.

柔枝野丁香 rou zhi ye ding xiang

Shrubs, 1.5–2 m tall; branches slender, usually nodding, grayish white, pubescent. Leaves opposite; petiole 2–6 mm; blade papery, silver-gray adaxially, slightly pallid abaxially, elliptic to lanceolate, 1.4–3.5 × 5–13 mm, adaxially glabrous except sometimes hispid on midrib and margin, abaxially usually hairy on midrib and lateral veins, margins hispidulous ciliate, base cuneate, ± decurrent, apex acute; stipules interpetiolar, broad at base, long cuspidate upward, ca. 3 mm, puberulent, ciliate. Cymes terminal and axillary on upper portion of branchlets; peduncle ca. 3.5 mm; flowers 3 fascicled, sessile; bracts narrowly elliptic-lanceolate, ca. 4 mm, ciliate, acute; bracteoles 2, connate into a sheath ca. 2.5 mm, free portion broadly ovate, 1–1.5 mm, 3-nerved, apiculate. Calyx tube turbinate, 5-ridged, 1.2–1.5 mm; lobes 5, oblong, ca. 1.2 mm, ciliate, rounded or subtruncate. Corolla white or purple, narrowly funnelform; tube slender, ca. 8 mm, pilose above base inside; lobes 5, gladiate, ca. 1.5 mm, subacute. Stamens 5, inserted in corolla tube throat; anthers sessile, linear, ca. 1.5 mm, included. Style slender; stigmas 3, filiform, 1–1.5 mm, papillose, slightly exerted. Capsules linear-oblong, ca. 5 mm, dehiscent in 5 valves; seeds not seen.

• Thickets, hill slopes; 1000–2700 m. NC Sichuan, SE Xizang.

1a. Flowers smaller; corolla ca. 9.5 mm ..... 9a. var. *gracilis*

1b. Flowers larger; corolla ca. 16 mm ..... 9b. var. *longiflora*

**9a. *Leptodermis gracilis* var. *gracilis***

柔枝野丁香(原变种) rou zhi ye ding xiang (yuan bian zhong)

Flowers smaller; corolla ca. 9.5 mm. Fl. Jul.

• Hill slopes; 1000–2400 m. SE Xizang (Bomi, Mêdog, Zayü).

**9b. *Leptodermis gracilis* var. *longiflora*** H. S. Lo, var. nov.

长花野丁香 chang hua ye ding xiang

Type: China. Sichuan: Barkam (Maerkang, 马尔康), Zhoukeji (卓克基), 2650 m, 30 Jul 1957, Z. Y. Zhang & H. F. Zhou 23393 (holotype, SZ; isotype, KUN).

Validating Latin diagnosis: that of "*Leptodermis gracilis* C. E. C. Fischer var. *longiflora* Lo" (H. S. Lo in W. C. Chen, Fl. Reipubl. Popularis Sin. 71(2): 338. 1999).

Flowers larger, corolla ca. 16 mm. Fl. Jul.

• Thickets; 2600–2700 m. NC Sichuan (Barkam).

This name was previously published by H. S. Lo (loc. cit.) but not validly so because no type was indicated (*Vienna Code*, Art. 37.1).

**10. *Leptodermis handeliana*** H. J. P. Winkler in Handel-Mazetti, Symb. Sin. 7: 1025. 1936.

川南野丁香 chuan nan ye ding xiang

Shrubs; young branches with 2 bands of short woolly hairs, old branches glabrescent, bark gray, longitudinally lacerate. Leaves sparsely arranged on branches 3–10 cm, with sparse and long internodes, very rarely crowded on short branches; blade slightly thick, broadly ovate, elliptic, or broadly elliptic, 7–18 × 4–11 mm, adaxially tomentose on midrib, abaxially with scattered bristles on lateral veins, very shortly setiform ciliate on margins, base abruptly contracted and attenuate into petiole, apex acute or abruptly shortly acuminate; lateral veins 4–6 pairs, ascending; stipules membranous-leathery, triangular on lower part, compressed triangular on upper part, acuminate, apiculus seldom with 1 or 2 lateral glandular teeth, 1–2 mm, 2 veins joining at tip, dorsal surface densely tomentulose, ventral surface densely covered with glandular appendages. Flowers 5–7 terminal on branches, subsessile, highest node with 1 or 3 flowers in axils of leaves, next node with 1 or 2 lateral branches terminated dichotomously with flowers; bracts especially of flowers in center somewhat leaflike, 4–5 mm, slightly longer than calyx, with midrib and reticulate veins, tomentose, connate below middle part, acuminate. Calyx ca. 3 mm; lobes 5, ovate, ciliate, acuminate. Young corolla hispidulous outside. Stigmas 5-lobed. Fl. Jun.

• S Sichuan (Yanyuan).

**11. *Leptodermis hirsutiflora*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 19. 1999.

拉萨野丁香 la sa ye ding xiang

Shrubs; branchlets terete, long branches with conspicuous internodes, short branches usually ca. 1 cm, young branches shortly pilose, glabrescent when old. Leaves subsessile or petiole ca. 0.5 mm; blade oblong or elliptic, sometimes lanceolate or ovate, 7–9 mm on long branches, 2–3 mm on short branches, glabrous on both surfaces, base attenuate, apex obtuse or slightly rounded; lateral veins inconspicuous; stipules broadly triangular, ca. 1 mm, apiculate. Flowers sessile, terminal or axillary on branchlets, usually densely flowered; bracteoles 2, membranous, obovate, ca. 3.5 mm, connate below middle portion or one side free, with brown veins, densely hirsute outside, apex apiculate. Long-styled flower: calyx tube obovate, ca. 2 mm, glabrous, lobes 5, narrowly triangular-lanceolate, ca. 2 mm, densely hirsute; corolla blue, narrowly funnelform, densely hirsute outside, tube 8–9 mm, villous inside, base ca. 2.5 mm in diam., lobes 5, subovate, ca. 2.5 mm, apex incurved, with a beak ca. 0.5 mm; stamens 5, inserted at base of throat, filaments very short or absent, anthers linear, ca. 3 mm, nearly

included; style 11–12 mm, stigmas 4- or 5-lobed, lobes linear, exserted. Short-styled flowers similar to long-styled flowers; calyx tube ca. 2 mm, lobes ca. 1.4 mm, acute; corolla tube very shortly pilose outside; stamens inserted above corolla tube throat, filaments ca. 0.8 mm, anthers exserted; style ca. 5.5 mm, stigmas 3- or 4-lobed, included. Fruit ca. 5 mm, with persistent calyx lobes 2.5–3 mm, hirsute; seeds ca. 4 mm; aril reticulate, adherent to testa. Fl. Jul.

• Thickets; 4000–4100 m. Xizang.

- 1a. Calyx lobes glabrous except ciliate on margins; corolla pubescent ..... 11a. var. *ciliata*  
1b. Calyx lobes densely hirsute; corolla densely hirsute outside, villous inside ..... 11b. var. *hirsutiflora*

**11a. *Leptodermis hirsutiflora* var. *ciliata*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 20. 1999.

光萼野丁香 guang e ye ding xiang

Calyx lobes glabrous except ciliate on margins; corolla pubescent.

• Thickets; ca. 4100 m. SE Xizang (Gyaca).

**11b. *Leptodermis hirsutiflora* var. *hirsutiflora***

拉萨野丁香(原变种) la sa ye ding xiang (yuan bian zhong)

Calyx lobes densely hirsute; corolla densely hirsute outside, villous inside.

• Thickets on desolate mountains; ca. 4000 m. Xizang.

**12. *Leptodermis kumaonensis*** R. Parker, Indian Forester 48: 576. 1922.

吉隆野丁香 ji long ye ding xiang

Shrubs, 1–2 m tall, sometimes to 3 m tall; branchlets terete, usually purple, glandular pilose. Petiole 2–4 mm, somewhat pilose; leaf blade papery, dark gray adaxially and grayish brown or pale abaxially when dry, oblong-lanceolate or ovate-lanceolate, 3–10 × 1–2.5 cm on long branches, usually shorter than 1.5 cm on short branches, strigose pilose adaxially, pilose on midrib and lateral veins abaxially, base broadly cuneate, margins entire, usually ciliate, apex subacuminate; lateral veins 6–9 pairs, ascending in an arch, midrib compressed abaxially, veinlets dark brown, inconspicuous adaxially, scrobiculate abaxially; stipules triangular, 4–4.5 mm on upper part of branchlets, shorter on lower part, pilose outside, abruptly contracted acuminate. Flowers 3–5 fascicled on ends of lateral short branches, sessile or subsessile; bracts 2, ca. 7 mm or slightly longer, ca. 2/3 connate, free portion cuspidate, ciliate, often pilose near midrib outside. Calyx tube 3.5–4 mm; lobes 5, triangular-ovate, ca. 1.5 mm, ciliate, acute or slightly obtuse. Corolla funnelform, 13–15 mm, pilose or subglabrous outside, white villous below throat inside; lobes 5, with sinus ca. 3 mm in depth, apex obtusely 3-dentate, central portion slightly thickened, ca. 2 mm wide, margins of both sides thin, 1–1.2 mm wide, inflexed in bud. Long-styled flowers: stamens 5, inserted below throat, filaments almost absent, anthers dorsifixed, linear, ca. 3 mm, included; style ca. 9 mm, stigmas 5- or 6-lobed, lobes linear, 4–

5 mm, slightly exserted. Short-styled flowers: stamens with filaments ca. 1.5 mm, anthers slightly exserted; style ca. 4.5 mm, stigmas 5 or 6, linear, ca. 2 mm, extending to below throat. Capsule not seen, subcylindric, ca. 5.6 mm (according to record); seeds linear, covered in fibers; aril not adherent to testa.

Thickets, forest margins; 2800–3000 m. S Xizang (Gyirong) [Bhutan, N India (Uttarakhand), Nepal].

*Leptodermis parkeri* Dunn (Bull. Misc. Inform. Kew 1920: 206. 1920), described from N India, was erroneously recorded from S Xizang (Gyirong) in FRPS (71(2): 139. 1999), based on the gathering *Qinghai-Xizang Expedition 6957*, which is in fact referable to *L. kumaonensis*.

**13. *Leptodermis lanata*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 19. 1999.

绵毛野丁香 mian mao ye ding xiang

Shrubs, 0.5–1 m tall; branches stout, terete, purplish red, subglabrous, short branches densely covered with many persistent scaly stipules at base. Petiole ca. 1 mm or leaves subsessile; leaf blade thickly papery, elliptic or obovate, sometimes oblong, 5–10 × 2–4 mm, tomentulose adaxially, grayish white lanate abaxially, base cuneate, margins revolute, apex acute; lateral veins inconspicuous; stipules long triangular, 1.5–2 mm, acuminate. Flowers sessile, usually 3 fascicled at tips of branchlets or axillary near tips of short branches; bracteoles 2, scarious, lower portion connate, longer than calyx or subequal, tomentulose, apex cuspidate. Calyx tube ca. 2 mm, subglabrous; lobes 5, oblong-lanceolate, slightly shorter than calyx tube, puberulent and shortly ciliate, shortly acuminate. Corolla pallid red, funnel-form, 12–14 mm, tomentulose outside; tube slender, decurved; lobes oblong-lanceolate or oblong-ovate, ca. 2 mm. Long-styled flowers: stamens 5, inserted below throat of corolla tube, anthers linear, included; style slightly exserted, stigmas 2-lobed, lobes filiform. Short-styled flowers similar to long styled; stamens inserted above throat of corolla tube, anthers slightly exserted. Fruit ca. 6 mm; seeds covered with reticulate aril adherent to testa. Fl. May.

• *Pinus* forests, roadsides; 2300–2500 m. NW Yunnan (Ninglang).

**14. *Leptodermis limprichtii*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. Beih. 12: 490. 1922.

天全野丁香 tian quan ye ding xiang

Small shrubs; young branches not lignified, with 2 bands of soft hairs, old branches slender, glabrous, with gray bark. Leaves sparsely borne on young abbreviated branches, subsessile; blade oblong-lanceolate, 1–2.5 × 0.3–0.9 cm, adaxially with scattered hairs, tomentulose on midrib, abaxially glabrous, base attenuate, margins with dense bristles, apex acute, apiculate; lateral veins 3–5 pairs, inconspicuous, reticulate veins conspicuous; stipules triangular, subulate acuminate and with 2 glandular teeth near apex, another 2 glandular teeth remotely arranged or lacerate, central portion triangular, membranous-papery, villous, with transparent broad margins, not ciliate. Flowers usually 3 terminal on branchlets, subsessile, sometimes lateral flowers pedicellate, sometimes with a pair of flowers in axils of upper nodes; bracteoles thin, transparent, ovate-oblong,

2–2.5 mm, equal to calyx in length or slightly longer, 1/6–1/4 connate, shiny, 1-veined, not ciliate, long subulate-acuminate. Calyx lobes usually 5, sometimes 4, long or shortly triangular, ciliate, very apiculate. Corolla yellowish white, medium-sized; tube narrowly funnelform, 8–9 mm, slightly curved, hispidulous outside, villous around middle inside; lobes ovate, ca. 2 mm, central portion thick and broader than transparent, wavy margins, villous at base inside, apex incurved. Stamens in long-styled flowers inserted at middle of corolla tube; filaments very short; anthers ca. 2 mm. Style usually (4 or) 5-lobed.

• Thickets or open fields on hill slopes; 1000–1500 m. C Sichuan (Tianquan).

**15. *Leptodermis ludlowii*** Springate, Edinburgh J. Bot. 53: 102. 1996.

管萼野丁香 guan e ye ding xiang

*Leptodermis tubicalyx* H. S. Lo.

Shrubs, 0.6–2(–3) m tall; branchlets slender, terete, with 2 bands of hairs decurrent from base of stipules. Petiole 0.2–0.8 cm, pilose adaxially; leaf blade membranous-papery or submembranous, turning black or iron-gray when dry, ovate to ovate-oblong or broadly lanceolate, usually 1.5 × 0.5–1.5(–2) cm, subglabrous to puberulent on both surfaces, base attenuate or slightly decurrent, margins ciliate, apex acute or acuminate; lateral veins slender, (3 or) 4 or 5 pairs, inconspicuous adaxially, slightly prominent abaxially; stipules subtriangular or long triangular, 1.5–2(–4) mm, glandular-denticulate or lacinate, sparsely pubescent at base, cuspidate. Inflorescences terminating short new growths, small, with uppermost pair of nodes approximate, few cymules and 3–5(–12) flowers; bract pairs leaflike and petiolate, rarely ligulate on subsidiary 1-flowered cymules; stipules as those of vegetative growth or reduced, hyaline, and lacinate. Flowers sessile; bracteole pairs ca. 1.5 mm, ca. 1/3 connate at base, lobes triangular, obtuse or subacute, glabrous, usually ciliate, mucronulate, central pairs in a cymule often more elongate and cuspidate. Calyx glabrous; hypanthium ca. 3.4 mm; tube black when dry, obovate or tubular, 1.1–1.4 mm above ovary; lobes 5, triangular, rarely orbicular, 0.7–0.8 mm, hairy or papillate in bud or around margins, rarely 6 lobes or 2 deeper clefts in tube. Corolla white, light pink, or purple, sometimes bicolored, black when dry, broadly funnelform, with white stiff hairs at apex in bud, exterior finely mammillate, more prominently so toward apex, very rarely with few short hairs decurrent from sinuses of lobes; tube 10–11.5 mm, with long fine hairs within; lobes 5, broadly ovate-triangular, 2–4 mm, margins thin, inflexed, ca. 1 mm wide, central portion ca. 2 mm wide, apex inflexed in a beak, with few short stout smooth hairs on inner surface. Stamens 5. Long-styled flowers: filaments ca. 0.3 mm, anthers 1.7–2 mm, attached near base or rarely inserted in middle of corolla tube, included; stigmas completely exserted. Short-styled flowers: filaments 1–1.7 mm, anthers 1.9–2.7 mm, inserted below middle of corolla tube, partly exserted; stigmas immediately below anthers. Stigmas 2–4-lobed, lobes linear, 2–2.5 mm, with hairs sometimes extending onto upper style. Capsule narrow, oblong, ca. 7 mm; seeds oblong; aril reticulate, adherent to testa. Fl. Jun–Sep.

Forests; ca. 2800 m. Xizang [Bhutan, NE India (Sikkim)].

**16. *Leptodermis oblonga*** Bunge, Enum. Pl. Chin. Bor. 34. 1833.

薄皮木 bao pi mu

*Hamiltonia oblonga* (Bunge) Franchet; *Leptodermis chaenetii* H. Léveillé; *L. huashanica* H. S. Lo; *L. oblonga* var. *leptophylla* H. J. P. Winkler.

Shrubs, 0.2–1 m tall or slightly taller; branches slender, gray to pale brown, puberulent, bark thin, usually peeling off when old. Petiole short, 1–3 mm; leaf blade papery or thinly leathery, lanceolate or oblong, sometimes elliptic or subovate, usually 0.7–2.5(–3) × 0.3–1(–1.7) cm, adaxially scabrid or irregularly wrinkled and sparsely strigose, abaxially subglabrous or pubescent or hispid along midrib, base attenuate or cuneate, margins revolute, apex acuminate, subacute, or obtuse; lateral veins ca. 3 pairs, inconspicuous on both surfaces; stipules broadly triangular, 1.5–2 mm, cuspidate with a stiff apiculus. Flowers sessile, usually 3 fascicled and terminal on branches, rarely axillary on upper part of branchlets; bracteoles hyaline, ovate, 3–4.5 mm, 1/2–2/3 connate, pilose outside, lobes subtriangular, with a stiff apiculus at apex, subequal to calyx in length. Calyx tube ca. 2.5 mm; lobes subovate, ca. (0.7–)1.3–1.5 mm, densely shortly ciliate, obtuse or shortly acuminate. Corolla purplish red, funnelform, (9–)11–14(–20) mm; tube slender, often curved, puberulent outside; lobes subovate, narrowly triangular, or lanceolate, 2–4 mm, apex incurved. Short-styled flowers: stamens slightly exserted, anthers linear; style included. Long-styled flowers: stamens included, anthers linear-oblong; style slightly exserted. Style with 4 or 5 linear lobes of stigma. Seed aril reticulate, free from testa. Fl. Jun–Aug, fr. Oct.

• Sunny hill slopes, roadsides, thickets. Gansu, Hebei, N Henan, Ningxia, Shaanxi, Shanxi, Sichuan [?Mongolia].

**17. *Leptodermis ordosica*** H. C. Fu & E. W. Ma, Fl. Intra-mongol. 5: 413. 1981.

内蒙野丁香 nei meng ye ding xiang

Small shrubs, much branched, 20–40 cm tall; branches slightly stout, often twisted, dark gray, with thin cracks; branchlets slender and straight, sometimes acicular, gray, puberulent. Petiole short or leaves subsessile; leaf blade thickly papery, oblong to elliptic, sometimes broadly elliptic, 3–10 × 2–5 mm, both surfaces subglabrous, slightly shiny adaxially, base cuneate or acuminate, margins often slightly revolute, apex acute or slightly obtuse; midrib prominent abaxially, lateral veins very inconspicuous; stipules triangular-ovate or ovate-lanceolate, slightly longer than petioles, denticulate or entire, ciliate, apiculate. Flowers subsessile, 1–3 fascicled on tips of branches or in axil near tips of branches; bracteoles 2, 1/2–2/3 connate, free part bilabiate, 3–4 mm, transparent, lobes sparsely ciliate, caudate-acuminate at apex. Calyx 2–2.5 mm; lobes 5, oblong-lanceolate, subequal to calyx tube in length or slightly shorter, ciliate, shortly acuminate. Corolla purplish red, fragrant, funnel-form, 11–14 mm, puberulent outside, villous inside; lobes 4 or 5, ovate-lanceolate, ca. 3 mm. Stamens 4 or 5, inserted above throat of corolla tube; anthers linear, slightly exserted. Style ca. 1/2 length of corolla tube; stigmas 3, filiform. Fruit 3–3.5 mm; seeds surrounded by reticulate aril free from testa. Fl. and fr. Jul–Aug.

• Rock crevices; ca. 1600 m. Nei Mongol.

**18. *Leptodermis parvifolia*** Hutchinson in Sargent, Pl. Wilson. 3: 404. 1916.

瓦山野丁香 wa shan ye ding xiang

Erect or procumbent shrubs, 0.5–1(–1.5) m tall; branchlets short or slightly long, gray or reddish when young, puberulent, soon glabrescent. Petiole short; leaf blade slightly thick, spatulate-ovate or oblanceolate, sometimes subovate or elliptic, 5–10 × 2–5 mm, base attenuate, apex obtuse or subacute; lateral veins ca. 3 pairs, usually inconspicuous; stipules subulate-acuminate, ca. 1 mm, shorter than calyx, glabrous, abruptly acuminate. Calyx tube with 10 ridges, 5 ridges extending to sinus, glabrous; lobes 5, triangular-lanceolate, ca. 1.25 mm, shortly ciliate, acute. Corolla tube ca. 1.2 cm, upper portion enlarged, puberulent outside, sparsely pubescent inside; lobes 5, ovate-lanceolate, ca. 2.5 mm, with revolute margins, acute. Anthers ca. 1.25 mm, slightly exserted. Style equal to corolla tube in length, glabrous, 5-lobed, lobes slender. Capsules 4–5 mm; seed aril reticulate, adherent to testa or free at one end. Fl. Aug–Sep.

• Thickets or forest margins on sunny mountain slopes; 1500–3000 m. Sichuan.

**19. *Leptodermis pilosa*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 276. 1912.

川滇野丁香 chuan dian ye ding xiang

Shrubs, 0.7–2(–3) m tall; branches subterete, young branches tomentulose or pubescent, old branches glabrescent, with thin, lamellar, longitudinally fissured bark. Petiole 1–5 mm, ± hairy; leaf blade papery, occasionally thinly leathery, shape and size often variable, broadly ovate, ovate, oblong, elliptic, or lanceolate, 0.5–2.5 × ca. 1.5 cm, both surfaces sparsely to densely pilose or subglabrous, base cuneate or attenuate, margins usually ciliate, apex acute, obtuse, or sometimes rounded; lateral veins 3–5 pairs, slightly prominent or inconspicuous abaxially; stipules broadly triangular, pilose or tomentose, cuspidate-apiculate, usually 1–2 mm. Cymes terminal or axillary near tips of branches, usually 3(–7)-flowered; flowers sessile or shortly pedicellate; bracteoles scarious, transparent, longer than calyx, ± hairy, 2/3–3/4 connate, free portion subulate-acuminate, apiculate, veined, ciliate. Calyx tube ca. 2 mm; lobes 5, 1–1.2 mm, ciliate, obtuse or subtruncate. Corolla funnelform; tube 9–10(–13) mm, densely tomentulose outside, villous inside; lobes 5, broadly ovate, 2–2.5 mm, margins narrow and thin, inflexed, apex incurved. Stamens 5, inserted in corolla tube throat; filaments short; anthers linear, slightly exserted in short-styled flowers, included in long-styled flowers. Style usually with (3–)5 filiform stigmas, exserted in long-styled flowers, included in short-styled flowers. Fruit 4.5–5 mm; seed aril reticulate, adherent to testa. Fl. Jun, fr. Sep–Oct.

• Thickets; 600–3800 m. S Gansu, W Hubei, S Shaanxi, Sichuan, Xizang, Yunnan.

- 1a. Branches spiny ..... 19a. var. *acanthoclada*  
 1b. Branches not spiny.  
     2a. Cymes in spikelike compound  
         inflorescences ..... 19d. var. *spicatifomis*

- 2b. Cymes not in spikelike compound inflorescences.  
 3a. Shrubs with branches tomentulose or pubescent when young, glabrescent when old ..... 19c. var. *pilosa*  
 3b. Shrubs sparsely pilose ..... 19b. var. *glabrescens*

**19a. *Leptodermis pilosa* var. *acanthoclada*** H. S. Lo ex X. Y. Wen & Q. Lin, Acta Phytotax. Sin. 45: 410. 2007.

刺枝野丁香 *ci zhi ye ding xiang*

Shrubs dwarf, much branched; branches spiny.

- Thickets. W Sichuan (Xiangcheng, Xiaojin), Xizang.

**19b. *Leptodermis pilosa* var. *glabrescens*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. 18: 160. 1922.

光叶野丁香 *guang ye ye ding xiang*

*Leptodermis mairei* H. Léveillé.

Shrubs sparsely pilose.

- S Sichuan (Dechang, Ningyuan, Xichang), Yunnan (Baiyanjing, Dongchuan, Lijiang).

**19c. *Leptodermis pilosa* var. *pilosa***

川滇野丁香(原变种) *chuan dian ye ding xiang (yuan bian zhong)*

*Leptodermis fusca* H. J. P. Winkler; *L. microphylla* (H. J. P. Winkler) H. J. P. Winkler; *L. pilosa* var. *microphylla* H. J. P. Winkler.

Shrubs with branches tomentulose or pubescent when young, glabrescent when old.

- Thickets on roadsides or on sunny slopes; 600–3800 m. W Hubei, S Shaanxi (Hanzhong, Hua Shan), Sichuan, SE Xizang, C and NW Yunnan (Kunming, Lijiang).

**19d. *Leptodermis pilosa* var. *spicatiformis*** H. S. Lo ex X. Y. Wen & Q. Lin, Acta Phytotax. Sin. 45: 411. 2007.

穗花野丁香 *sui hua ye ding xiang*

Leaves to 1.7 cm. Cymes often in spikelike compound inflorescences.

- Thickets on roadsides on mountain slopes; ca. 800 m. S Gansu (Huixian, Liangdang, Tianshui), SW Shaanxi (Baoji, Fengxian, Lüeyang).

**20. *Leptodermis potaninii*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: [319]. 1898 [*"potanini"*].

野丁香 *ye ding xiang*

Shrubs, 0.5–2 m tall or taller; branches pale gray, young branches usually reddish, with 2 bands of soft hairs. Leaves sparsely arranged or slightly crowded; petiole short; blade thin, ovate or lanceolate, sometimes oblong or elliptic, both surfaces white pubescent, tomentose, subglabrous, or glabrous, base cuneate, margins entire, apex obtuse to subrounded, apiculate; lateral veins 3 or 4 pairs, prominent abaxially, reticulate veins con-

spicuous; stipules membranous, broadly triangular, acuminate, with acicular apiculus. Cymes terminal, sessile, 3-flowered, rarely reduced to 1 or 2 flowers, central flowers sessile, lateral ones pedicellate; pedicels red, with 2 bands of stiff or soft hairs; bracteoles 2, longer than calyx tube,  $\pm$  connate, densely hispid or pilose outside, acute to acuminate. Calyx tube narrowly obconical, densely hispid or pilose on upper portion and calyx lobes; lobes 5 or 6, narrowly triangular, length 3  $\times$  size of width, ciliate, acute. Corolla funnelform, to 1.5 cm; tube  $\pm$  pilose or subglabrous outside, densely hispid on upper portion and throat inside, limb spreading, 3  $\times$  shorter than corolla tube; lobes 5 or 6, with valvate aestivation, transparent, glabrous, margins membranous, apex rounded. Stamens 5 or 6, attached to upper portion of corolla tube, glabrous; filaments longer than anthers; anthers semi-exserted, linear-oblong. Pistils ca. 1/2 as long as corolla; ovary 3-celled; stigmas 3 or 4. Capsule 5-valvate from apex to base; valves crowned by persistent calyx lobes. Fl. May, fr. autumn and winter.

- Thickets on hill slopes or at streamsides, mountains; 800–2700 m. W Guizhou, W Hubei, S Shaanxi, W Sichuan, Yunnan.

1a. Leaves hairy.

2a. Leaves white pubescent ..... 20c. var. *potaninii*

2b. Leaves tomentose or long

hirsute ..... 20d. var. *tomentosa*

1b. Leaves glabrous.

3a. Leaves glaucous green ..... 20b. var. *glauc*

3b. Leaves brown when dry ..... 20a. var. *angustifolia*

**20a. *Leptodermis potaninii* var. *angustifolia*** H. S. Lo, var. nov.

狭叶野丁香 *xia ye ye ding xiang*

Type: China. Yunnan: Luquan Xian (禄劝县), 5th District, Wumeng (乌蒙) town, "A-sha-hei," 2000 m, 9 Jun 1952, P. I. Mao 1185 (holotype, KUN; isotype, KUN).

Validating Latin diagnosis: that of "*Leptodermis potaninii* [sic!] Batalin var. *angustifolia* Lo" (H. S. Lo in W. C. Chen, Fl. Reipubl. Popularis Sin. 71(2): 338. 1999).

Leaves narrowly lanceolate, brown when dry, both surfaces glabrous.

- Thickets at streamsides; ca. 2000 m. NC Yunnan (Luquan).

This name was previously published by H. S. Lo (loc. cit.) but not validly so because no type was indicated (*Vienna Code*, Art. 37.1).

**20b. *Leptodermis potaninii* var. *glauc*** (Diels) H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. Beih. 12: 490. 1922.

粉绿野丁香 *fen lü ye ding xiang*

*Leptodermis glauca* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 275. 1912; *L. esquirolii* H. Léveillé; *L. motsouensis* H. Léveillé.

Leaves glaucous green abaxially. Corolla and bracteoles glabrous.

- Mountains; 800–2700 m. SW Guizhou (Xingyi), SW Sichuan, Yunnan.

**20c. *Leptodermis potaninii* var. *potaninii***野丁香(原变种) *ye ding xiang* (yuan bian zhong)*Leptodermis nigricans* H. J. P. Winkler.

Leaves white pubescent on both surfaces, though usually subglabrous and pale abaxially.

• Thickets on hill slopes; 800–2400 m. W Guizhou, W Hubei (Shennongjia, Xingshan), S Shaanxi (Pingli), W Sichuan (Kangding), Yunnan.

**20d. *Leptodermis potaninii* var. *tomentosa*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. 18: 153. 1922.

绒毛野丁香 *rong mao ye ding xiang*

*Leptodermis potaninii* var. *rufa* H. Winkler; *L. tongchouanensis* H. Léveillé.

Branches, leaves, stipules, bracteoles, and flowers tomentose or long hirsute.

• Mountains; ca. 2600 m. SW Sichuan, C, NE, and NW Yunnan.

**21. *Leptodermis pumila*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 18. 1999.

矮小野丁香 *ai xiao ye ding xiang*

Dwarf shrubs, 5–10 cm tall; taproots stout, lignose, brown; branches relatively short, pubescent, with many nodes. Leaves crowded on upper portion of short branches; petiole 1–2 mm; blade papery, elliptic or oblong, sometimes subobovate, 5–15 × 3–7 mm, pilose on midrib and lateral veins on both surfaces, base cuneate, apex acute; lateral veins 3 or 4 pairs, slightly prominent abaxially; stipules thick, triangular, 1.5–2 mm, densely pilose and ciliate. Flowers sessile, 3 fascicled at tips of short branches; bracteoles 2, connate below middle portion, upper portion free, subtriangular, slightly shorter than or subequal to calyx in length, pilose. Calyx tube obconical, ca. 1.8 mm; lobes 5, subovate, ca. 1 mm, ciliate, acute. Corolla pale red, funnelform; tube 1.1–1.2 cm, densely pilose outside, villous inside; lobes 5, ca. 3.5 mm, with thin and broad margins. Stamens 5, inserted below throat of corolla tube; filaments short; anthers linear, ca. 3 mm, slightly exserted. Style 7–8 mm; stigmas 3, filiform, ca. 2 mm. Fl. May.

• Grassy slopes; ca. 3000 m. NW Yunnan (Lijiang).

**22. *Leptodermis purdomii*** Hutchinson in Sargent, Pl. Wilson. 3: 405. 1916.

甘肃野丁香 *gan su ye ding xiang*

Shrubs, 1–2 m tall; branchlets slender, puberulent when young, soon glabrescent. Leaves fascicled, papery, linear-oblan-ceolate, 0.5–1 × 1.5–3.5 mm, both surfaces glabrous, base attenuate, margin obviously recurved, apex obtuse; nerves inconspicuous; stipules ovate, ca. 1.5 mm. Flowers sessile or subsessile, fascicled on apex of branches; bracteoles 2, opposite, transparent, membranous, ovate, ca. 1.5 mm, shorter than calyx, connate at base, subglabrous (with white acicular lines?), with carina on dorsal surface, abruptly acute at apex. Calyx tube glabrous; lobes 5, oblong-ovate, ca. 1.5 × 0.75 mm, leathery, ciliate, triangular-acute. Corolla pink, narrowly funnelform,

8–10 mm; tube slender, slightly curved, throat slightly dilated, densely pilose outside, sparsely villous inside; lobes 5, ovate-lanceolate, ca. 2 mm, sparsely pilose, subobtuse. Stamens 5, inserted in corolla tube throat; anthers linear, ca. 2 mm, included in long-styled flowers, slightly exserted in short-styled flowers. Style slender, exserted in long-styled flowers, reaching middle of tube in short-styled flowers; stigmas 5-lobed, lobes linear. Capsules ca. 5 mm; seed aril reticulate, adherent to testa. Fl. Jul–Aug, fr. Sep–Oct.

• Mountain slopes; 800–1000 m. S Gansu, N Sichuan (Songpan).

**23. *Leptodermis rehderiana*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. 18: 157. 1922.

白毛野丁香 *bai mao ye ding xiang*

Shrubs, 1–2 m tall, very much branched, white villous or pilose; branchlets slender. Petiole to 1 cm; leaf blade papery, brownish gray when dry, lanceolate-oblong or ovate-oblong, sometimes subovate, 1–4 × ca. 2 cm, base attenuate, apex acute or shortly acuminate, sometimes obtuse; lateral veins 2–5 pairs, slightly prominent abaxially; stipules stiff, ca. 2 mm, acicular-acuminate on lower portion, shortly acuminate on upper portion. Flowers terminal on foliate branches, 5–7 flowers arranged in a line; central flowers sessile, lateral ones conspicuously pedicellate, branchlets usually with 2 or 3 flowers axillary on upper 4 or 5 nodes, inflorescence-like on lower 1 or 2 nodes, with peduncle; bracteoles transparent, oblong, 2.5–3 mm, slightly longer than calyx, ca. 2/3 connate, upper portion very shortly pilose, other parts glabrous, veined, subulate-acuminate. Calyx 2.5–2.8 mm; lobes 5, very short, ciliate, with longitudinal veins. Corolla tube very narrowly funnelform, 12–13 mm, slightly curved, densely shortly tomentose outside; lobes 5, subovate, ca. 2 mm, central portion and narrow margins not differentiated conspicuously, apex incurved. Stamens of short-styled flowers slightly exserted; filaments inserted at 1/4–1/3 of anthers, free portion very short. Stigmas 5-lobed. Capsules black, 6–7 mm; seed aril reticulate, adherent to testa. Fl. Sep, fr. Oct–Nov.

• Thickets, jungles; 1600–2400 m. NW Yunnan (Zhongdian).

**24. *Leptodermis scabrida*** J. D. Hooker, Fl. Brit. India 3: 199. 1881.

糙叶野丁香 *cao ye ye ding xiang*

Shrubs, 1–1.5 m tall; branches stout, brown or dark gray, short branches often with dense persistent scaly stipules, pilose. Petiole short or leaves subsessile; leaf blade oblong-lanceolate or oblong, sometimes narrowly lanceolate, 1–3(–4) × 4–10 mm, both surfaces strigose or only midrib and lateral veins hairy abaxially, base cuneate or decurrent, apex acute to acuminate; midrib prominent abaxially; lateral veins 3 or 4 pairs, inconspicuous; stipules subtriangular, pilose, with a long and ex-curved stiff apiculus. Flowers subsessile, 3–5 terminal or axillary near tips of branches; bracteoles transparent, 3–4 mm, pilose, ca. 2/3 connate, free portion triangular-ovate, with a stiff apiculus at apex. Calyx tube ca. 2 mm; lobes 0.5–0.7 mm, width greater than length or subequal, densely ciliate, obtuse. Corolla white, funnelform, 9–19 mm, pilose outside; lobes 5, sublan-ceolate, 2–2.5 mm. Short-styled flowers with stamens

inserted below throat of corolla tube, anthers linear, included; style slightly exserted, stigmas 3-lobed, filiform, excurved. Capsule 5–6 mm; seed aril free from testa (according to literature). Fl. Jun.

Forests, hill slopes; 2400–2600 m. S Xizang (Nyalam, Zayü) [NE India (Assam)].

**25. *Leptodermis schneideri*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. 18: 156. 1922.

纤枝野丁香 xian zhi ye ding xiang

*Leptodermis schneideri* var. *hutchinsonii* H. J. P. Winkler.

Shrubs, 0.2–1.3 m, branches slender; young branches tomentulose, soon glabrescent, old branches with gray longitudinally fissured bark. Leaves sparsely arranged on long branches, very crowded on very short branches in axils of long branches, appearing as if leaves whorled; petiole very short or leaves sessile; blade oblong or ovate, 4–9 × 1.25–2 mm, glabrous on both surfaces, base attenuate, apex acute or slightly obtuse or apiculate; midrib impressed adaxially and prominent abaxially, lateral veins inconspicuous; stipules membranous-leathery, small, ca. 1 mm, pilose and ciliate, upper portion triangular, lower part acicular acuminate, with 2 callose nerves near margins extending to apex. Flowers terminal on lateral foliate branches, upper 2 or 3 nodes with 1–3 flowers axillary; peduncles present or almost absent; bracteoles transparent, oblong, ca. 2 mm, slightly longer than calyx, connate to or above middle portion, margins of upper portion hairy, apex rounded, apiculate. Calyx lobes 5, length slightly greater than width, ciliate, rounded. Corolla small; tube narrowly funnelform, ca. 5 mm, ± curved, covered with conical woolly hairs outside, densely covered with long hairs on throat inside, glabrous at base; lobes oblong, ca. 2 mm, covered with short papilla outside, villous at base inside, with thin, soft, narrow margins, apex incurved. Stamens inserted in throat of corolla tube; long-styled flowers with filaments short, anthers included; short-styled flowers with filaments long, anther exserted. Stigmas 5-lobed, conspicuously exserted in long-styled flowers, extending below throat in short-styled flowers. Capsules ca. 4 mm; seed aril adherent to testa.

● Sichuan, Xizang, Yunnan.

**26. *Leptodermis scissa*** H. J. P. Winkler in Handel-Mazzetti, Symb. Sin. 7: 1024. 1936.

撕裂野丁香 si lie ye ding xiang

Shrubs, 20–50 cm tall, occasionally to 1.5 m tall; branchlets gray or brown, tomentulose. Leaves crowded on branchlets, blade papery, ± grayish when dry, oblong-ovate or broadly ovate, 5–8 × 2.5–4 mm on lower branches, 15–23 × 7–13 mm on upper branches, adaxially densely scabrid on midvein, slightly scabrid on lateral veins and margins, abaxially glabrous, base attenuate, apex apiculate; lateral veins 3 or 4 pairs, straight; stipules submembranous, tomentulose outside, with glandular appendages inside, long triangular on lower portion, shortly triangular on upper portion, glandular acuminate upward, sometimes with 1 or 2 glandular teeth, with 2 veins confluent at apex, uppermost stipules short and broad, abruptly acuminate, without veins. Flowers often 3 terminal on short

branches, with short pedicels or longer at each side, or 1–3 flowers axillary in axils of leaves at nodes; bracteoles ovate, 2.8–3 mm, free almost to base, midrib nearly brownish, shortly hairy, other portions subglabrous, margins imbricate, ciliate, apex acuminate, with apiculus almost as long as calyx or shorter. Calyx 3–3.2 mm; lobes 5, triangular, usually ± scattered pilose, ciliate. Corolla tube funnelform, ca. 11 mm, slightly curved, glabrous or puberulent outside, long villous inside, glabrous near base; lobes ovate-orbicular, ca. 2 mm, glabrous outside. Stamens 5 in short-styled flowers, inserted in throat of corolla tube; anthers linear, ± semi-exserted, covered with glandular long soft hairs inside. Style 5-lobed, included, glabrous. Fruit ovoid, ca. 4 mm; seed aril conspicuously free from testa. Fl. Jul–Aug, fr. Oct.

● Thickets; 1500–2500 m. Sichuan, Yunnan.

**27. *Leptodermis tomentella*** H. J. P. Winkler, Repert. Spec. Nov. Regni Veg. 18: 159. 1922.

蒙自野丁香 meng zi ye ding xiang

Shrubs; stems, branches, and both surfaces of leaves tomentulose; branchlets stout, terete, upper branchlets short, lower branchlets longer, secondary branchlets very short. Petiole short and thick; leaf blade thickly papery, brownish when dry, ovate or elliptic, 5–19 × 2.5–10 mm, base broadly cuneate, apex acute, with a short stiff apiculus; lateral veins 2 or 3 (or 4) pairs, inconspicuous adaxially, slightly prominent abaxially; stipules triangular, 1–1.5 mm, with stiff acicular apiculus. Flowers 3–7 fascicled at tips of branchlets, sessile; bracteoles ovate, ca. 3 mm, ca. 1/3 connate, tomentose, with acicular apiculus slightly shorter than calyx lobes. Calyx tubes black when dry; lobes pale brown, ovate-oblong, ca. 1.5 mm, ciliate, slightly obtuse. Corolla purple or white, funnelform, 1.2–1.3 cm, tomentose outside, throat villous; lobes with margins broad, soft and thin. Stamens 5, inserted in throat of corolla tube; filaments very short; anthers linear, ca. 2.5 mm. Style exserted; stigmas 5-lobed, lobes linear. Capsules ca. 5 mm; seed aril reticulate, adherent to testa. Fl. May–Jun, fr. Sep.

● Mountain slopes; 1500–2000 m. C and S Yunnan (Chengjiang, Mengzi).

**28. *Leptodermis umbellata*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 374. 1894.

伞花野丁香 san hua ye ding xiang

Shrubs, to 2 m, much branched; young branches, peduncles, and pedicels covered with white stiff hairs. Leaves sparsely arranged; petiole usually 4–6 mm; blade papery, black adaxially and usually pale or brownish abaxially when dry, elliptic or oblong, sometimes obovate, 10–35 × 5–16 mm, both surfaces shortly hispid, base cuneate, attenuate, apex acute or shortly acuminate; lateral veins sparse, usually 2 or 3 pairs, inconspicuous; stipules broadly triangular, hispid. Flowers with pedicels straight, 3–9 mm, arranged in umbelliform groups, rarely 1–3 flowers axillary; peduncles to 1 cm or longer; bracteoles ca. 3 mm, subequal to calyx tube in length or slightly shorter, ca. 2/3 connate, upper portion bilabiate dehiscent, hispid. Calyx lobes suborbicular, width slightly greater than length, ciliate, apex slightly rounded or subtruncate. Corolla purple, narrowly

funnel-form, ca. 12 cm, densely hispid outside, slightly hairy inside; lobes 5, oblong, ca. 3 mm, with incurved abrupt apiculus. Long-styled flowers: stamens inserted above throat of corolla tube, filaments ca. 1.5 mm, anthers linear, ca. 2.5 mm, exserted. Short-styled flowers: stigmas 5-lobed, lobes linear, included. Capsule 4–5 mm; seed aril reticulate, free from testa or adnate with testa on ventral side. Fl. Sep–Oct.

• Hill slopes; 500–700 m. S Gansu (Bikou, Wenxian), N Sichuan (Qingchuan).

**29. *Leptodermis velutiniflora*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 17. 1999.

毛花野丁香 mao hua ye ding xiang

Shrubs, 0.5–1 m tall; branchlets terete, slender and firm, densely pubescent. Petiole 3–6 mm, densely pilose; leaf blade papery or thinly papery, when dry turning black adaxially, pale brown abaxially, elliptic to oblong or ovate to lanceolate, 10–40 × 5–20 mm, scattered with sparse appressed pubescence adaxially, villous on midrib and lateral veins abaxially, base cuneate to broadly cuneate, apex acute or acuminate; lateral veins 4 or 5 pairs, slender, conspicuous abaxially; stipules ca. 1.5 mm, broadly triangular at base, sometimes with stipitate glands on margins, with a stiff acicular apiculus at apex. Short-styled flowers 2–5 fascicled on tips or axillary on upper portion of branchlets; pedicels usually 2–6 mm, sometimes up to 8 mm, pilose; bracteoles 2, small, ca. 1.2 mm, ca. 1/3 of lower portion connate, lobes triangular, ca. 7 mm, pubescent. Calyx tube ca. 2 mm, glabrous; lobes 5, triangular, ca. 0.4 mm, margins hirsute, apex acute. Corolla funnel-form or broadly funnel-form, ca. 0.4 mm, brown tomentose outside, white villous on throat inside, or glabrous on both sides; lobes 5, triangular-oblanceolate, 3–3.5 × ca. 4 mm, margins thin and broad, apex obtuse. Stamens 5, inserted in throat of corolla tube; filaments ca. 2 mm; anthers ca. 2.5 mm, exserted. Style extended to middle of corolla tube; stigmas 4-lobed, lobes 0.5–0.6 mm. Fl. May–Jun.

• Forests, forest margins; 2800–3100 m. Sichuan, SE Xizang, NW Yunnan.

- 1a. Leaves thinly papery; corolla glabrous ..... 29a. var. *tenera*  
 1b. Leaves papery; corolla brown tomentose outside, white villous on throat inside ..... 29b. var. *velutiniflora*

**29a. *Leptodermis velutiniflora* var. *tenera*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 17. 1999.

薄叶野丁香 bao ye ye ding xiang

Leaves thinly papery. Corolla glabrous. Fl. May–Jun, fr. Aug.

• Forests, forest margins; 2800–3100 m. SW Sichuan (Muli, Yan-yuan), SE Xizang (Bomi, Mainling, Nyingchi), NW Yunnan (Binchuan, Weixi).

**29b. *Leptodermis velutiniflora* var. *velutiniflora***

毛花野丁香(原变种) mao hua ye ding xiang (yuan bian zhong)

Leaves papery. Corolla brown tomentose outside, white villous on throat inside.

• Sichuan.

**30. *Leptodermis vestita*** Hemsley, J. Linn. Soc., Bot. 23: 390. 1888.

广东野丁香 guang dong ye ding xiang

*Leptodermis ovata* H. J. P. Winkler.

Shrubs, with a few ascending branches, to 0.6 m tall; young branches and leaves slightly to densely squarrose hirsute, glabrescent. Petiole stout, 0.4–0.7 cm, slightly to densely hairy, sometimes leaves sessile; leaf blade subleathery, iron-gray abaxially when dry, ovate, ovate-oblong, elliptic, or sometimes sub-orbicular, 1.5–4 × 1–2.2 cm, adaxially glabrous or ± hirsutulous on midrib, abaxially hirsutulous on midrib and lateral veins or glabrous, base attenuate or cuneate, margin slightly revolute, apex shortly acuminate, acute, or obtuse; lateral veins 4–7 pairs, together with veinlets adaxially inconspicuous, abaxially conspicuous; stipules broadly triangular, 0.8–1.5 mm, sometimes inconspicuous, apex apiculate. Flowers 3–7 fascicled, terminal or in axils of upper 3–6 pairs of leaves, subsessile or pedicel 0.3–2.6 mm; bracteoles rigid, hyaline, oblong, 2.5–3.5 mm, longer than calyx or subequal at anthesis, ca. 2/3 portion connate, veined, subulate-acuminate. Calyx tube 1.3–3.3 mm, glabrous or slightly hairy outside; lobes 5, ca. 0.5 mm, width greater than length, longitudinally veined, margins slightly imbricate, ciliate, apex subrounded. Corolla white, purple, or red, narrowly funnel-form, ca. 1.5 cm, slightly curved, tomentose to sparsely pubescent; lobes 5, oblong, 1.4–1.8 mm, central portion thicker than narrow margins, apex incurved. Stamens 5. Short-styled flowers: stamens inserted above throat of corolla tube, filaments 1.3–3.2 mm, anthers 1.2–2 mm, slightly exserted; style 6.5–9.7 mm, stigma 0.3–1.8 mm, 3–6-lobed. Long-styled flowers: stamens inserted at throat of corolla tube, filaments ca. 0.7 mm, anthers 1.6–2 mm, included; ovary 5-celled, ovule 1 per cell; style 11.2–15.3 mm, stigma 0.6–1.8 mm, 3–5-lobed, slightly exserted. Capsule obovoid, 5.2–7.6 mm; seeds narrowly ellipsoid to ellipsoid or narrowly obovoid to obovoid, 3.3–5.5 mm; aril reticulate, free from testa. Fl. Jun–Dec, fr. Aug–Jan.

• N Guangdong (Lianxian, Ruyuan), Guangxi.

**31. *Leptodermis wilsonii*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 275. 1912.

大果野丁香 da guo ye ding xiang

Shrubs, usually 0.5–1 m tall; branches slightly stout, with brown or grayish white bark and 2 longitudinal grooves, grooves pilose. Petiole 2–4 mm or slightly longer; leaf blade papery, black or dark gray adaxially when dry, light brown abaxially, ovate or ovate-elliptic, sometimes lanceolate or oblong-lanceolate, 1–3.5(–3.9) × 0.5–1.8(–2) cm, glabrous on both surfaces except midrib and margins pilose adaxially, slightly smooth, base broadly cuneate, apex acute or obtuse; lateral veins 3 or 4 pairs, inconspicuous adaxially, not or slightly prominent abaxially; stipules long triangular, ca. 2 mm, with stiff apiculus, margins usually glandular. Flowers subsessile, usually 3 flowers terminal on branches, occasionally axillary near tips of branches; bracteoles 2, subscarios, lanceolate or ovate-triangular, 2–2.5 mm, usually slightly shorter than

sinus of calyx limb, glabrous or pilose, acuminate. Calyx black when dry; tube ca. 2.5 mm; lobes narrowly triangular, ca. 1.8 mm, shortly ciliate, acuminate, slightly spreading. Corolla white or pallid red, fragrant, funnelform, smooth outside, glabrous; tube 12–14 mm, villous inside; lobes spreading, suborbicular, 4–6 mm in diam., central portion relatively thick, margins broad and thin, erose, apex callose acute. Stamens 5, inserted in throat of corolla tube in short-styled flowers; filaments ca. 3 mm; anthers linear, ca. 4 mm, slightly exserted. Style dark brown or black when dry, linear, 7–8 mm, glabrous. Seed aril reticulate, adherent to testa. Fl. Jun, fr. Oct–Nov.

• Jungles, thickets; 1800–3000 m. W Sichuan (Shimian), NW Yunnan (Dali, Heqing, Lijiang).

**32. *Leptodermis xizangensis*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 16. 1999.

西藏野丁香 xi zang ye ding xiang

Shrubs, 50–80 cm tall; branches terete, slightly stout, purplish black, glabrous or pubescent, short branch usually ca. 1 cm, with dense nodes and short internodes. Leaves arranged on short branches; petiole short or leaves sessile; blade thickly papery or slightly fleshy, black adaxially and pale brown abaxially when dry, ovate-elliptic to lanceolate-oblong, 0.7–1.2 × 4–6 mm, both surfaces glabrous except margin ciliate, base broadly cuneate, apex acute or obtuse; midrib conspicuous abaxially, lateral veins sparse, inconspicuous; stipules long triangular, 2–2.5 mm, cuspidate-caudate, sometimes both sides adnate to petiole. Flowers sessile, usually 3 flowers terminal on tips of short branches; bracteoles 2, scarious, transparent, ca. 4.5 mm, connate to middle portion, apex with an acicular apiculus. Calyx tube ca. 2.5 mm; lobes 5, triangular, ca. 0.6 mm, densely ciliate, acute. Corolla purple, turning black when dry, broadly funnelform, ca. 1.6 mm, glabrous outside, throat expanded, ca. 5 mm in diam., sparsely villous or subglabrous inside; lobes 5, broadly ovate-suborbicular, ca. 4 mm, apex shallowly 3-lobed or cuspidate, apiculus obtuse. Stamens 5, inserted below corolla tube throat; filaments very short; anthers lanceolate-linear, ca. 2 mm. Style ca. 12 mm; stigmas 3-lobed, ca. 2 mm, linear.

• Thickets; ca. 3400 m. S Xizang (Gyirong).

**33. *Leptodermis yangshuoensis*** Tao Chen, sp. nov.

阳朔野丁香 yang shuo ye ding xiang

Type: China. Guangxi: Yangshuo Xian (阳朔县), Bilianfeng (碧莲峰), between rocks at roadsides or forest margins on limestone hilltop, ca. 300 m, 16 Sep 1999, T. Chen & Y. K. Li 990916001 (holotype, SZG; isotypes, A, MO).

*Haec species Leptodermidi vestitae Hemsley similis, sed ab ea inflorescentiis ad ramos hornotinos dispositis terminalibus vel raro in axillis foliorum superiorum, pedunculo elongato atque pedicello manifesto usque ad 8 mm longo differt.*

Paratype: China. Guangxi: Yangshuo Xian (阳朔县), Matang (马堂), Longtouzhai (龙头寨), 380 m, on limestone hill, 20 Oct 1963, Z. Z. Chen (陈照宙) 53104 (IBK – bar code 00100138).

Shrubs to 1 m high, with raphides distinctly present on

leaves, stipules, bracts, bracteoles, calyx, and corolla. Current year's branches subquadrangular, glabrous, ?straw-yellow when dry; previous year's branches with grayish white bark peeling off; old branches dark brown. Leaves opposite and sometimes in clusters on lateral short branches; petiole to 12 mm, grooved adaxially; blade subleathery, slightly shiny when dry, adaxially dark green, abaxially pale green, ovate to ovate-oblong, to 50 × 25 mm, glabrous on both surfaces, base obtuse, slightly decurrent to petiole, margins entire, slightly ciliate near apex, apex acute or shortly acuminate; midrib impressed adaxially when dry, lateral veins 3–6 pairs, slender, arcuate ascending, confluent along leaf margin, adaxially depressed or slightly impressed, abaxially prominent, veinlets abaxially conspicuous; stipules broadly triangular, apiculate. Inflorescences thyrsoid, borne on current year's branches, terminal or rarely in axils of upper leaves; peduncle purplish brown, elongate, slightly angular when dry, slender or slightly stout; bracts leaflike to subulate. Flowers (1–)3–5 fascicled, terminal on ultimate branches of inflorescence; pedicels purplish brown, to 8 mm; bracteoles connate, membranous, ca. 3 mm, equal to or slightly longer than calyx, distinctly veined, with raphides; lobes 2, triangular, ca. 1.2 mm, slightly bilobed at apex. Calyx with hypanthium ca. 1.5 mm; tube ca. 0.3 mm; lobes 5, ovate-oblong, ca. 1.2 mm, white ciliate. Corolla white or pale purple, narrowly funnelform, ca. 12 mm; tube narrow, 9–10 mm, densely hairy at throat, with hairs becoming sparse toward base; lobes 5, ovate-triangular, ca. 3 mm, reticulately veined. Stamens 5, inserted at throat; filaments very short; anthers ca. 1.5 mm. Ovary 5-celled, each cell with 1 ovule, basal; style slender; stigma 5-lobed, lobes linear, slender, revolute, adaxially hairy. Fruit a capsule, ovoid, ca. 4 mm, septically dehiscent into 5 valves, 5-seeded; valves persistent, with persistent calyx lobes at apex; seeds black, ca. 2.5 mm; aril reticulate, free. Fl. Aug–Oct, fr. Oct–Nov.

• Limestone hills; 300–400 m. NE Guangxi (Yangshuo).

**34. *Leptodermis yui*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 15. 1999.

德浚野丁香 de jun ye ding xiang

Shrubs, 0.5–1.5 m tall; branches and branchlets slender, old branches purplish red, glabrous, young branches with short, soft hairs in 2 bands. Leaves sparsely arranged; petiole 0.3–0.6 cm; blade membranous, adaxially dark brown and abaxially slightly pale when dry, broadly ovate to lanceolate, 1.5–4.5 × 0.7–2 cm, adaxially dispersedly strigose, abaxially glabrous or with sparse stiff hairs on midrib, base broadly cuneate or cuneate, margins fimbriate ciliate, apex obtuse or subacute, sometimes rounded; midrib very compressed abaxially, lateral veins slender, 4 or 5 pairs, conspicuous abaxially; stipules slightly short on upper part of branchlets, ca. 1 mm, apex lacerate, glandular, triangular on lower portion of branchlets, ca. 2 mm, margins with glandular hairs. Flowers 1–3 terminal, sessile; bracteoles 2, base connate (ca. 1 mm), free portion lanceolate or ensiform-lanceolate, ca. 2 mm, sparsely hispid, margins sometimes glandular. Calyx tube ca. 2 mm; lobes 5, narrowly triangular, longer than tube, hispid ciliate, acuminate. Corolla purple, broadly funnelform, apex with tufted long soft hairs; tube

9–10 mm, glabrous outside, covered with white long soft hairs inside; lobes 5, broad, oblate, ca. 5 mm wide, margin crisped, both surfaces villous, apex shallowly 3-lobed. Stamens 5, inserted below throat of corolla tube; filaments short; anthers ob-

long-linear, ca. 2 mm, included. Style slightly exerted, stigmas 2-lobed, lobes filiform.

• Forest margins; ca. 2500 m. SW Sichuan (Muli).

#### 45. **LEPTOMISCHUS** Drake, Bull. Mus. Hist. Nat. (Paris) 1: 117. 1895.

报春茜属 bao chun qian shu

Chen Tao (陈涛); Charlotte M. Taylor

*Indopolysolenia* Bennet; *Polysolen* Rauschert, nom. illeg. superfl.; *Polysolenia* J. D. Hooker (1873), not Ehrenberg ex Kützing (1849) [Fungi].

Perennial herbs or subshrubs, unarmed, presumably rather succulent. Raphides present. Leaves opposite, sometimes crowded or rosulate, perhaps without domatia, with margins sometimes crisped and/or reportedly serrulate; stipules persistent to deciduous, interpetiolar or shortly united around stem, triangular to suborbicular (*Leptomischus funingensis*), often well developed and veined, entire or 2- or 3-lobed (*L. wallichii*), glabrous or glabrescent adaxially. Inflorescences terminal and apparently sometimes pseudoaxillary, capitate to congested-cymose or umbelliform, several to many flowered, subsessile to pedunculate, bracteate with bracts often well developed to involucre. Flowers sessile to pedicellate, bisexual, distylous and sometimes markedly dimorphic. Calyx limb 5-lobed. Corolla white or yellow, funnelform, salverform, or sometimes inflated, inside pubescent in upper part or most of tube; lobes 5, valvate in bud. Stamens 5, inserted below middle of corolla tube in long-styled flowers, inserted in corolla throat in short-styled flowers, included or partially exerted; filaments usually short; anthers basifixed or perhaps dorsifixed near base. Ovary 2-celled, ovules numerous in each cell borne on stipitate placentas apparently near base of septum; stigma 2-lobed, included or exerted. Fruit capsular, subglobose, dehiscent through apical portion or operculum inside calyx limb, perhaps papery, with septum reportedly mostly disintegrating leaving 1 incomplete cell; seeds numerous, small, reticulate or areolate.

Seven species: S China, NE India, Myanmar, Vietnam; five species (three endemic) in China.

*Leptomischus* seems to be similar to *Keenania* and *Mouretia*; all of these genera are rather poorly known. Several authors (e.g., Deb & Rout, Kew Bull. 45(2): 339–341. 1990; H. S. Lo in FRPS 71(1): 184–189. 1999) have reported marked floral dimorphism in species of *Leptomischus*.

- 1a. Leaf blade shallowly cordate or subtruncate at base; stems well developed with leaves distributed along them; calyx with multicellular long trichomes ..... 3. *L. guangxiensis*
- 1b. Leaf blade obtuse to acute at base; stems short to well developed with leaves distributed along them or congested at ends; calyx glabrous or with unicellular or multicellular trichomes.
  - 2a. Flowers smaller, corolla 6–6.5 mm; calyx and corolla glabrous outside ..... 4. *L. parviflorus*
  - 2b. Flowers larger, corolla longer than 10 mm; calyx and corolla glabrous to variously pubescent outside.
    - 3a. Stems short, with leaves crowded and rosulate; calyx and corolla unicellular pilosulous outside ..... 5. *L. primuloides*
    - 3b. Stems developed, with leaves distributed along them; calyx and corolla densely multicellular villous, tomentose, or -pilosulous outside.
      - 4a. Stipules ovate to lanceolate, 8–9 mm ..... 1. *L. erianthus*
      - 4b. Stipules suborbicular, 4–5 mm ..... 2. *L. funingensis*

**1. *Leptomischus erianthus*** H. S. Lo, Bull. Bot. Res., Harbin 18: 277. 1998.

毛花报春茜 mao hua bao chun qian

Herbs, weak to erect, 1–2 m tall; stems quadrangular, densely hirtellous. Leaves opposite, distributed along stems; petiole usually 0.5–1.5 cm, densely hirtellous; blade drying papery, black adaxially, dark brown abaxially, narrowly elliptic to lanceolate-elliptic, 4–12 × 1.5–4 cm, adaxially sparsely strigose to glabrescent, abaxially glabrescent except multicellular villous along principal veins, base cuneate, margins densely multicellular-ciliate, apex acuminate or caudate-cuspidate; secondary veins 9–12 pairs; stipules persistent, ovate or lanceolate, 8–9 mm, densely striate veined. Inflorescences terminal, subcapitate, densely multicellular villous with trichomes drying brown; peduncle shorter than 1 cm. Flowers subsessile. Calyx multicellular villous; hypanthium portion obconic, ca. 1.5 mm; limb lobed for ca. 1/2; lobes narrowly triangular, ca. 4 mm, acute.

Corolla white, tubular, densely multicellular tomentose or -pilosulous outside with trichomes drying brown; tube 15–16 cm, inside upper part white villous; lobes triangular-lanceolate, 4–5 mm, acute. Capsules obconic, 5–6 mm, with persistent calyx lobes to 3 mm. Fl. May, fr. Jul.

• Dense forests in moist valleys; 1500–1700 m. Yunnan.

**2. *Leptomischus funingensis*** H. S. Lo, Bull. Bot. Res., Harbin 18: 278. 1998.

富宁报春茜 fu ning bao chun qian

Herbs, unbranched; stems terete to quadrangular, pilosulous. Leaves opposite, distributed along stems; petiole 1–3 cm; blade drying black-brown, ovate, narrowly elliptic, or rarely obovate, 8–15 × 2.5–4.5 cm, adaxially glabrescent to pilose, abaxially villous, base cuneate, margins entire or serrulate-ciliate, apex acuminate; secondary veins 5–7(or 8) pairs; stipules suborbicular, 4–5 mm, usually reflexed, villous abaxially

and marginally. Inflorescences terminal, cymose, densely many flowered; peduncles shorter than 1 cm; pedicels 3–3.5 mm. Flowers pedicellate. Calyx densely multicellular villous; hypanthium portion obconic, 3.5–4 mm; limb deeply lobed; lobes subtriangular, ca. 1.5 mm, obtuse. Corolla white or bright yellow, tubular-salverform, densely multicellular villous outside; tube 14–16 mm, white villous inside; lobes subelliptic, 4–6 mm, obtuse. Capsules obconic or subglobose, pilose, weakly shiny. Fl. summer.

- Streamsides in dense forests; ca. 1000 m. Yunnan (Funing).

**3. *Leptomischus guangxiensis*** H. S. Lo, Bull. Bot. Res., Harbin 18: 278. 1998.

心叶报春茜 xin ye bao chun qian

Herbs; stems densely multicellular tomentose with trichomes drying grayish brown. Leaves opposite, distributed along stems; petiole 2.5–3.5 cm, densely pilosulous; blade drying papery and brownish gray adaxially, ovate or oblong-ovate, 5–8.5 × 2.5–4.5 cm, sparsely strigose adaxially, pilosulous except multicellular tomentose along midrib abaxially, base shallowly cordate to subtruncate, margins entire, apex acute to obtuse; secondary veins 5–7 pairs; stipules subovate, 7–9 mm, villous. Inflorescences terminal, cymose, densely multicellular tomentose; peduncle ca. 1 cm. Flowers not seen. Capsules obconic, multicellular villous, together with persistent calyx lobes 9–10 mm. Fl. May, fr. Apr, Jan.

- Shady grasslands near water. Guangxi.

**4. *Leptomischus parviflorus*** H. S. Lo, Bull. Bot. Res., Harbin 6(4): 49. 1986.

小花报春茜 xiao hua bao chun qian

Herbs, 10–30 m tall; stems terete to 4-angled, densely villosulous. Leaves opposite, distributed along stems or in clusters near stem apices; petiole 4–10(–20) mm, puberulent to villosulous; blade drying papery, dark green adaxially, greenish yellow abaxially, elliptic, narrowly elliptic, or oblanceolate, 4–14 × 1–4 cm, glabrous adaxially, glabrous on lamina and densely puberulent to villosulous on veins abaxially, base acute to obtuse, margins entire, apex obtuse to shortly acuminate; secondary veins 12–16 pairs; stipules persistent, rather leaflike, ovate to ligulate,

4–14 mm, veined, glabrescent, acute to obtuse. Inflorescences terminal, capitate, several flowered, puberulent to glabrous; peduncle 0.4–5 cm; bracts obovate to oblong-ob lanceolate or narrowly oblanceolate, 3–10 mm, entire or sparsely ciliate. Flowers subsessile. Calyx glabrous; hypanthium portion obovoid, smooth to 5-ribbed, ca. 1.5 mm; limb lobed for ca. 1/2; lobes ovate to ligulate, 1–1.2 mm, obtuse. Corolla white, funnelliform, 6–6.5 mm, glabrous outside; tube densely white villous in throat; lobes subtriangular, margins thickened, apex rostrate. Capsules subglobose, 2.5–3.5 × 3–4.5 mm, glabrous; seeds 0.2–0.4 mm. Fl. Jul–Aug, fr. Aug.

Dense forests. Hainan (Sanya), Yunnan (Hekou) [N Vietnam].

**5. *Leptomischus primuloides*** Drake, Bull. Mus. Hist. Nat. (Paris) 1: 117. 1895.

报春茜 bao chun qian

*Indopolysolenia burmanica* Deb & Rout.

Perennial herbs or subshrubs, 10–30 cm tall; stems stout, subterete to quadrangular, pilosulous. Leaves opposite, crowded and rosulate; petiole 0.4–4 cm, pilose; blade drying papery, obovate, broadly obovate, or elliptic, (7–)15–25 × (2–)5–10 cm, adaxially glabrous, abaxially glabrescent except puberulent along principal veins, base cuneate to acute, margins entire, apex acute or obtuse; secondary veins 14–19 pairs; stipules deciduous, elliptic, lanceolate, or ovate, 6–18 mm, pilosulous, acute or acuminate. Inflorescences terminal and/or pseudoaxillary in uppermost axils, capitate to subcapitate, several flowered, glabrescent; peduncle 2.5–12 cm; heads 2–5 cm wide; bracts ovate, 6–14 mm, pilose, acuminate or acute. Flowers subsessile. Calyx unicellular pilosulous; hypanthium portion ellipsoid-obovoid, 1–1.5 mm; limb lobed for ca. 1/2; lobes lanceolate, (1–)2.5(–4) mm, ciliate, acute or acuminate. Corolla funnelliform or tubular to inflated, outside pilosulous; tube 16–18(–25) mm, villous in throat; lobes triangular, ca. 2 mm, acute or obtuse. Capsules obovoid, ca. 3 × 4 mm. Fl. early winter.

Forests; [ca. 200 m in Myanmar]. Yunnan (Hekou) [Myanmar, Vietnam].

The measurements above include some from the protologue of *Indopolysolenia burmanica*, which was placed by Lo (Acta Phytotax. Sin. 31: 275. 1993) in synonymy with *Leptomischus primuloides*.

## 46. LEPTUNIS Steven, Bull. Soc. Imp. Naturalistes Moscou 29(2): 366. 1857.

乐土草属 le tu cao shu

Chen Tao (陈涛); Friedrich Ehrendorfer

Herbs, annual, slender. Raphides present. Stems subterete. Leaves and leaflike stipules in whorls of 8–16, sessile, linear to filiform, without domatia. Inflorescences terminal, thyrsoid, below with dichasial and above with monochasial cymes, few flowered when young but usually continuing to grow and becoming many flowered and diffuse; peduncles and pedicels filiform with leaflike bracts and reduced bracteoles. Flowers pedicellate to sessile, bisexual, monomorphic. Calyx limb obsolete. Corolla salmon-orange to pale greenish, tubular to funnelliform, glabrous inside; lobes 4, valvate in bud. Stamens 4, inserted in upper part of corolla tube, included or partially exserted; filaments short; anthers dorsifixed, black. Ovary inferior, 2-celled, ovules 1 in each cell, basal; stigmas 2, globose, partially exserted. Fruit schizocarpous; mericarps obovoid, with 1 seed, indehiscent, upper part somewhat incurved, dry, with appressed short and curved hairs.

One species: from the SE Caucasus through Afghanistan and C Asia to NW China.

Ehrendorfer et al. (Fl. Iranica 176: 1–287. 2005) included the monotypic genus *Leptunis* in *Asperula* sect. *Trichodes* Boissier, based on the fol-

lowing arguments. Segregation of *Leptunis* as a monotypic genus from *Asperula* was based only on its ripe mericarps being rather obovoid and incurved than ellipsoid and straight. Furthermore, *Leptunis* appears closely linked to *Asperula* by *A. seticornis* Boissier. This local species from S Iran has long been recognized as having fruit that are intermediate in shape between *Leptunis* and "typical" *Asperula*. Nevertheless, considering the still incomplete DNA-analytical study of SW-Asiatic taxa of *Asperula* and the recent discovery of *Leptunis* in China (Abdusalih et al., Acta Bot. Boreal-Occid. Sin. 23(4): 674. 2003), the genus is provisionally retained here. It is inserted in the key to Rubiaceae genera and species found in the present volume under *Galium*.

**1. *Leptunis trichodes*** (J. Gay ex Candolle) Schischkin, Fl. URSS 23: 285. 1958 [*"trichoides"*].

乐上草 le tu cao

*Asperula trichodes* J. Gay ex Candolle, Prodr. 4: 582. 1830; *Leptunis tenuis* Steven.

Herbs, annual, erect, 10–40 cm tall; stems and branches subterete, glabrous. Leaf blade drying stiffly papery, linear, 10–35 × 0.3–1 mm, glabrous to sparsely scaberulous, base acute, margins usually revolute, apex acute; 1 main vein as midrib, secondary veins not visible. Inflorescence 1–15 × 1–20 cm,

glabrous; bracts leaflike, 1–3.5 × 0.1–0.2 mm; pedicels lacking or up to 20 mm, thickened toward flowers. Corolla puberulent outside, 1.5–2 mm; lobes elliptic to ovate, 0.5–1 mm, obtuse. Ovary inferior, obovoid, ca. 1 × 1 mm. Mericarps 1–2 mm, with appressed short and curved hairs. Fl. Jun–Jul, fr. Jul–Aug.

Open ground and grasslands on mountains, riversides, sunny rocky slopes; 900–1500 m. Xinjiang (Ürümqi) [Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Azerbaijan, Iran)].

*Leptunis trichodes* was first documented from China by Abdusalih et al. (Acta Bot. Boreal-Occid. Sin. 23(4): 674. 2003).

## 47. **LERCHEA** Linnaeus, Mant. Pl. 2: 155, 256. 1771, nom. cons., not *Lerchia* Haller ex Zinn (1757).

多轮草属 duo lun cao shu

Chen Tao (陈涛); Charlotte M. Taylor

*Codaria* Linnaeus ex Kuntze.

Subshrubs or perennial herbs, unarmed, sometimes unbranched. Raphides present. Leaves opposite, often grouped at stem apices, perhaps without domatia; stipules caducous or persistent, interpetiolar, triangular or generally ligulate to obovate. Inflorescences terminal or pseudo-axillary, cymose, corymbiform, or racemiform with axes scorpioid, spiciform, or bearing small heads, several to many flowered, pedunculate, bracteate or bracts reduced. Flowers pedicellate to sessile, bisexual, distylous. Calyx limb shallowly to deeply 5-lobed, inside with well-developed colleters. Corolla white or yellowish green, tubular or funnelform, inside with pubescent ring in throat; lobes 5, often cucullate, valvate in bud. Stamens 5, inserted near or above middle of corolla tube, exserted or included; filaments developed; anthers dorsifixed, sometimes pubescent at one or both ends. Ovary 2-celled, ovules numerous in each locule on peltate axile placentas; stigma 2-lobed, stout, sometimes scabrous, exserted or included. Fruit baccate, fleshy except with bony endocarp, subglobose, with calyx limb persistent; seeds numerous, brown, small, angled.

About ten species: SE Asia; two species (one endemic) in China.

This genus was reviewed in detail in Sumatra and Java by Axelius (Blumea 32: 91–114. 1987). She noted among other observations that the plants are quite infrequently encountered in the field. The genus was apparently first reported from China by H. S. Lo (Bull. Bot. Res., Harbin 18: 275–283. 1998), who transferred one described species of *Ophiorrhiza* and *Xanthophyllum* into *Lerchea*.

- 1a. Inflorescences with secondary axes mostly scorpioid; leaves with secondary veins 12–18 pairs; stipules caducous, not seen ..... 1. *L. micrantha*
- 1b. Inflorescences with secondary axes mostly dichasial; leaves with secondary veins 20–25 pairs; stipules persistent, 25–30 mm ..... 2. *L. sinica*

**1. *Lerchea micrantha*** (Drake) H. S. Lo, Bull. Bot. Res., Harbin 18: 275. 1998.

多轮草 duo lun cao

*Ophiorrhiza micrantha* Drake, J. Bot. (Morot) 9: 214. 1895; *Notodontia micrantha* (Drake) Pierre ex Pitard; *Spiradiclis micrantha* (Drake) H. S. Lo.

Herbs, rather fleshy; stems procumbent and rooting on nodes with apical parts ascending. Petiole densely pilosulous-hirtellous; leaf blade drying membranous, elliptic, ovate-elliptic, or lanceolate-oblong, 5–18 × 2.5–8 cm, base cuneate to rounded and often decurrent along petiole, apex acuminate or

obtuse; secondary veins 12–18 pairs; stipules caducous, not seen. Inflorescence terminal, ferruginous tomentose, 10–18 cm, many branched; secondary branches arcuate to recurved, mostly scorpioid, with flowers rather densely grouped; bracts reduced. Calyx with hypanthium portion weakly 5-ridged, 0.5–0.7 mm. Corolla white, shortly tubular; tube swollen in lower part; lobes obtuse. Berries subglobose, ca. 1.5 mm in diam.

Shady wet streamsides in forests. Yunnan (Hekou) [N Vietnam].

This species was incorrectly called *Polyura geminata* J. D. Hooker by Wu (Acta Phytotax. Sin. 6: 294. 1957) in its first report from China, but that was a misidentification. *Polyura* J. D. Hooker is an accepted genus of Rubiaceae but is not (yet) known from China.

**2. *Lerchea sinica*** (H. S. Lo) H. S. Lo, Bull. Bot. Res., Harbin 18: 275. 1998.

华多轮草 *hua duo lun cao*

*Xanthophytum sinicum* H. S. Lo, Guihaia 11: 97. 1991.

Suffrutescent herbs, rather fleshy, to 1 m tall; stems ascending, angled, densely villous. Petiole 3–6 cm, villous to hirsute; leaf blade drying papery, oblanceolate to elliptic, 18–27 × 7–10 cm, glabrous on both surfaces or pilose along midrib abaxially, base cuneate, apex acute or abruptly acute; secondary

veins 20–25 pairs; stipules persistent, obovate, 25–30 mm, parallel nerved, obtuse. Inflorescence terminal, paniculiform, lax, ca. 15 cm, multicellular villous; axes spreading to reflexed, mostly dichotomous with flowers rather closely grouped; bracts reduced; pedicels 0.5–1 mm. Calyx with hypanthium portion subtruncate to globose, ca. 2 mm, multicellular villous; lobes narrowly triangular, ca. 3.5 mm, glabrescent. Corolla yellowish green, tubular, glabrous outside; tube 3–3.5 mm; lobes triangular-ovate, ca. 1.5 mm. Fl. Aug.

• Dense forests. Yunnan (Hekou).

#### 48. *LUCULIA* Sweet, Brit. Fl. Gard. 2: t. 145. 1826.

滇丁香属 *dian ding xiang shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees, unarmed. Raphides absent. Leaves opposite, sometimes with domatia; stipules caducous, interpetiolar, triangular, acute. Inflorescences terminal and sometimes in axils of uppermost leaves giving tripartite appearance, cymose and usually rounded-corymbiform, pedunculate, bracteate with bracts caducous. Flowers pedicellate, bisexual, distylous, generally showy. Calyx limb deeply 5-lobed, lobes well developed to subleaflike, usually deciduous shortly after anthesis and often before corolla. Corolla red to pink or white, salverform; tube prolonged and in long-styled form expanded in throat to enclose anthers, with upper part of throat spreading with lobes at anthesis, glabrous inside; lobes 5, imbricate (and apparently quincuncial) in bud, rounded, margins usually crisped and slightly irregular, sometimes with a lamellate basal appendage on each side. Stamens 5, inserted in upper part of corolla tube, included in long-styled form or partially to completely exerted in short-styled form; filaments short; anthers dorsifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas; stigmas 2, linear, included in short-styled form or exerted in long-styled form. Fruit capsular, obovoid to ellipsoid, smooth, septicidally dehiscent from apex for half or completely, woody, becoming deflexed, with calyx limb caducous; seeds numerous, small, fusiform, flattened, prolonged into narrow wings at each end; endosperm fleshy; embryo minute, slightly clavate; cotyledons obtuse.

About five species: Bhutan, China, India, Myanmar, Nepal, Thailand, Vietnam; three species (one endemic) in China.

The relationships of *Luculia* have not been clear until recently, when molecular studies (e.g., Bremer et al., Syst. Biol. 48: 413–435. 1999) found it to be basal in the Rubiaceae. Additional references regarding *Luculia*'s biology and classification, not listed here, were cited by Rydin et al. (Pl. Syst. Evol. 278: 101–120. 2009).

The treatment here summarizes the existing taxonomy, as a basis for future work; it seems possible that there are only two species in China, but evaluation of this is beyond the scope of this study and the available specimens. Hutchinson (in Sargent, Pl. Wilson. 3: 408. 1916) gave taxonomic significance at the species level to the presence vs. absence of "striking flap-like processes upon and continuous between the lobes of the corolla" for separating species of *Luculia*; these structures have not been much studied or detailed by other authors.

- 1a. Corolla tube 30–50 mm; corolla lobes 12–15 mm wide, suborbicular to broadly elliptic, without lamellate appendages at their bases ..... 1. *L. gratissima*
- 1b. Corolla tube 25–32 mm; corolla lobes 9–15 mm wide, obovate to suborbicular, usually with a lamellate appendage at each side of base inside.
  - 2a. Inflorescence axes, hypanthium portion of calyx, and fruit glabrous or sparsely hirtellous or pilosulous, surfaces of structures easily visible between trichomes ..... 2. *L. pinceana*
  - 2b. Inflorescence axes, hypanthium portion of calyx, and fruit densely tomentose, surfaces of structures completely covered by pubescence ..... 3. *L. yunnanensis*

**1. *Luculia gratissima*** (Wallich) Sweet, Brit. Fl. Gard. 2: t. 145. 1826.

馥郁滇丁香 *fu yu dian ding xiang*

*Cinchona gratissima* Wallich in Roxburgh, Fl. Ind. 2: 154. 1824; *Mussaenda luculia* Buchanan-Hamilton ex D. Don, nom. illeg. superfl.

Shrubs or small trees, to 5 m tall, with thin pale brown bark; branches somewhat flattened to subterete, pilosulous [to glabrous], sometimes with sparse elliptic lenticels. Petiole 0.8–2 cm, pilosulous to glabrous; leaf blade drying papery or thinly

leathery, elliptic, lanceolate-elliptic, lanceolate, or elliptic-oblong, 5–15 × 2–6 cm, adaxially glabrous, abaxially pilosulous at least along principal veins, base cuneate or acute, apex acute to acuminate; secondary veins 8–12 pairs, sometimes with pilosulous domatia; stipules lanceolate to narrowly lanceolate, 6–8 mm, glabrous to strigillose, acute to acuminate. Inflorescence corymbiform, many flowered, villosulous to pilosulous; peduncle 2–3 cm; branched portion 3–5 × 6–8 cm (not including corollas); bracts linear to narrowly ligulate, 4–7 mm, acute; pedicels 4–5 mm. Calyx glabrous to densely hirtellous; ovary portion obovoid, 3–4 mm; lobes lanceolate, oblanceolate, or narrowly ligulate, 10–16 mm, acute. Corolla red, outside glabrous;

tube 30–50 mm, slenderly cylindrical; lobes suborbicular to broadly elliptic, 11–12 × 12–15 mm, rounded. Capsule 1–2 × 1–1.5 cm, pilosulous to glabrous; seeds 2–3 mm, spongy-reticulate. Fl. and fr. Apr–Nov.

Forests or thickets on mountains; 800–2400 m. Xizang (Mêdog), Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

W. C. Chen (in FRPS 71(1): 239. 1999) distinguished this from other species of *Luculia* in part by its villous pubescence on the calyx and hypanthium, but some individual specimens seen vary from densely pubescent to glabrous. The pollination biology of this species was studied by Murray (Ann. Bot. 65: 691–698. 1990).

**2. *Luculia pinceana*** Hooker in Curtis, Bot. Mag. 71: t. 4132. 1845.

滇丁香 dian ding xiang

Shrubs or trees, 2–10 m tall; branches flattened to subterete, with usually rather dense elliptic lenticels, hirtellous to glabrous. Petiole 1–3.5 cm, glabrous or hirtellous; leaf blade drying stiffly papery to thinly leathery and paler below, elliptic, elliptic-oblong, or oblanceolate, 5–22 × 2–8 cm, adaxially glabrous, abaxially glabrous or hirtellous to strigillose on principal veins to throughout, base cuneate, acuminate, or obtuse, apex acuminate; secondary veins 9–14 pairs, often with pilosulous domatia; stipules triangular to narrowly triangular, 5–19 mm, glabrous, long acuminate. Inflorescence corymbiform, many flowered, glabrous; peduncle 2–8 cm; branched portion 2–6 × 3–8 cm (not including corollas); bracts stipuliform, linear-lanceolate, 12–15 mm, glabrous, acute; pedicels 2–6 mm. Calyx glabrous or sparsely hirtellous; ovary portion cylindrical-obovoid, 4–5 mm; lobes lanceolate to narrowly oblanceolate, 8–18 × 2–6 mm, often ciliate, acute. Corolla red or rarely white, glabrous; tube slenderly cylindrical, 30–32 mm; lobes suborbicular, 15–22 × 11–15 mm, at base with a lamellate appendage on each side inside, apex rounded. Capsules obovoid to ellipsoid-obovate, 15–25 × 5–10 mm, weakly longitudinally ridged, glabrous or sparsely hirtellous; seeds ca. 4 mm. Fl. and fr. Mar–Dec.

Forests or thickets on mountain slopes, streamsides in valleys; 600–3000 m. Guangxi, Guizhou, Xizang, Yunnan [India, Myanmar, Nepal, Vietnam].

The varieties below were recognized by W. C. Chen in FRPS (71(1): 239–241. 1999) and are included here for reference.

- 1a. Branchlets and peduncles glabrous ..... 2a. var. *pinceana*  
1b. Branchlets and peduncles pubescent .... 2b. var. *pubescens*

## 2a. *Luculia pinceana* var. *pinceana*

滇丁香(原变种) dian ding xiang (yuan bian zhong)

*Luculia intermedia* Hutchinson.

Branchlets and peduncles glabrous. Fl. and fr. Mar–Nov.

Forests or thickets on mountain slopes, streamsides in valleys; 600–3000 m. Guangxi, Guizhou, Xizang, Yunnan [India, Myanmar, Nepal, Vietnam].

## 2b. *Luculia pinceana* var. *pubescens* (W. C. Chen) W. C. Chen, Fl. Reipubl. Popularis Sin. 71(1): 241. 1999.

毛滇丁香 mao dian ding xiang

*Luculia intermedia* var. *pubescens* W. C. Chen, Acta Phytotax. Sin. 22: 139. 1984.

Branchlets and peduncles pubescent. Fl. and fr. Apr–Dec.

• Forests or thickets on mountain slopes or at streamsides; 600–1800 m. Guangxi (Napo), Xizang (Mêdog), Yunnan.

## 3. *Luculia yunnanensis* S. Y. Hu, J. Arnold Arbor. 32: 398. 1951.

鸡冠滇丁香 ji guan dian ding xiang

Shrubs and trees, 3.5(–10) m tall; branches weakly flattened to terete, densely tomentose to hirtellous, with dense elliptic lenticels. Petiole 0.8–2 cm, sparsely pilosulous to glabrous; leaf blade drying leathery or stiffly papery, oblanceolate, oblanceolate-oblong, or elliptic-oblong, 5.5–18 × 2–5.5 cm, adaxially glabrous, abaxially glabrous except strigose to pilose along principal veins, base cuneate or acute, apex acute to acuminate; secondary vein 9–14 pairs, usually with pilosulous domatia; stipules lanceolate to narrowly triangular, 4–14 mm, glabrous, acute to acuminate. Inflorescence corymbiform, many flowered, densely tomentose; peduncle 1.5–3.5 cm; branched portion 5–10 × 6–15 cm (not including corollas); bracts linear to narrowly spatulate, 5–15 mm; pedicels 3–10 mm. Calyx with ovary portion obconic, 5–6 mm, densely tomentose; lobes lanceolate to narrowly ligulate or narrowly oblanceolate, 12–20 × 3–3.5 mm, glabrous except strigose along veins and margins, apex acute to shortly acuminate. Corolla red, outside glabrous; tube 25–32 mm, cylindrical to slightly funnelform; lobes suborbicular to obovate, 13–18 × 9–12 mm, with 2 lamellate appendages or crests at each side of base inside, apex rounded. Capsules obovoid, 1.5–2.5 × 0.5–0.8 mm, smooth to weakly ridged, densely tomentose; seeds 2–4 mm. Fl. and fr. Mar–Nov.

• Forests or thickets on mountains; 1200–3200 m. Yunnan.

## 49. METADINA Bakhuizen f., Taxon 19: 472. 1970.

黄棉木属 huang mian mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Trees, unarmed; buds pyramidal to conical with stipules obvolvate. Raphides absent. Leaves opposite, sometimes with domatia; stipules caducous, interpetiolar, generally triangular. Inflorescences terminal and in axils of uppermost leaves, capitate with several globose heads in fascicles or cymes, many flowered, pedunculate, bracteate; peduncles articulate; bracts often subtending heads; bracteoles filiform to filiform-clavate. Flowers sessile, bisexual, monomorphic. Calyx limb 5-lobed. Corolla color not noted, salverform to narrowly funnelform, inside glabrous; lobes 5, in bud valvate except apices subimbricate. Stamens 5, inserted in upper part of corolla tube, partially exserted; filaments short; anthers basifixed. Ovary 2-celled, ovules 4–12 in each cell, pendulous on axile pla-

centas attached in upper third of septum; stigma globose to clavate, smooth, exserted. Fruit capsular, obconic, septically then sometimes loculicidally dehiscent into 2 or 4 valves from base to apex, woody to stiffly papery, with calyx limb persistent on persistent septum; seeds several, small, subglobose to trigonous or ellipsoid, unwinged.

One species: Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

The taxonomy of this genus here follows Ridsdale (Blumea 24: 350–351. 1979), with a broader morphological variation as found in more recently collected specimens, in particular in inflorescence morphology. This taxonomy is complicated by varied application of the name *Adina polycephala*: Ridsdale treated this as a synonym of *Metadina trichotoma*, but older Chinese authors (in herb.) have long applied it to the plants treated here as *A. pubicostata*.

**1. *Metadina trichotoma*** (Zollinger & Moritz) Bakhuizen f., Taxon 19: 472. 1970.

黄棉木 huang mian mu

*Nauclea trichotoma* Zollinger & Moritz, Syst. Verz. 61. 1846; *Adina polycephala* Benth; *A. trichotoma* (Zollinger & Moritz) Benth & J. D. Hooker ex B. D. Jackson; *A. zschokkei* Elmer; *N. polycephala* Wallich ex G. Don (1834), not A. Richard ex Candolle (1830).

Trees, apparently evergreen, flowering at 5–10 m tall; branches compressed becoming terete, brown to gray, puberulent to glabrous, usually densely lenticellate with elliptic white raised lenticels. Petiole 3–10 mm, glabrous; leaf blade drying stiffly papery to subleathery, lanceolate, elliptic-lanceolate, or ovate-oblong, 6–20 × 2–7 cm, adaxially glabrous and rather shiny, abaxially glabrous to puberulent or tomentulose at least along veins, base acute to obtuse, apex acute to caudate-acumi-

nate; secondary veins 8–12 pairs, sometimes with small pilosulous domatia in axils; stipules deltoid to narrowly triangular, 5–8 mm, acute to perhaps obtuse. Inflorescence glabrous to densely puberulent or tomentulose; peduncles 1.5–3 cm, usually articulate and with 4 caducous bracts 1–3 mm near middle; flowering heads 6–7 mm in diam. across calyces, ca. 12 mm in diam. across corollas; bracteoles ca. 2 mm. Calyx with ovary portion obconic, 0.5–1 mm, pilosulous to glabrescent, surrounded at base by a ring of pilose trichomes ca. 0.5 mm; limb lobed essentially to base; lobes 1–2 mm, narrowly elliptic-oblong, obtuse. Corolla outside glabrous; tube 3–3.5 mm; lobes triangular-spatulate, ca. 1 mm. Stigmas obconic, ca. 1 mm, exserted for ca. 5 mm. Fruiting head 8–10 mm in diam. Capsules obovoid to obconic, ca. 1.5 mm, pilosulous at least on apical portion. Fl. and fr. Apr–Dec.

Forests at streamsides in valleys; 300–1400 m. Guangdong, Guangxi, Hunan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

## 50. MICROPHYSA Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 2: 115. 1844.

泡果茜草属 pao guo qian cao shu

Chen Tao (陈涛); Friedrich Ehrendorfer

Herbs, perennial, rhizomatous. Raphides present. Stems rough. Leaves and leaflike stipules of middle stem region in whorls of 4, without domatia, sessile or subsessile. Inflorescences terminal, thyrsoid, corymbose, cymes pedunculate, several to many flowered, bracteate but bracteoles strongly reduced. Flowers sessile to pedicellate, remarkably small, bisexual, monomorphic. Calyx limb obsolete. Corolla white, funnel-shaped, glabrous; lobes 4, valvate in bud. Stamens 4, inserted on upper part of corolla tube, exserted; filaments short; anthers dorsifixed. Ovary (hypanthium) with 2 cells, each with 1 erect ovule inserted at base of placenta; stigma 2-lobed, exserted. Fruit indehiscent or tardily schizocarpous, dry, with pericarp leathery and inflated (i.e., bladderlike) and usually including both seeds at dispersal; seeds small, ellipsoid-oblong or plano-convex, grooved on ventral (i.e., adaxial) side; testa membranous; endosperm corneous; embryo curved; cotyledons leaflike; radicle terete, hypogynous.

One species: NW China, Kazakhstan, Uzbekistan.

*Microphysa* was originally described as *Asperula elongata*. Its subsequent generic separation by Schrenk (Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 2: 116. 1844) was justified by its peculiar fruit structure. Only much later, Ehrendorfer et al. (Fl. Iranica 176: 161–258. 2005) postulated that *Microphysa* (as well as *A. platygalium* and *A. maximoviczii*: see under *Galium*), in spite of their funnel-shaped corollas, phylogenetically belong to *G. sect. Platygalium* (usually with rotate corollas), a section to which they correspond in all remaining essential characters. In the aberrant fruit of *Microphysa* the two parts of the inferior ovary do not develop into separate mericarps, each with its own pericarp, but remain united within a ± inflated leathery and common pericarp. Nevertheless, this peculiar development is not limited to *Microphysa* but, according to personal observations (F. Ehrendorfer), also occurs sporadically within populations of the *G. boreale-G. rubioides* group (corresponding to the series *G. ser. Rubioides* Pobedimova and *G. ser. Borealia* Pobedimova within *G. sect. Platygalium*; cf. Pobedimova et al., Fl. URSS 23: 345–354. 1958). Thus, on the basis of available evidence, the single species of *Microphysa* should be placed into *G. sect. Platygalium*.

Considering that *Microphysa* was separated as a monotypic genus by Pobedimova (loc. cit.) and by H. S. Lo (in FRPS 71(2): 318. 1999), and that DNA-analytical proof for its transfer to *Galium* sect. *Platygalium* is still lacking, the genus is maintained here provisionally. Furthermore, its possible future transfer will make a new species name necessary, because “*elongata*” has been used already for another taxon within *Galium*.

**1. *Microphysa elongata*** (Schrenk) Pobedimova in Schischkin, Fl. URSS 23: 286. 1958.

泡果茜草 pao guo qian cao

*Asperula elongata* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 58. 1841; *Microphysa galioides* Schrenk.

Herbs, perennial, erect, rhizomatous. Stems 30–50(–70)

cm tall, with 4 scabrous angles. Leaf blade drying subleathery, linear-lanceolate, lanceolate, or narrowly oblong, 30–60 × 3–5(–12) mm, glabrous except antrorsely aculeolate along margins and veins abaxially, base acute, margins thinly revolute, apex acute or obtuse; vein 1, distinct, secondary veins not visible. Inflorescence corymbose, with scabrous axes, inconspicuously bracteate. Ovary ellipsoid, 1.5–2 mm, glabrous. Co-

rolla funnel-shaped, 2.5–3 × 3.5–4 mm, lobed to ca. 1/2 length or slightly more; tube 1.2–1.5 mm; lobes elliptic-oblong, shortly acuminate. Fruit 3–4 mm in diam., vesicular, smooth to granulate; seeds ca. 1 × 1 mm. Fl. and fr. May–Jul.

Meadows, banks of rivers and lakes, foothills and lower mountains. Xinjiang (Chabuchaer) [Kazakhstan, Uzbekistan].

## 51. MITCHELLA Linnaeus, Sp. Pl. 1: 111. 1753.

蔓虎刺属 man hu ci shu

Chen Tao (陈涛); Charlotte M. Taylor

*Chamaedaphne* Mitchell; *Perdicesca* Provancher.

Herbs, perennial, unarmed, creeping, rooting at nodes. Raphides present. Leaves opposite, without domatia; stipules generally persistent, interpetiolar, triangular, entire to deeply 3(–5)-lobed, often glandular at apex. Inflorescences terminal or pseudoaxillary near stem apices, 2-flowered, pedunculate, ebracteate. Flowers sessile, bisexual, distylous, fused in pairs by their ovaries. Calyx with ovary portion of individual flowers subglobose, with structure formed by fused ovaries oblate to dicoccous, with limb of individual flowers (3 or)4-lobed. Corolla white, funnelform, pilose in throat and onto lobes; lobes (3 or)4, valvate in bud. Stamens (3 or)4, inserted in corolla throat, exserted in short-styled flowers, included in long-styled flowers; filaments stout; anthers basifixed. Ovary of individual flowers 4-celled, ovules 1 in each cell, axile; stigmas 4, linear, exserted in long-styled flowers, included in short-styled flowers. Fruit multiple, orange to red, drupaceous, subglobose to oblate, fleshy, with calyx limbs 2, persistent; pyrenes 8, 1-celled, each with 1 seed, angled, 3-ridged; seeds medium-sized, ellipsoid; endosperm corneous; embryo small; radicle hypogynous.

Two species: one in E Asia (China, Japan, Korea), the other in Central America (Guatemala) and E North America (Canada, Mexico, United States); one species in China.

Y. Z. Ruan (in FRPS 71(2): 159. 1999) gave the number of calyx lobes, corolla lobes, and stamens as 3 or 4; in general, the flowers of *Mitchella* are considered 4-merous, although throughout Rubiaceae occasional individual flowers vary from the “characteristic” in having fewer or more calyx lobes, corolla lobes, and infrequently also stamens.

1. *Mitchella undulata* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 175. 1846.

蔓虎刺 man hu ci

*Mitchella repens* Linnaeus var. *undulata* (Siebold & Zuccarini) Makino.

Plants with stems quadrate, to 30 cm, glabrous or subglabrous. Petiole 0.3–1.1 cm, glabrous or subglabrous; leaf blade drying papery, triangular-ovate or ovate, 0.2–2.1 × 0.2–1.5 cm, both surfaces glabrous, base truncate or cordulate to rounded, margins sometimes undulate, apex acute to rounded; secondary veins 2 or 3 pairs; stipules 1–1.5 mm. Flowers with peduncles 1–12 mm, glabrous. Calyx glabrous; ovary portion

subglobose to turbinate, ca. 2 mm; limb deeply lobed; lobes narrowly to broadly triangular, 0.5–1 mm. Corolla glabrous outside; tube 9–10 mm; lobes lanceolate to triangular, 4–5 mm, acute. Multiple fruit subglobose, 6–8 mm in diam., glabrous; pyrenes ca. 2.5 mm. Fl. autumn, fr. winter.

Understories of wet forests. Taiwan, Zhejiang [Japan, Korea].

In Fl. Taiwan (ed. 2, 4: 297. 1998) Liu and Yang reported the plants there are evergreen. Y. Z. Ruan (in FRPS 71(2): 159. 1999) described the leaf blades as unequal and gave measurements for large ones and small ones without further explanation. All other authors reported this species to be generally isophyllous, which corresponds to specimens seen. The leaf description by Ruan may apply to the variable leaf sizes along the stems of some plants, rather than consistent size differences between the two leaves at a single stem node.

## 52. MITRACARPUS Zuccarini in Schultes & J. H. Schultes, Mant. 3: 210 [“*Mitracarpum*”], 399. 1827.

盖裂果属 gai lie guo shu

Chen Tao (陈涛); Charlotte M. Taylor

Herbs [to small shrubs], annual or perennial, unarmed. Raphides present. Leaves opposite, subsessile or sessile, without domatia; stipules persistent, interpetiolar and fused to leaf bases or petioles, truncate to rounded, setose. Inflorescences terminal and/or axillary, glomerulate or capitate, several to many flowered, sessile, sometimes immediately subtended by 1 or 2 pairs of leaves, bracteate. Flowers sessile, bisexual, monomorphic. Calyx limb deeply 4(or 5)-lobed; lobes usually unequal in pairs, usually with hyaline margins. Corolla white, salverform or funnelform, inside glabrous or pubescent in throat; lobes 4, valvate in bud. Stamens 4, inserted in corolla throat, included or exserted; filaments developed; anthers dorsifixed. Ovary 2-celled, ovules 1 in each cell on peltate axile placentas attached at middle of septum; stigmas 2, linear, usually exserted. Fruit capsular, subglobose to somewhat dicoccous, with dehiscence circumscissile around equator, with apical valve or “lid” deciduous and basal portion persistent, papery to

cartilaginous, with calyx limb persistent or deciduous on lid; seeds 2, medium-sized, oblate to rounded, on ventral (i.e., adaxial) face with cruciform (i.e., X-shaped) scar; endosperm fleshy; cotyledon leaflike; radicle hypogeous.

About 30 species: widespread in tropical and subtropical Central, North, and South America and the Antilles, with one species widely naturalized in tropical Africa, Asia, Australia, and Pacific islands; one species (introduced) in China.

This genus is frequently overlooked even in its native range, but the circumscissile capsules, seeds with a distinctive cruciform scar, leaves scabrous to the touch on the upper surface, and well-developed calyx lobes with hyaline erose margins are distinctive. W. C. Ko (in FRPS 71(2): 210. 1999) described the ovary as sometimes 3-celled; this condition is not otherwise known in *Mitracarpus* and has not been reconfirmed, although it does characterize the very similar, likewise adventive genus *Richardia*.

**1. *Mitracarpus hirtus* (Linnaeus) Candolle, Prodr. 4: 572. 1830.**

盖裂果 *gai lie guo*

*Spermacoce hirta* Linnaeus, Sp. Pl., ed. 2, 1: 148. 1762; *Mitracarpus scaber* Zuccarini; *M. senegalensis* Candolle; *M. verticillatus* (Schumacher & Thonning) Vatke; *M. villosus* (Swartz) Candolle; *S. villosa* Swartz; *Staurospermum verticillatum* Schumacher & Thonning.

Herbs, annual, branched, 40–80 cm tall; branches flattened to subterete or 4-angled, sometimes becoming woody in lower part, sparsely hirsute to villous. Leaves sessile; blade drying thinly papery, elliptic-oblong or lanceolate, 3–4.5 × 0.7–1.5 cm, adaxially scabrous and usually also sparsely villosulous or pilosulous, abaxially moderately to densely villous or pilose, base acute to obtuse or rounded, apex acute; secondary veins 3–6 pairs; stipule sheaths 1–4 mm, villosulous or pilosulous to glabrescent, with 1–9 setae 1–5 mm. Inflorescences 5–20 mm in diam. (not including subtending leaves), villosulous or pilosulous; bracts linear, 1–2 mm. Calyx sparsely to densely puberulent or strigillose; ovary portion subglobose to ellipsoid, ca.

0.5 mm; limb deeply lobed; lobes unequal, triangular to lanceolate, 2 larger 1.8–2 mm, 2 smaller 0.8–1.2 mm, ciliate. Corolla funnelform, outside puberulent to glabrous; tube 1–1.5 mm, glabrous inside; lobes triangular to ovate, 0.5–1 mm, obtuse to acute. Capsules subglobose, ca. 1 mm in diam., scabrous or sparsely puberulent; seeds dark brown, oblate-suboblong, ca. 0.8 mm. Fl. and fr. Apr–Nov.

Wastelands at highway sides; near sea level to 800 m. Hainan (Wanning), Hong Kong, Yunnan [native to the Antilles and Central, North, and South America; naturalized in tropical Africa, Asia, Australia, and Pacific islands].

The correct name for this species, whether *Mitracarpus hirtus* or *M. villosus*, has been controversial (for additional comments, see Taylor et al., Fl. Venez. Guayana 8: 497–847. 2004); most authors working with neotropical Rubiaceae today use the name *M. hirtus*. The capsules of all the Chinese specimens studied are smaller than those of neotropical plants. Fruit of similar size are found in plants of India (Sebastine & Ramamurthy, Bull. Bot. Surv. India 9: 291–292. 1967, see in particular f. 1–7) and may characterize several adventive populations. W. C. Ko (in FRPS 71(2): 212. 1999, as *M. villosus*) suggested that this species might be distylous, but *Mitracarpus* is monomorphic so far as known.

### 53. MITRAGYNA Korthals, Observ. Naucl. Indic. 19. 1839, nom. cons., not *Mitragyne* R. Brown (1810).

帽蕊木属 *mao rui mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Paradina* Pierre ex Pitard; *Stephegyne* Korthals.

Trees, unarmed; buds flattened, with stipules erect and pressed together. Raphides absent. Leaves opposite, sometimes with domatia; stipules caducous, interpetiolar, generally ovate to obovate, sometimes keeled, entire, often well developed. Inflorescences terminal on main stems and axillary branches and often accompanied by reduced, petaloid, and/or bracteate leaves, capitate with globose heads in fascicles, cymes, umbels, or thyrses, sessile to shortly pedunculate, bracteate; bracteoles spatulate to obpyramidal. Flowers sessile, bisexual, monomorphic. Calyx limb truncate to 5-lobed. Corolla cream to yellow-green, funnelform or narrowly salverform, inside glabrous to variously pubescent; lobes 5, valvate in bud. Stamens 5, inserted near corolla throat, exserted or included; filaments short; anthers basifixed, partially to fully exserted. Ovary 2-celled, ovules numerous in each cell on fleshy, pendulous, axile placentas attached in upper third of septum; stigma clavate to mitriform (i.e., upside-down cupular), exserted. Fruit capsular, obovoid to ellipsoid, septicidally then loculicidally dehiscent, cartilaginous to woody, with calyx limb persistent or deciduous; seeds numerous, small, somewhat flattened, fusiform to lanceolate, shortly winged at both ends with basal wing sometimes bifid or notched.

About seven species: one species in Africa, six species in Asia and Malesia; three species in China.

Ridsdale reviewed this genus in detail (Blumea 24: 46–68. 1978) and excluded the African species. H. H. Hsue and H. Wu (in FRPS 71(1): 245. 1999) reported only *Mitragyna rotundifolia* from China; Ridsdale (loc. cit.: 65) reported only *M. diversifolia* from China; and Wu (Acta Phytotax. Sin. 6: 293. 1957) reported a third species, *M. hirsuta*, in a report that has been overlooked. Several other species of *Mitragyna* are found widely in Thailand and Myanmar, as well as cultivated for lumber, and should be expected in China (in particular, see comments under *M. diversifolia*). The leaves of *M. speciosa* (Korthals) Haviland are the source of kratom and used for tea, chewing, smoking, and as medicine in Thailand and Malaysia; the main active ingredient here is the alkaloid mitragynine, known only from this species and said to be stimulating at low doses but narcotic at high doses.

- 1a. Calyx limb deeply lobed, with lobes 1.5–2.5 mm, spatulate to oblanceolate, usually quite evident on fruit ..... 2. *M. hirsuta*  
 1b. Calyx limb subtruncate or lobed for up to 1/2, with lobes up to 1 mm, triangular, deciduous or at least hardly evident on fruit.  
 2a. Branch leaves 6–14 × 3–9 cm, with secondary veins strongly ascending (i.e., departing midrib at 55°–75°); corolla tube ca. 3 mm, lobes ca. 2.5 mm ..... 1. *M. diversifolia*  
 2b. Branch leaves 9–25 × 6–20 cm, with secondary veins spreading (i.e., departing midrib at 35°–60°); corolla tube 2–3 mm, lobes 4–5 mm ..... 3. *M. rotundifolia*

**1. *Mitragyna diversifolia*** (Wallich ex G. Don) Haviland, J. Linn. Soc., Bot. 33: 71. 1897.

异叶帽蕊木 yi ye mao rui mu

*Nauclea diversifolia* Wallich ex G. Don, Gen. Hist. 3: 467. 1834; *Stephegyne diversifolia* (Wallich ex G. Don) J. D. Hooker.

Trees, perhaps deciduous, to 15 m tall; branches angled becoming terete, pilosulous to glabrescent. Petiole 5–15 mm, glabrous, puberulent, or pilosulous; leaf blade drying papery, ovate-oblong to elliptic-ovate, 6–14 × 3–9 cm, adaxially glabrous, abaxially sparsely to densely pilosulous or tomentulose, base rounded to cordulate, apex obtuse to shortly acuminate; secondary veins 8 or 9 pairs, strongly ascending, sometimes with pilosulous domatia in abaxial axils; stipules elliptic-oblong to ovate, ca. 2.5 cm, strigillose to glabrous, abaxially weakly to strongly keeled and pilosulous, apex obtuse to rounded. Inflorescence densely pilosulous or strigillose to glabrescent; peduncles 1–3 mm (i.e., portion above articulation of subtending leaves but not including entire growth of branch); flowering heads 3 to numerous, 8–10 mm in diam. across calyces, 13–20 mm in diam. across corollas; bracteoles linear-spatulate, ca. 3 mm, glabrous to sparsely ciliolate. Calyx glabrous; ovary portion obconic, ca. 1.5 mm; limb ca. 1.5 mm, subtruncate to lobed for up to ca. 1/2; lobes triangular, obtuse. Corolla yellowish white, outside glabrous, inside densely pilosulous in throat and on lobes; tube ca. 3 mm; lobes triangular, ca. 2.5 mm, acute. Fruiting heads 8–10 mm in diam. Capsules 3–4 mm, with persistent calyx limb markedly thickened; seeds 1–2 mm. Fl. [Feb, Jul, Aug], fr. [Jan, Mar, Dec].

Forests; [300–400 m]. Yunnan [Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

This species seems to be similar to and at least sometimes confused with the commonly collected *Mitragyna parvifolia* (Roxburgh) Korthals; these species differ at least in their corollas, with the tube 5–6 mm and substantially longer than the lobes ca. 2 mm in *M. parvifolia*, vs. the tube ca. 3 mm and less than twice as long as the lobes ca. 2.5 mm in *M. diversifolia*. Ridsdale (Blumea 24: 63–65. 1978) reported a difference in the distribution of these, with *M. parvifolia* primarily found in India and Sri Lanka and *M. diversifolia* to the north and east of this, including China. Puff et al. (Rubiaceae of Thailand, 46. 2005) noted that in Thailand *M. diversifolia* is most often found in deciduous vegetation and is common in secondary vegetation, in particular in edges along fields.

**2. *Mitragyna hirsuta*** Haviland, J. Linn. Soc., Bot. 33: 72. 1897.

毛帽蕊木 mao mao rui mu

*Paradina hirsuta* (Haviland) Pitard.

Trees, deciduous, to 20 m tall; branches angled to terete,

densely pilosulous to glabrescent. Petiole 5–30 mm, glabrous to densely pilosulous; leaf blade drying stiffly papery, suborbicular to broadly elliptic or ovate, 8–18(–30) × 2–12(–20) cm, adaxially glabrous, abaxially sparsely to densely pilosulous or rarely glabrescent, base broadly obtuse to cordulate, apex rounded to acute; secondary veins 6–12 pairs, spreading, sometimes with pilosulous domatia in abaxial axils; stipules elliptic-oblong to ovate, 10–20 × 8–15 mm, pilosulous and weakly keeled, apex obtuse to rounded. Inflorescences densely puberulent to pilosulous; flowering heads sessile, 7 to numerous, 10–12 mm in diam. across calyces, 20–25 mm in diam. across corollas; bracteoles linear-spatulate, 2.5–3.5 mm, glabrous to sparsely pubescent and/or ciliolate. Calyx glabrous; ovary portion obconic, 1.2–2 mm; limb deeply lobed; lobes oblanceolate to spatulate, 1.5–2.5 mm, entire to ciliolate. Corolla yellow, outside glabrous, inside densely hairy; tube 5–6 mm; lobes narrowly elliptic, 2–2.5 mm, acute. Fruiting heads 15–20 mm in diam. Capsules 5–8 mm, weakly ridged; seeds ca. 1 mm. Fl. [Jun–Jul, Dec], fr. [Apr, Dec].

Forests; [100–1500 m]. Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

This species was illustrated by Ridsdale (Blumea 24: 60, f. 6. 1978).

**3. *Mitragyna rotundifolia*** (Roxburgh) Kuntze, Revis. Gen. Pl. 1: 289. 1891.

帽蕊木 mao rui mu

*Nauclea rotundifolia* Roxburgh, Fl. Ind. 2: 124. 1824; *Mitragyna brunonis* (Wallich ex G. Don) Craib; *N. brunonis* Wallich ex G. Don.

Trees, perhaps deciduous, to 30 m tall; branches angled to subterete, glabrous to glabrescent. Petiole 15–60 mm, glabrous to densely pilosulous; leaf blade drying papery, suborbicular to broadly elliptic or ovate, 9–25 × 6–20 cm (to 75 cm on seedlings and sprouts), adaxially glabrous to puberulent, abaxially sparsely to densely pilosulous or tomentulose, base rounded to cordate, apex rounded to obtuse; secondary veins 5–7 pairs, spreading, sometimes with pilosulous domatia in abaxial axils; stipules elliptic-oblong to ovate, 13–50 × 5–30 mm, pilosulous, keeled, apex obtuse to rounded. Inflorescences densely puberulent to pilosulous; peduncles 1–3 mm (i.e., portion above articulation of subtending leaves but not including internode below node bearing inflorescence); flowering heads 1–5, 7–10 mm in diam. across calyces, 15–20 mm in diam. across corollas; bracteoles linear-spatulate, 1–1.5 mm, glabrous or sparsely pubescent. Calyx glabrous; ovary portion 1.5–3 mm; limb ca. 0.5 mm, subtruncate to lobed for ca. 1/2; lobes triangular, obtuse. Corolla yellowish white, outside glabrous, densely hairy inside; tube 2–3 mm; lobes narrowly oblanceolate, 4–5 mm, acute. Fruiting heads 10–16 mm in diam. Capsules 3–5 mm, weakly

ridged, with persistent calyx thickened; seeds ca. 1 mm. Fl. [Aug–Nov], fr. Sep, Dec.

Dense forests; ca. 1000 m. S Yunnan [Bangladesh, India, Laos, Myanmar, Thailand].

This species was illustrated by Ridsdale (Blumea 24: 66, f. 8. 1978). Puff et al. (Rubiaceae of Thailand, 46. 2005) noted that in Thailand this species is most often found in deciduous vegetation and is common in secondary vegetation.

#### 54. *MORINDA* Linnaeus, Sp. Pl. 1: 176. 1753.

巴戟天属 *ba ji tian shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Rojoc* Adanson.

Lianas, climbing shrubs, erect shrubs, or small trees, rarely dioecious, sometimes with spines; branching sometimes sylleptic with growth continued from an axillary or subapical node, with lateral branches sometimes surrounded at base by persistent leafless stipules. Raphides present. Leaves opposite, rarely ternate, or sometimes anisophyllous and apparently 1 at flowering nodes, sometimes with domatia in axils of secondary and occasionally tertiary veins, margins rarely sinuate-undulate or lyrate; stipules persistent or infrequently caducous, interpetiolar, united around stem, or fused to petioles, triangular, entire. Inflorescences terminal, axillary, or leaf-opposed, capitate with 1 to several hemispherical to subglobose heads, these fasciculate or cymose, few to many flowered, pedunculate or sessile, bracteate or bracts reduced. Flowers sessile, shortly to fully fused by their ovaries [to free or nearly so], bisexual and distylous, rarely bisexual and monomorphic, or rarely dioecious. Calyx limb truncate to sinuate or rarely in 1–3 flowers of an inflorescence with 1 petaloid calycophyll (*Morinda citrifolia*). Corolla white or pink, funnelform, salverform, or campanulate, inside glabrous or pubescent in throat, [tube sometimes fenestrate]; lobes 3–7, valvate in bud. Stamens 3–7, inserted in corolla throat or tube, exerted or included; filaments short; anthers dorsifixed, sometimes with connective prolonged into an apical appendage. Ovary 2-celled with ovules 2 in each cell, or incompletely to completely 4-celled due to secondarily formed false septa with ovules 1 in each cell, ovules attached to septum near base; stigmas 2, linear, exerted or included. Fruit multiple with entire fruiting heads comprising one fruit (i.e., drupelet) [sometimes fruit simple]; individual fruit drupaceous, fleshy, generally obovoid, blue to black, with calyx limb persistent; pyrenes 2–4, 1-locular, with 1 seed, cartilaginous or bony, subtrigonal to plano-convex, adaxially (i.e., ventrally) flat or sulcate; seeds medium-sized, subtrigonal or ellipsoid; endosperm abundant, corneous; embryo small; cotyledons oblong; radicle inferior.

About 80–100 species: widespread in tropical and subtropical regions worldwide; 27 species (18 endemic) in China.

*Morinda* includes a notable range of breeding systems (Johansson, Opera Bot. 122: 1–167. 1994), but most of the species are apparently distylous, with the anthers and stigmas separated and their positions reciprocal between the short-styled and long-styled form of the same species; however, this biology has been sometimes overlooked. Also, as noted by Johansson (loc. cit.), the position of the inflorescences, in particular terminal vs. leaf-opposed, deserves careful observation and aids identification of species. In particular, the leaf-opposed inflorescences often are produced on the terminal node, then later displaced by subsequent growth from the axil of that leaf, and can be confused with true terminal inflorescences that have two subtending leaves. The inflorescences with “fasciculate to umbellate” peduncles actually appear to be condensed cymes or racemes, with the peduncles arising from a very shortly prolonged structure at the stem apex that also bears several stipuliform bracts, usually one above the other. The twining Asian species apparently share having their lateral branches surrounded at the base (i.e., at the divergence from main stem) by persistent leafless stipules. Some species of *Morinda* have petaloid bracts or possibly calyx lobes; this character appears to vary within some individual species. Y. Z. Ruan’s (in FRPS 71(2): 179–202. 1999) taxonomy of *Morinda* distinguished species based on different characters, in particular pubescence, leaf shape, peduncle length compared across developmental stages, drying color and texture, pattern of tertiary leaf veins on dried specimens, and degree of fusion of flowers, than used by many other authors (e.g., Johansson, loc. cit.; Springate et al., Fl. Bhutan 2(2): 804. 1999).

- 1a. Erect trees or shrubs; inflorescences terminal, axillary, or leaf-opposed, 1 or 2 per node.
  - 2a. Plants of seashores and low elevations, 0–50 m; leaves with 5–7 pairs of secondary veins; fruit 2.5–5 cm in diam. .... 6. *M. citrifolia*
  - 2b. Plants of terrestrial inland habitats, 500–1400 m (exact elevation unknown in *M. leiantha*).
    - 3a. Inflorescences terminal and/or axillary.
      - 4a. Stems hirtellous, hispidulous, or subglabrous; leaves with secondary veins 5–8 pairs; peduncles 0.2–0.5 cm; corollas with tubes ca. 20 mm and lobes ca. 4 mm ..... 13. *M. leiantha*
      - 4b. Stems glabrous or subglabrous; leaves with secondary veins 8–10 pairs; peduncles ca. 2 cm; corollas with tubes ca. 32 mm and lobes ca. 13 mm ..... 15. *M. longissima*
    - 3b. Inflorescences leaf-opposed.
      - 5a. Stems glabrous to pubescent; leaves pubescent abaxially, with secondary veins 7–10 pairs; peduncles 0.1–0.3 cm ..... 19. *M. persicifolia*
      - 5b. Stems glabrous; leaves glabrous abaxially, with secondary veins 9–24 pairs; peduncles 1–6 cm.
        - 6a. Leaves 4–5.5 cm wide, with secondary veins 12–24 pairs; corollas with tubes 15–18 mm, lobes 3–4 mm ..... 26. *M. undulata*
        - 6b. Leaves 5–11 cm wide, with secondary veins 9–14 pairs; corollas with tubes 16–33 mm, lobes 4–15 mm.

- 7a. Petioles 0.5–1 cm; corollas with tubes 16–33 mm, lobes 4–15 mm; fruit ca. 2.5 cm in diam. .... 1. *M. angustifolia*
- 7b. Petioles 2–4 cm; corollas with tubes ca. 22 mm, lobes ca. 4 mm; fruit ca. 1 cm in diam. .... 21. *M. rosiflora*
- 1b. Lianas, twiners, or subshrubs; inflorescences terminal, with heads solitary or in groups of 2–11.
- 8a. Calyx limb developed, 1–2.5 mm; leaves acute to obtuse, rounded, truncate, or cordulate at base.
- 9a. Stems and leaves glabrous ..... 10. *M. howiana*
- 9b. Stems and leaves glabrous to densely hirtellous or pilosulous, with pubescence present at least on veins abaxially on young leaves.
- 10a. Stems and leaves sparsely to moderately puberulent to glabrescent; corollas with tubes and lobes  $\pm$  equal, tube 3–4 mm, lobes 3–4 mm; fruit 0.5–1.1 cm in diam. .... 17. *M. officinalis*
- 10b. Stems and leaves abaxially densely hirtellous or pilosulous; corollas with lobes longer than tube, tube 1–2 mm, lobes 3–4.5 mm; fruit 1–2 cm in diam.
- 11a. Leaves with 7–10 pairs of secondary veins; corollas with tubes 1.5–2 mm and lobes 4–4.5 mm; calyx lobes narrowly triangular, acute ..... 8. *M. cochinchinensis*
- 11b. Leaves with 10–13 pairs of secondary veins; corollas with tubes 1–1.2 mm and lobes 3–4 mm; calyx lobes rounded to obtuse ..... 27. *M. villosa*
- 8b. Calyx limb reduced to shortly developed, less than 1 mm; leaves acute to cuneate, obtuse, or rounded at base.
- 12a. Leaves rugulose; corolla tube ca. 10 mm ..... 22. *M. rugulosa*
- 12b. Leaves flat, smooth; corolla tube 1–3 mm or 12–25 mm.
- 13a. Corolla tube 12–25 mm.
- 14a. Corolla tube 12–20 mm.
- 15a. Young stems densely ferruginous hirtellous when dry; leaves drying leathery and abaxially whitened ..... 5. *M. cinnamomifoliata*
- 15b. Young stems densely puberulent, strigillose, or hirtellous with pubescence drying colorless; leaves drying papery to membranous and abaxially golden yellow or brownish yellow ..... 7. *M. citrina*
- 14b. Corolla tube ca. 25 mm.
- 16a. Leaves glabrous throughout ..... 3. *M. brevipes*
- 16b. Leaves sparsely to densely pubescent at least abaxially on veins.
- 17a. Stems puberulent with trichomes drying colorless, to glabrescent ..... 2. *M. badia*
- 17b. Stems densely hirtellous with trichomes drying golden brown ..... 4. *M. callicarpifolia*
- 13b. Corolla tube 1–3 mm.
- 18a. Corollas with tubes and lobes  $\pm$  equal in length, tube 2–2.5(–3) mm, lobes 2–2.5(–3) mm.
- 19a. Stems and leaves glabrous ..... 12. *M. lacunosa*
- 19b. Stems and leaves puberulent to hirtellous at least when young.
- 20a. Leaves drying with gray to black cast ..... 14. *M. litseifolia*
- 20b. Leaves drying with brown or yellow cast.
- 21a. Leaves drying with brown cast; corollas with tubes ca. 3 mm, lobes ca. 3 mm ..... 24. *M. shuanghuaensis*
- 21b. Leaves drying with brown, grayish brown, or yellowish brown cast; corollas with tubes 2–2.5 mm, lobes 2–2.5 mm.
- 22a. Petioles 0.4–0.8 cm; leaves adaxially sparsely hispidulous to glabrescent ..... 11. *M. hupehensis*
- 22b. Petioles 0.5–1.5 cm; leaves adaxially sparsely hirtellous, subglabrous, or glabrous ..... 23. *M. scabrifolia*
- 18b. Corollas with lobes longer than tubes by 50% or more, tube 1–2 mm, lobes 2–4 mm.
- 23a. Leaves drying with gray to black cast; stems densely yellowish, clear, or ferruginous strigillose or hirtellous ..... 9. *M. hainanensis*
- 23b. Leaves drying with green, brown, yellow, or reddish cast; stems moderately to sparsely hirtellous, hispidulous, or puberulent with colorless trichomes, to subglabrous.
- 24a. Leaves drying with yellow or reddish cast.
- 25a. Leaves 2–7  $\times$  0.3–3 cm, cuneate to acute at base; corolla lobes 3–4 mm ..... 18. *M. parvifolia*
- 25b. Leaves 7–13  $\times$  2–4 cm, cuneate to obtuse or rounded at base; corolla lobes ca. 2 mm ..... 20. *M. pubiofficialis*
- 24b. Leaves drying with brown, grayish brown, or greenish cast.
- 26a. Leaves with secondary veins 4 or 5 pairs; peduncles 0.4–1.1 cm; fruit 0.4–0.8 cm in diam. .... 16. *M. nanlingensis*

- 26b. Leaves with secondary veins 5–7 pairs; peduncles 1–1.5 cm; fruit 0.7–1.2 cm in diam. .... 25. *M. umbellata*

**1. *Morinda angustifolia*** Roxburgh, Pl. Coromandel 3: 32. 1815.

黄木巴戟 huang mu ba ji

Erect shrubs or small trees, ca. 6 m tall; branches quadrangular, glabrous. Leaves opposite, or solitary opposite an inflorescence; petiole 0.5–1 cm, glabrous; blade drying papery, matte on both surfaces, brownish green, elliptic-oblong, elliptic, oblong-lanceolate, or oblanceolate, 15–30 × 6–10 cm, adaxially glabrous, abaxially scabrous to glabrous or sometimes sparsely hirtellous on veins, base acute to attenuate, apex acute to acuminate; secondary veins 9–13 pairs; stipules interpetiolar, free or shortly united to petioles, triangular, 4.5–5 mm, acuminate or acute. Inflorescence solitary and leaf-opposed; peduncle 1.5–4 cm; flowering head 1, subglobose to cylindrical, many flowered, 0.8–2.5 cm (not including corollas); bracteoles subulate. Flowers fused only shortly at base, distylous. Calyx glabrous; limb truncate to denticulate, ca. 1 mm. Corolla white, salverform, outside glabrous; tube cylindrical to slenderly funnel-form, 16–33 mm; lobes 5, ovate-lanceolate, 4–15 mm, acute. Ovary 4-celled. Drupecetum mulberry-shaped, subglobose, or ellipsoid-oblong, to 2.5 cm in diam. Drupes partially fused to nearly separate, white or black, obovoid to subglobose, 10–15 mm. Fl. Apr–May, fr. summer–autumn.

Forests; 500–1400 m. S Yunnan [Bhutan, India, Laos, Myanmar, Nepal, Thailand].

The inflorescences are indeterminate and begin flowering with ± a dozen developed buds; the flowers continue to be produced through growth at the top of the spike while the fruit are developing on the lower parts, thus the older inflorescences become cylindrical or oblong in shape. Y. Z. Ruan (in FRPS 71(2): 185. 1999) described the inflorescence position as consistently leaf-opposed at the terminal node; however, inflorescences can also be found along the stem well below its apex (e.g., *Tsi Zhanhou* 92-130, MO), and the infructescences are usually found along the stem well below the apex (e.g., Puff et al., Rubiaceae of Thailand, 113. 2005).

**2. *Morinda badia*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 327. 1999.

栗色巴戟 li se ba ji

Lianas; branches at base with persistent leafless stipules, when young puberulent and terete, becoming glabrescent, angled, dark brown or purplish blue. Leaves opposite; petiole 4–8 mm, densely hirtellous; blade drying papery, adaxially brownish black, abaxially ferruginous, elliptic-oblong, elliptic-lanceolate, or oblanceolate, 7–12 × 2–4 cm, adaxially shiny and hirtellous or glabrescent, abaxially hirtellous at least along veins, base cuneate to attenuate, apex acuminate; secondary veins 4–6 pairs; stipules fused into a tube, 2–5 mm, truncate. Inflorescence terminal; peduncles 3–5, umbellate, 5–18 mm, hirtellous; heads 1 per peduncle, 3–10-flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate or often with 1–3 teeth in outermost flowers of head. Corolla yellowish white; tube ca. 2.5 mm; lobes 4 or 5, narrowly oblong,

apically thickened and rostrate. Drupecetum subglobose, 0.5–0.8 cm in diam. Drupes fused, orange. Fl. Jun, fr. Oct.

• Forests on mountains, thickets at watersides. Guangdong (Guangzhou), Guangxi, Hainan, Hunan.

**3. *Morinda brevipes*** S. Y. Hu, J. Arnold Arbor. 32: 399. 1951.

短柄鸡眼藤 duan bing ji yan teng

Lianas; young branches densely hirtellous or pilosulous, becoming glabrous, brown. Leaves opposite; petiole 3–10 mm, puberulent or hirtellous; blade drying papery or subleathery, adaxially straw-yellow or brownish black, abaxially olive-green, brownish yellow, or brownish red, obovate-oblong, obovate, oblanceolate, lanceolate, narrowly lanceolate, or linear-lanceolate, 5–10(–13) × 0.7–3(–4) cm, glabrous on both surfaces, shiny adaxially, matte abaxially, base cuneate to acute, apex acute or acuminate; secondary veins 5–7 pairs, with foveolate or pubescent domatia; stipules fused into a tube or spathe, 2–3 mm, puberulent, hispidulous, or hirtellous, truncate, on each side with 2 bristles 0.3–1 mm. Inflorescence terminal; peduncles 4–9, fasciculate to shortly racemiform, 4–10 mm, densely puberulent, as a group sometimes subtended by 2–4 stipuliform bracts; heads 1 per peduncle, conical or cylindrical to subglobose, 4–6 mm, 6–16-flowered. Flowers fused for ca. 1/2 length of hypanthium, biology not noted. Calyx puberulent to glabrescent; limb 0.3–0.5 mm, truncate to denticulate. Corolla white, campanulate, outside glabrous; tube ca. 2.5 mm; lobes 4 or 5, narrowly oblong, ca. 3 mm, apically thickened and rostrate. Drupecetum subglobose to cylindrical, 1–1.2 cm in diam. Drupes almost fully fused, orange, subglobose, 5–8 mm. Fl. Apr–May, fr. Jul–Dec.

• Hills, mountains; 200–800 m. Hainan.

- 1a. Leaf blade obovate-oblong, obovate, oblanceolate, or lanceolate, 5–10(–13) × 2–3(–4) cm ..... 3a. var. *brevipes*  
1b. Leaf blade narrowly lanceolate to lanceolate-linear, 7–11.5 × 0.7–1.4 cm ..... 3b. var. *stenophylla*

**3a. *Morinda brevipes* var. *brevipes***

短柄鸡眼藤(原变种) duan bing ji yan teng (yuan bian zhong)

Leaf blade obovate-oblong, obovate, oblanceolate, or lanceolate, 5–10(–13) × 2–3(–4) cm. Fl. Apr–May, fr. Jul–Dec.

• Hills, mountains; 200–800 m. Hainan.

**3b. *Morinda brevipes* var. *stenophylla*** Chun & F. C. How ex W. C. Ko, Fl. Hainan. 3: 581. 1974.

狭叶鸡眼藤 xia ye ji yan teng

Leaf blade narrowly lanceolate to lanceolate-linear, 7–11.5 × 0.7–1.4 cm. Fl. May.

• Wet places in forests on hills. Hainan.

**4. *Morinda callicarpifolia*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 325. 1999 [*"callicarpaefolia"*].

紫珠叶巴戟 *zi zhu ye ba ji*

Lianas or subshrubs; branches at base with persistent leafless stipules, when young densely golden hirtellous, becoming sparsely pubescent or subglabrous, terete or angled, brown or purplish black. Leaves opposite; petiole 7–10 mm, densely golden hirtellous; blade drying papery, adaxially brownish black, abaxially brown, obovate-oblong, oblong-lanceolate, or elliptic, 7–14 × 2.5–4 cm, adaxially sparsely hirtellous or hispidulous, abaxially sparsely hispidulous or hirtellous, or glabrous, on both surfaces pubescence denser along midrib, base cuneate to acute, apex acuminate, long acuminate, or obtuse then abruptly mucronate; secondary veins 5–7 pairs, with pilosulous domatia; stipules fused into a tube, 3–4 mm, densely golden hispidulous or -hirtellous, subtruncate, on each side with 1 or 2 bristles. Inflorescence terminal; peduncles 4–7, umbellate or fasciculate, 6–15 mm, densely hirtellous, as a group often subtended by 1 subulate bract; heads 1 per peduncle, 2–8-flowered. Flowers fused at base, biology not noted. Calyx puberulent; limb reduced, truncate or sometimes with 1 subulate tooth. Corolla white, tubular; tube ca. 2.5 mm, densely villous inside; lobes 4, lanceolate. Drupecetum globose, 4–8 mm in diam. Drupes fused. Fl. Jun–Jul, fr. winter.

• Forests on mountains, thickets at roadsides, ditch sides, hill slopes. Guizhou, Sichuan, Yunnan.

**5. *Morinda cinnamomifolia*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 336. 1999.

樟叶巴戟 *zhang ye ba ji*

Lianas or subshrubs; branches at base with persistent leafless stipules, when young densely ferruginous hirtellous or -pilosulous, becoming glabrescent, angled, gray or indigo. Leaves opposite; petiole 5–10 mm, densely hirtellous; blade drying leathery, adaxially grayish black, abaxially whitened, narrowly elliptic-oblong, oblong-lanceolate, or obovate-oblong, 8–11 × 2.5–3.5 cm, adaxially ± ferruginous pilosulous, abaxially hispidulous to hirtellous, base cuneate or rounded, apex acuminate or obtuse then abruptly mucronate; secondary veins 4 or 5(or 6) pairs; stipules united into a tube. Inflorescence terminal; peduncles 6–10, umbellate or fasciculate, 5–10 mm, ferruginous pilosulous; heads 1 per peduncle, 5–7-flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate or denticulate. Corolla white, outside glabrescent; tube ca. 2 mm, inside densely villous; lobes 4, linear-oblong, ca. 3 mm. Drupecetum subglobose. Drupes fully fused. Fl. Jul, fr. winter.

• Thickets on slopes near villages. SE Guangxi.

**6. *Morinda citrifolia*** Linnaeus, Sp. Pl. 1: 176. 1753.

海滨木巴戟 *hai bin mu ba ji*

*Morinda bracteata* Roxburgh.

Evergreen shrubs or small trees, to 5 m tall, often fleshy; branches subquadrangular, glabrous. Leaves opposite or solitary opposite an inflorescence; petiole 5–20 mm, glabrous; blade fleshy, drying papery, elliptic-oblong, elliptic, or ovate, 10–25 ×

5–13 cm, glabrous and shiny on both surfaces, base acute or acuminate, apex acute to obtuse; secondary veins 5–7 pairs, with pubescent domatia; stipules interpetiolar, free or shortly fused to petioles, broadly triangular to ovate, 4–16 mm, obtuse or rounded. Inflorescence solitary and leaf-opposed; peduncle 1–1.5 cm; head 1, oblong to subglobose, 5–10 mm in diam., many flowered; bracts absent. Flowers with hypanthia partially fused, distylous. Calyx glabrous or puberulent; limb subtruncate to truncate, 0.2–0.5 mm, sometimes in 1 to numerous flowers of a head with 1(–3) calycophylls, these white, narrowly elliptic to oblanceolate, 5–16 mm, obtuse to acute. Corolla white, funnel-form, outside glabrous; tube ca. 15 mm, densely villous in throat; lobes 5, ovate-lanceolate, ca. 6 mm. Drupecetum white, irregularly ovoid to subglobose, 2.5–5 cm. Drupes not distinguishable individually. Fl. and fr. year-round.

Flat land on seashores, sparse forests; below 100 m. Guangdong, Hainan, Taiwan [?Cambodia, India, Indonesia, Japan (Bonin and Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Solomon Islands; introduced in tropical America and Pacific islands].

The distinctive form called *Morinda bracteata* has well-developed white calycophylls that give the plants a markedly different appearance and may function in pollination, but these two forms have generally been considered conspecific. Nelson and Elevitch (Noni, 42–43. 2006) noted that plants with bracteate inflorescences produce smaller fruit and that the cultivated plants with variegated leaves are called *M. citrifolia* 'Potteri.' Both of these forms are found in Taiwan (e.g., Yang & Chuang 11410, MO, "*citifolia*" form; Yang & Chuang 12060, MO, "*bracteata*" form). The fruit of this species are edible (though not particularly palatable) and said to have medicinal and/or tonic value; they are sold by natural food vendors under the name "noni" or "nona." This species is increasingly widely cultivated, as detailed by Nelson and Elevitch (loc. cit.).

**7. *Morinda citrifolia*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 331. 1999.

金叶巴戟 *jin ye ba ji*

Lianas; branches at base with persistent leafless stipules, when young densely puberulent, strigillose, or hirtellous, becoming glabrescent, angled, brown, purplish blue, or purplish black. Leaves opposite; petiole 2–6 mm, densely puberulent, hirtellous, or pilosulous; blade drying membranous to papery, adaxially gray, abaxially golden yellow or brownish yellow, matte on both surfaces, ovate-lanceolate, oblong-linear, or elliptic, 5–12 × 1.5–3 cm, adaxially sparsely to moderately puberulent, strigillose, hispidulous, or hirtellous, abaxially moderately to sparsely strigillose, puberulent, or hirtellous especially along principal veins, base cuneate to acute, apex acuminate or acute; secondary veins 4–6 pairs, with pilosulous domatia; stipules fused into a tube or spathe, 2.5–4 mm, moderately to densely strigillose to pilosulous, truncate, on each side with 1 or 2 bristles 0.3–1 mm. Inflorescence terminal; peduncles 2–5, fasciculate or umbellate, 6–8 mm, densely puberulent to pilosulous, as a group subtended by 1 or 2 stipuliform bracts; heads 1 per peduncle, hemispherical, 4–5 mm in diam., 1–5-flowered. Flowers fused at base or for up to half of hypanthium, biology not noted. Calyx strigillose, puberulent, or glabrescent; limb 0.3–0.5 mm, truncate. Corolla white, salverform, outside densely puberulent; tube 1.2–2 mm, inside villous; lobes 4(or 5), narrowly oblong to lanceolate, 2.5–3 mm, apically thickened and

rostrate. Drupecetum subglobose to oblate, 8–12 mm in diam. Drupes fully fused, orange, subglobose, 3–5 mm. Fl. Apr–Jul, fr. Oct–Nov.

• Forests or thickets on mountains; 500–1300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Zhejiang.

- 1a. Older leaves usually drying greenish, sometimes brown, or rarely yellow, usually not hirsutulous but rather thin and sparsely hairy along midrib ..... 7a. var. *chlorina*  
 1b. Older leaves usually drying golden yellow or brownish yellow, hirtellous especially along midrib ..... 7b. var. *citrina*

**7a. *Morinda citrina* var. *chlorina*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 332. 1999.

白蕊巴戟 *bai rui ba ji*

Older leaves usually drying greenish, sometimes brown, or rarely yellow, usually not hirsutulous but rather thin and sparsely hairy along midrib.

• Forests or thickets on mountains. Anhui, Fujian, Guangxi, Guizhou, Hunan, Jiangxi, Zhejiang.

**7b. *Morinda citrina* var. *citrina***

金叶巴戟(原变种) *jin ye ba ji* (yuan bian zhong)

Older leaves usually drying golden yellow or brownish yellow, hirtellous especially along midrib. Fl. Apr–Jul, fr. Oct–Nov.

• Sparse or dense forests on mountains; 500–1300 m. Guangdong, Guangxi, Guizhou, Hunan.

**8. *Morinda cochinchinensis*** Candolle, Prodr. 4: 449. 1830.

大果巴戟 *da guo ba ji*

*Morinda trichophylla* Merrill.

Lianas; branches at base with persistent leafless stipules, when young densely ferruginous- or yellow villosulous, terete to weakly quadrangular. Leaves opposite; petiole 3–10 mm, densely villosulous; blade drying papery, yellowed, matte to shiny adaxially, matte abaxially, elliptic, elliptic-oblong, obovate-oblong, or oblanceolate, 5.5–14 × 2–6 cm, adaxially sparsely strigose to strigillose, abaxially densely ferruginous- or yellow hirtellous to villosulous with pubescence denser along veins, base rounded to truncate, subcordate, or cordulate, apex caudate-acuminate or shortly acuminate; secondary veins 7–10 pairs, with pilosulous domatia; stipules fused into a tube or spathe, 5–9 mm, densely hispidulous to hispid, broadly triangular to truncate, on each side with 2 bristles 1–4 mm, usually quickly deciduous. Inflorescence terminal; peduncles 3–12, fascicled or umbellate, 1–3 cm, densely ferruginous- or yellow hirtellous, as a group subtended by 2 to several bracts 1–3 mm, 2- to several lobed; heads 1 per peduncle, subglobose, 5–6 mm in diam., 5–15-flowered; bracteoles linear, 0.2–1 mm. Flowers with hypanthium partially fused, biology not noted. Calyx with hypanthium portion densely strigose to strigillose; limb 1–2.5 mm, puberulent to strigillose, lobed for ca. half, lobes 4 or 5, narrowly triangular, 1–2 mm, sometimes unequal on an in-

dividual flower, often reflexed. Corolla white, rotate to salverform, outside hirtellous, pilosulous, or glabrescent, inside densely villous throughout tube and onto lobes; tube 1.5–2 mm; lobes 4 or 5, narrowly oblong to lanceolate, 4–4.5 mm, apically thickened and rostrate. Drupecetum subglobose, oblong-globose, or irregular, 1–2 cm in diam., with peduncles elongating to 4 cm. Drupes mostly fused, orange-yellow to orange-red, subglobose, 4–6 mm. Fl. May–Jul, fr. Jul–Nov.

Forests or thickets on mountain slopes, in valleys, or at stream-sides or roadsides; 100–1200 m. Fujian, Guangdong, Guangxi, Hainan [Vietnam].

The names *Morinda umbellata* and *M. villosa* were synonymized with *M. cochinchinensis* by Merrill and Chun (Sunyatsenia 1(1): 80–81. 1930) but were separated by Y. Z. Ruan (in FRPS 71(2): 187, 190. 1999) as provisionally treated here.

**9. *Morinda hainanensis*** Merrill & F. C. How, Sunyatsenia 5: 188. 1940.

海南巴戟 *hai nan ba ji*

Lianas; branches at base with persistent leafless stipules, when young densely yellow-, clear-, or ferruginous strigillose to -hirtellous, becoming scabrous to glabrescent, brownish gray. Leaves opposite; petiole 5–11 mm, densely villosulous to hirtellous; blade drying papery, matte and gray on both surfaces, narrowly elliptic, elliptic-oblong, oblong-lanceolate, or linear-lanceolate, 5–9 × 1.2–2.5 cm, adaxially sparsely strigillose to hirtellous, abaxially densely villosulous, pilosulous, or sericeous, base acute or attenuate, apex acute to acuminate; secondary veins 6–9 pairs, with pilosulous domatia; stipules fused into a tube or spathe, 2.5–6 mm, pilosulous to hirtellous, on each side with 2 bristles 0.2–1 mm. Inflorescence terminal; peduncles 3–9, fasciculate to umbellate, 5–10 mm, densely sericeous to strigillose, as a group sometimes subtended by 1 or 2 linear bracts 0.5–1 mm; heads 1 per peduncle, hemispherical, 3–4 mm in diam., 3–8-flowered. Flowers fused at base, apparently distylous. Calyx with hypanthium puberulent to densely strigillose; limb 0.5–0.8 mm, glabrescent, truncate. Corolla salverform, outside puberulent to pilosulous, inside densely villous in upper part of tube and onto lobes; tube ca. 1 mm; lobes 4, narrowly lanceolate, ca. 2 mm, apically thickened and rostrate. Drupecetum subglobose or compressed globose, 6–8 mm in diam. Drupes fully fused, subglobose, ca. 3 mm. Fl. May, fr. May.

• Wet places under dense forests on hills; ca. 900 m. Hainan.

**10. *Morinda howiana*** S. Y. Hu, J. Arnold Arbor. 32: 400. 1951.

糠藤 *kang teng*

Lianas; branches at base with persistent leafless stipules, glabrous, terete, drying brown. Leaves opposite; petiole 6–10 mm, glabrous to puberulent; blade drying thinly to thickly papery, adaxially shiny and reddish dark brown, abaxially matte to somewhat shiny and reddish brown, elliptic, elliptic-lanceolate, or oblong, 6–14 × 2–6 cm, glabrous, base rounded, cuneate, or acute, apex acute to acuminate; secondary veins 6–9 pairs, with pilosulous domatia; stipules fused into a tube, 5–15 mm, puberulent to glabrous, truncate, on each side with 2 bristles 0.2–1

mm. Inflorescence terminal; peduncles 5–10, fasciculate to umbellate, 8–18 mm, puberulent, as a group subtended by several triangular to bifid bracts 1–2 mm; heads 1 per peduncle, subglobose to hemispherical, 4–6 mm in diam., 4–12-flowered. Flowers fused only shortly at base, biology not noted. Calyx puberulent to glabrescent; limb ca. 1 mm, truncate, sinuate, or shallowly lobed; lobes rounded, ciliolate. Corolla subcampanulate, puberulent outside; tube ca. 2 mm, inside densely villous in upper part and throat; lobes 4 or 5, narrowly oblong to lanceolate, ca. 2 mm, apically thickened and rostrate. Drupecetum subglobose to oblate, 8–14 mm in diam. Drupes fully fused, subglobose, 4–5 mm. Fl. Apr–May, fr. Jul–Oct.

• Forests in valleys and at streamsides, thickets at roadsides or on hill slopes; 300–700 m. Guangdong (Yangjiang), Hainan.

The protologue commented that “the presence of bristles on the glabrous capitulum is also very characteristic,” but these bristles are apparently small bracts, which are now also known from several other Chinese species of *Morinda*.

**11. *Morinda hupehensis*** S. Y. Hu, J. Arnold Arbor. 32: 400. 1951.

湖北巴戟 hu bei ba ji

Lianas; branches at base surrounded by persistent leafless stipules, when young densely white hirtellous, white puberulent, ferruginous hirtellous, or glabrescent, becoming angled, purplish blue. Leaves opposite; petiole 4–8 mm, densely hirtellous; blade drying papery, matte on both surfaces, adaxially greenish brown, abaxially coffee-colored or brownish black, oblanceolate, elliptic-lanceolate, elliptic-oblong, or linear-oblong, 5–9 × 1.5–3 cm, adaxially sparsely hispidulous to glabrescent, abaxially ferruginous hirtellous, yellow hirtellous, or brownish gray hirtellous, base cuneate, obtuse, or acute, apex acuminate or sometimes obtuse then abruptly mucronulate; secondary veins 5–7 pairs, with pilosulous domatia; stipules frequently deciduous through fragmentation, fused into a tube or spathe, 2.5–5 mm, pilosulous to hirtellous, truncate, on each side with 2 bristles 0.2–0.5 mm. Inflorescence terminal; peduncles 4–9, fasciculate to umbellate, 5–15 mm, densely puberulent to pilosulous, as a group subtended at base by 1–4 stipuliform bracts; heads 1 per peduncle, 4–7-flowered. Flowers with hypanthia partially fused, biology not noted. Calyx puberulent to glabrescent; limb reduced, truncate or sinuate-undulate. Corolla white; tube ca. 2.5 mm, densely villous inside; lobes 4 or 5, ca. 2.5 mm. Drupecetum subglobose, 4–10 mm in diam. Drupes fully fused, red, subglobose, 4–5 mm. Fl. Jul–Aug, fr. Oct–Nov.

• Forests, thickets at forest margins; 400–1000 m. Fujian, Guangxi, Guizhou, Hubei, Hunan, Sichuan.

**12. *Morinda lacunosa*** King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 73: 87. 1903.

长序羊角藤 chang xu yang jiao teng

Lianas, to 20 m tall; branches when young terete, glabrous, becoming angled, brownish gray. Leaves opposite; petiole 8–20 mm, glabrous; blade drying thinly papery or subleathery, adaxially brownish black, abaxially dark brownish red, elliptic, elliptic-lanceolate, or ovate-oblong, 10–16 × 3–7 cm, glabrous, base cuneate, apex acuminate or acute; secondary

veins 6 or 7 pairs, with pilosulous foveolate domatia; stipules caducous, interpetiolar or fused into a spathe or tube, 3–17 mm, glabrous, obtuse, rounded, or truncate. Inflorescence terminal, pilosulous [to perhaps glabrous]; peduncles 1–3, 0.5–8 cm, terminating in 1 head or 6–20 rays 0.8–2 cm and subtended by linear bracts 1–3 mm; heads several, subglobose, 8–10 mm in diam., 6–20-flowered. Flowers fused for half or more of hypanthium, biology not noted. Calyx glabrous; limb reduced, truncate to shallowly 4-dentate. Corolla white, subcampanulate; tube 2–2.5 mm, villous in upper part inside; lobes 4, 2–2.5 mm. Drupecetum subglobose to oblate, 4–11 mm in diam. Fl. Jun, fr. Dec.

Shady places in forests at streamsides or roadsides; 1000–1100 m [to only ca. 700 m in Thailand]. Yunnan [Malaysia, Thailand].

**13. *Morinda leiantha*** Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 313. 1872.

顶花木巴戟 ding hua mu ba ji

Erect shrubs or small trees; branches hirtellous or subglabrous, angled, dark brown. Leaves opposite; petiole 0.5–1(–3) cm; blade drying thinly papery, matte and dark brown on both surfaces, oblong-lanceolate, narrowly lanceolate, rhombic-lanceolate, or oblanceolate, 8–14(–20) × 2–5 cm, adaxially glabrous or pilosulous, abaxially scabrous, glabrous, or pilosulous along veins, base acute to attenuate, apex acuminate; secondary veins 5–8 pairs; stipules ovate-triangular to ovate-lanceolate, acute or 2-lobed. Inflorescence terminal or axillary; peduncle 2–5 mm, often with 2–4 branches, each with 1 capitulum; capitulum ellipsoid-oblong, many flowered. Flowers partially fused, each with 3–5 bracts in a whorl, biology not noted. Calyx limb truncate. Corolla white, salverform, outside glabrous; tube ca. 20 mm, inside glabrous; lobes 5, lanceolate, ca. 4 cm. Young drupeccetum mulberry-shaped. Fl. and fr. year-round.

Forests on hill slopes, shady thickets. S Yunnan [Myanmar].

**14. *Morinda litseifolia*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 335. 1999.

木姜叶巴戟 mu jiang ye ba ji

Lianas or subshrubs; branches at base surrounded by persistent leafless stipules, when young sparsely puberulent, becoming glabrescent, purplish black. Leaves opposite; petiole 4–6 mm, hirtellous; blade drying membranous or papery, adaxially gray, grayish green, or grayish black, abaxially brownish gray or greenish red, linear, oblong-linear, lanceolate-linear, oblanceolate, or elliptic-oblanceolate, 5–11 × 1.5–2(–3) cm, adaxially glabrous or sparsely pilosulous, abaxially usually glabrous except hirtellous along veins, base cuneate to acute, apex acuminate or acute; secondary veins 4–6; stipules fused into a spathe or tube, ca. 4 mm. Inflorescences terminal; peduncles 3–5, fasciculate or umbellate, ca. 7 mm, puberulent; heads 1 per peduncle, subglobose, 5–7-flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate. Corolla yellowish white; tube ca. 2 mm, densely villous inside; lobes 4 or 5, ca. 2 mm. Drupecetum subglobose, 2–8 mm in diam. Drupes almost fully fused. Fl. Jul, fr. Oct–Nov.

• Sparse or dense forests on mountains; 700–1300 m. Fujian, Guangxi, Hunan, Jiangxi, Sichuan.

**15. *Morinda longissima*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 323. 1999.

大花木巴戟 da hua mu ba ji

Erect shrubs, to 2 m tall; branches glabrous or subglabrous, subquadangular, green or pale green. Leaves opposite, sometimes crowded at ends of branches; petiole 2–3 cm, glabrous or subglabrous; blade drying submembranous to membranous, pale green and matte on both surfaces, oblong-oblancheolate, oblong-lanceolate, or oblanceolate, 13–23 × 6–10 cm, glabrous or pilosulous abaxially, base cuneate to attenuate, margin sometimes weakly repand or sinuate, apex acuminate or obtuse then abruptly acuminate; secondary veins 8–10 pairs, apparently without domatia; stipules interpetiolar, ovate, semicircular, or subcordate, acute or 2-lobed. Inflorescence terminal or axillary; peduncle 1, ca. 2 cm, glabrous; heads 1 per peduncle, subglobose, many flowered; bracts encircling flowers in 1 or 2 whorls, 3–6 per whorl, subulate. Flowers shortly fused at base, biology not noted. Calyx limb truncate to sinuate. Corolla white, slenderly funnelform to salverform, glabrous outside; tube ca. 32 mm, glabrous inside; lobes 5, lanceolate to ligulate, ca. 13 mm. Infructescences and fruit unknown. Fl. Apr–May.

- Sparse forests, shady thickets; ca. 700 m. S Yunnan.

The bracts arranged in whorls subtending the flowers are notable and probably distinctive for the species; however, these bracts are not shown in the illustrations of this species in the protologue nor in the additional figure presented in the FRPS *Morinda* treatment (Y. Z. Ruan, loc. cit.: 184, t. 46, f. 5).

**16. *Morinda nanlingensis*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 329. 1999.

南岭鸡眼藤 nan ling ji yan teng

Lianas or subshrubs; branches surrounded at base by persistent leafless stipules, when young hirtellous or hispidulous, becoming glabrescent, angled, purplish blue. Leaves opposite; petiole 3–5 mm, hirtellous; blade drying papery, adaxially greenish brown or dark brown, abaxially brownish gray, obovate, elliptic-oblancheolate, elliptic, or rhombic-lanceolate, rarely dimorphic, 4–9(–12) × 1.5–3.5 cm, adaxially pilosulous to glabrescent, abaxially glabrous to densely hirtellous at least on principal veins, base cuneate, apex acute, acuminate, or obtuse then abruptly mucronulate; secondary veins 5–7 pairs; stipules fused into a tube, truncate. Inflorescence terminal; peduncles 7–10, umbellate or fasciculate, 10–15 mm, pilosulous; heads 1 per peduncle, 3–11-flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate or perhaps sometimes with 1 calycophyll. Corolla campanulate, mealy puberulent outside; tube ca. 2 mm, internally densely bearded; lobes 4 or 5, sublancheolate, ca. 3 mm. Drupecetum subglobose, 4–8 mm in diam. Drupes orange or dark. Fl. Jun, fr. Oct.

- Shady places, forests, thickets on mountains, hills. Guangdong, Guangxi, Hunan, Yunnan, Zhejiang.

- 1a. Flowering heads with 3 or 4(–7) flowers;  
leaf blade rhombic-lanceolate, 4–7 ×  
1.5–2 cm ..... 16b. var. *pauciflora*
- 1b. Flowering heads with 5–11 flowers;  
leaf blade obovate, elliptic-oblancheolate,  
or elliptic, 7–12 × 2–3.5 cm.

2a. Leaf blade glabrous abaxially

..... 16a. var. *nanlingensis*

2b. Leaf blade densely pilosulous

abaxially ..... 16c. var. *pilophora*

**16a. *Morinda nanlingensis* var. *nanlingensis***

南岭鸡眼藤(原变种) nan ling ji yan teng (yuan bian zhong)

Leaf blade obovate, elliptic-oblancheolate, or elliptic, 7–9(–12) × 2–3.5 cm, glabrous abaxially. Flowering heads 5–11-flowered. Fl. Jun, fr. Oct.

- Shady places at streamsides in forests, thickets on mountains. Guangdong, Guangxi, Hunan, Yunnan.

**16b. *Morinda nanlingensis* var. *pauciflora*** Y. Z. Ruan, var. nov.

少花鸡眼藤 shao hua ji yan teng

Type: China. Zhejiang: Hangzhou, X. Y. He 20528 (holotype, IBSC).

Validating Latin diagnosis: that of “*Morinda nanlingensis* Y. Z. Ruan va. [sic!] *pauciflora* Y. Z. Ruan” (Y. Z. Ruan in W. C. Chen, Fl. Reipubl. Popularis Sin. 71(2): 331. 1999).

Leaf blade rhombic-lanceolate, 4–7 × 1.5–2 cm. Flowering heads 3- or 4(–7)-flowered.

- Forests on hills. S Zhejiang.

This name was previously published by Y. Z. Ruan (loc. cit.) but not validly so because the herbarium in which the type is conserved was not specified (*Vienna Code*, Art. 37.7).

**16c. *Morinda nanlingensis* var. *pilophora*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 331. 1999.

毛背鸡眼藤 mao bei ji yan teng

Leaf blade obovate, elliptic-oblancheolate, or elliptic, 7–9(–12) × 2–3.5 cm, abaxially densely pilosulous. Flowering heads 5–11-flowered.

- Forests, shady thickets on mountains. Guangxi, Hunan.

**17. *Morinda officinalis*** F. C. How, Acta Phytotax. Sin. 7: 326. 1958.

巴戟天 ba ji tian

Lianas; branches surrounded at base by persistent leafless stipules, when young strigillose, hirtellous, or pilose, becoming glabrescent and scabrous, angled, brown or bluish black. Leaves opposite; petiole 4–11 mm, densely puberulent, strigillose, hirtellous, or hirsute to glabrescent; blade drying papery, on both surfaces brown to yellow-brown, shiny to matte adaxially, matte abaxially, ovate-oblong, obovate-oblong, or elliptic, 6–13 × 3–6 cm, adaxially sparsely strigillose, hirtellous, or hirsute to glabrescent, abaxially glabrous or sparsely hirtellous along principal veins, base obtuse, rounded, cuneate, or acute, apex acute, obtuse, or rounded and abruptly mucronulate; secondary veins (4 or) 5–7 pairs, with small pilosulous domatia; stipules fused into a spathe or tube, 3–5 mm, membranous, puberulent to hirtellous, truncate, on each side 2-denticulate. Inflorescence terminal; peduncles 1–7 or 15–25, umbellate or fasciculate, 0.1–1

cm, densely hirtellous to strigillose, as a group usually subtended by 1 or 2 stipuliform bracts; heads 1 per peduncle, subglobose to hemispherical, 5–7 mm in diam., 1–3- or 4–10-flowered. Flowers fused for ca. half of hypanthium, biology not noted. Calyx puberulent to glabrous; limb 1–1.5 mm, lobed for ca. 1/2; lobes 2–4, triangular, sometimes markedly unequal on an individual flower, obtuse to acute. Corolla white, campanulate or urceolate, outside puberulent, hirtellous, or glabrescent; tube 3–4 mm, inside densely villous from middle of tube to throat; lobes (2–)4, lanceolate or narrowly oblong, 3–4 mm, apically thickened and rostrate. Drupecetum globose to oblate, 5–11 mm in diam. Drupes fully fused, red, subglobose, 4–5 mm. Fl. May–Jul, fr. Oct–Nov.

• Sparse or dense forests and thickets on mountains, also cultivated; 100–500 m. Fujian, Guangdong, Guangxi, Hainan.

According to the protologue, the species is apparently cultivated and used medicinally. The roots were described by Y. Z. Ruan (in FRPS 71(2): 199, 1999) as fleshy, irregularly intestine-like constricted, slightly purplish red, purplish blue when dry; they are illustrated in the protologue figure. The roots of almost no other *Morinda* species have been described by Y. Z. Ruan or any other authors seen.

- 1a. Flowering heads 15–25, each with 1(–3) flowers; peduncles ca. 2 mm; calyx lobes often becoming white ..... 17c. 'Uniflora'
- 1b. Flowering heads 1–10, each with 4–10 flowers; peduncles 1–10 mm; calyx lobes green.
- 2a. Young branches and leaf blades abaxially sparsely hirtellous, puberulent, or hirsute to glabrescent ..... 17b. var. *officinalis*
- 2b. Young branches and leaf blades densely transparent villous ..... 17a. var. *hirsuta*

**17a. *Morinda officinalis* var. *hirsuta*** F. C. How, Acta Phytotax. Sin. 7: 328. 1958.

毛巴戟天 mao ba ji tian

Young branches and leaf blade densely transparent villous. Flowering heads 1–10, 4–10-flowered; peduncles 1–10 mm. Calyx lobes green.

• Forests on mountains. Hainan.

**17b. *Morinda officinalis* var. *officinalis***

巴戟天(原变种) ba ji tian (yuan bian zhong)

Young branches and leaf blades adaxially sparsely hirtellous, puberulent, or hirsute to glabrescent. Flowering heads 1–10, 4–10-flowered; peduncles 1–10 mm. Calyx lobes green. Fl. May–Jul, fr. Oct–Nov.

• Sparse or dense forests and thickets on mountains. Fujian, Guangdong, Guangxi, Hainan.

**17c. *Morinda officinalis* 'Uniflora'**

密梗巴戟天 mi geng ba ji tian

Flowering heads 15–25, 1(–3)-flowered; peduncles ca. 2 mm. Calyx lobes often becoming white.

• Cultivated in Guangdong.

This taxon was originally published as a cultivar (Y. Z. Ruan in W. C. Chen, Fl. Reipubl. Popularis Sin. 71(2): 337. 1999), but it was not made clear if it is a well-known form that is deliberately selected and propagated or a wild-encountered form.

**18. *Morinda parvifolia*** Bartling ex Candolle, Prodr. 4: 449. 1830.

鸡眼藤 ji yan teng

Lianas, climbing, twining, or prostrate; branches surounded at base by persistent leafless stipules, when young glabrous, puberulent, or densely hispidulous-hirtellous, becoming weakly angled, brown to slightly purplish blue. Leaves opposite; petiole 3–8 mm, glabrous, puberulent, or hispidulous-hirtellous; blade drying papery, on both surfaces matte and yellowish green, yellowish brown, or yellowish gray, obovate, linear-oblongate, sub lanceolate, obovate-oblongate, oblanceolate, or obovate-oblong, 2–5(–7) × 0.3–3 cm, both surfaces glabrous or infrequently moderately to sparsely hirsute or hirtellous, base cuneate to acute, apex acute, obtuse, or rounded and shortly abruptly acuminate or mucronulate; secondary veins 3 or 4(–6) pairs, with pilosulous domatia; stipules fused into a spathe or tube, 2–4 mm, membranous, glabrous, puberulent, or hispidulous, truncate and on each side with 1 or 2, sometimes caducous bristles 0.5–1 mm. Inflorescence terminal; peduncles (2 or) 3–9, umbellate to fasciculate, 0.6–2 cm, densely puberulent to hispidulous, as a group often subtended by 1 to several stipuliform bracts; heads 1 per peduncle, subglobose, oblate, conical, or rarely cylindrical, 5–8 mm in diam., 3–15(–17)-flowered, often with 1 to several linear bracts 0.5–1 mm. Flowers fused at base, biology not noted. Calyx puberulent to glabrescent; limb 0.5–0.8 mm, truncate to sinuate or denticulate. Corolla white, campanulate, outside puberulent to glabrous; tube 1.5–2 mm, inside densely villous from middle to throat; lobes 4 or 5, narrowly oblong, 3–4 mm, apically thickened and rostrate. Drupecetum subglobose to oblate, 6–15 mm in diam. Drupes fully fused, orange, subglobose, 4–5 mm. Fl. Apr–Jun, fr. Jun–Aug.

Thickets at roadsides or ditch sides, prostrate on bare land, thickets or forests on hills; sea level to 400 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan [Philippines, Vietnam].

Y. Z. Ruan (in FRPS 71(2): 194. 1999) commented that leaf shape in this species varies based to some degree on ecology, with obovate and dimorphic leaves in dry, sunny, bare habitat; linear-oblongate or sub lanceolate leaves in shady, dry, bare habitat; and obovate-oblongate, oblanceolate, or obovate-oblong leaves when climbing on shrubs.

**19. *Morinda persicifolia*** Buchanan-Hamilton, Trans. Linn. Soc. London 13: 535. 1822.

短梗木巴戟 duan geng mu ba ji

Shrubs or small trees, to 11 m tall; branches quadrangular, pubescent or glabrous. Leaves opposite or solitary opposite an inflorescence; petiole 1–2 cm; blade drying papery, adaxially gray, abaxially pale green, oblong-lanceolate, lanceolate, oblanceolate, or linear-lanceolate, 6–18 × 2–12 cm, glabrous or sparsely pilosulous, base acute to attenuate, apex acute or shortly acuminate; secondary veins 7–10 pairs; stipules inter-

petiolar, triangular to broadly triangular, acute to subulate acuminate. Inflorescence solitary and leaf-opposed; peduncle 1, 1–3 mm; head 1, many flowered; bracteoles subulate. Flower biology not noted. Calyx limb truncate. Corolla white, salverform; tube ca. 16 mm, somewhat curved, inside glabrous; lobes 5, ca. 4 mm. Drupecetum mulberry-shaped or conical-oblong, 2–2.5 × 1.5–2 cm. Fl. and fr. summer–autumn.

Sparse forests on mountains. S Yunnan [Cambodia, NE India, Indonesia, Laos, Malaysia, Myanmar, Vietnam].

**20. *Morinda pubiofficinalis*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 334. 1999.

细毛巴戟 xi mao ba ji

Lianas or shrubs, 2–10 m tall; branches when young sparsely hirtellous, becoming subglabrous, weakly angled, brown or pale brownish purple. Leaves opposite; petiole ca. 4 mm, hirtellous or pilosulous; blade drying papery, adaxially shiny and dark brownish red or yellowish brown, abaxially pale brownish red or brownish yellow, oblong-lanceolate, linear-lanceolate, or ovate-oblong, 7–13 × 2–4 cm, adaxially glabrous or sometimes sparsely hirtellous when young, abaxially glabrous, base cuneate or rounded, apex acute to acuminate; secondary veins 5 or 6 pairs; stipules fused into a tube, ca. 4 mm, subtruncate. Inflorescence terminal; peduncles 2–5, umbellate, 7–11 mm; heads 1 per peduncle, 3- to many flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate. Corolla white, campanulate to weakly urceolate, outside glabrous; tube ca. 1.2 mm, inside densely bearded; lobes 4 or 5, linear, ca. 2 mm. Drupecetum subglobose, 5–10 mm in diam. Drupes fully fused, red. Fl. May–Jun, fr. Oct–Nov.

• Forests in valleys or on mountains, thickets at watersides. Guangdong, Guizhou, Hunan.

The roots were described by Y. Z. Ruan as irregularly intestine-like constricted, with fleshy cortex.

**21. *Morinda rosiflora*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 324. 1999.

红木巴戟 hong mu ba ji

Erect shrubs, ca. 2.5 m tall; branches glabrous, quadrangular, purplish black. Leaves opposite or solitary opposite an inflorescence; petiole 2–4 cm; blade matte on both surfaces, adaxially purplish black or purplish red, abaxially dark brown, elliptic-oblong, elliptic, or oblong-oblong, 13–22 × 5–11 cm, adaxially glabrous, abaxially scabrous, base acute to attenuate, margin sometimes weakly sinuate, apex acuminate or mucronulate; secondary veins 10–14 pairs; stipules interpetiolar, triangular, ovate, or ovate-lanceolate, acute, acuminate, or bifid. Inflorescence leaf-opposed; peduncle 1(or 2), 1–2 cm, glabrous; heads 1 per peduncle, globose, many flowered; bracteoles 3–5, subulate. Flowers fused at base, biology not noted. Calyx limb truncate. Corolla pink, salverform, outside glabrous; tube ca. 22 mm, somewhat curved, glabrous inside; lobes 4 or 5, lanceolate, ca. 4 mm. Young drupelet globose, ca. 1 cm in diam. Young drupes dark red. Fl. summer, fr. autumn.

• Sparse forests on hill slopes; 500–800 m. S Yunnan.

The protologue gave the number of corolla lobes as 5, but the protologue figure shows 4 corolla lobes.

**22. *Morinda rugulosa*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 328. 1999.

皱面鸡眼藤 zhou mian ji yan teng

Lianas or shrubs, to 6 m tall; branches when young pilosulous, becoming glabrescent. Leaves opposite; petiole 6–9 mm, hirtellous; blade drying papery, adaxially brownish black, abaxially ferruginous, obovate or obovate-lanceolate, 7–9 × 2.5–4 cm, adaxially rugulose and sparsely pilosulous to glabrescent, abaxially glabrous except hirtellous along midrib, base cuneate or attenuate, apex rounded, obtuse, or acute; secondary veins 5 or 6 pairs, with pilosulous domatia; stipules fused into a tube, 3–4 mm, truncate. Inflorescence terminal; peduncles 4–8, umbellate, 7–15 mm, pilosulous; heads 1 per peduncle, 5–12-flowered. Flowers fused in lower half of hypanthium, biology not noted. Calyx limb reduced. Corolla white, campanulate; tube ca. 1 mm, inside densely bearded; lobes 4, narrowly oblong, ca. 3 mm, apically rostrate. Drupecetum subglobose, 4–10 mm in diam. Drupes fully fused, red. Fl. Jul, fr. Dec.

• Forests at riversides and roadsides, thickets. N Guangxi, SW Hunan.

**23. *Morinda scabrifolia*** Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 332. 1999.

西南巴戟 xi nan ba ji

Lianas or shrubs; branches when young densely hirtellous, becoming glabrescent, angled, whitened, pale purplish blue, or brown. Leaves opposite; petiole 5–15 mm, hirtellous; blade drying papery or leathery, adaxially brownish yellow or brownish gray, abaxially pale brown, elliptic-oblong, oblong-lanceolate, or oblong-linear, 7–13 × 2–4 cm, adaxially sparsely hirtellous, subglabrous, or glabrous, abaxially glabrous or strigillose-pilosulous at least on principal veins, base cuneate or rounded, apex acute, acuminate, or obtuse then abruptly mucronulate; secondary veins 5–7 pairs; stipules 3–5 mm. Inflorescence terminal; peduncles 3–10, fasciculate or umbellate, 5–20 mm, puberulent, as a group sometimes subtended by 1 linear bract; heads 1 per peduncle, 5–10-flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate. Corolla white, urceolate to campanulate, outside puberulent; tube ca. 2.5 mm, inside densely bearded; lobes 4 or 5, linear, ca. 2.5 mm. Drupecetum subglobose, ca. 1 cm in diam. Fl. Jun, fr. Sep–Oct.

• Forests or thickets on mountains, shady rock sides. Guangxi, Jiangxi, Sichuan, Yunnan.

**24. *Morinda shuanghuaensis*** C. Y. Chen & M. S. Huang, J. Trop. Subtrop. Bot. 16: 578. 2008.

假巴戟 jia ba ji

Lianas; branches when young hirtellous, becoming glabrescent, angled, bluish black. Leaves opposite; petiole 3–5 mm, hirtellous; blade drying papery or thinly papery and brown, elliptic, elliptic-oblong, or obovate-oblong, 4–10(–13) × 2.5–5 cm, adaxially hirsute to pubescent or sparsely hispidulous, abaxially glabrous or sparsely pilosulous along midrib, base rounded or cuneate, apex acute or mucronulate; secondary veins 5 or 6 pairs; stipules 3–5 mm, pilosulous, truncate. Inflores-

cence terminal; peduncles 4–8, umbellate, 3–15 mm, pubescent; heads 1 per peduncle, 3–8-flowered. Flowers fused at base, biology not noted. Calyx limb reduced, truncate or with 2 or 3 undulate teeth. Corolla white, urceolate, outside puberulent; tube ca. 3 mm, inside densely bearded; lobes 3 or 4, narrowly oblong, ca. 3 mm, apically thickened and rostrate. Drupecetum compressed globose. Drupes red. Fl. May–Jul, fr. Oct.

● Forests on mountains. Fujian, Guangdong.

Y. Z. Ruan (in FRPS 71(2): 201. 1999) described the roots as irregularly intestine-like constricted, with cortex more or less fleshy.

**25. *Morinda umbellata* Linnaeus, Sp. Pl. 1: 176. 1753.**

印度羊角藤 yin du yang jiao teng

Lianas, climbing or twining; branches glabrous to puberulent or hispidulous, becoming weakly angled, often channeled, bluish black to reddish brown. Leaves opposite; petiole 4–6 mm, glabrous, puberulent, or sparsely hirsute; blade drying papery, leathery, or rigid-membranous, adaxially shiny and greenish, pale brown, or brownish black, abaxially matte, greenish, pale brown, or straw-colored, ovate, obovate-lanceolate, obovate-oblong, lanceolate, or linear-lanceolate, 6–9 × 2–3.5 cm, both surfaces glabrous or sometimes hirsute, hispidulous, or puberulent along principal veins, base acute or cuneate, apex acuminate or mucronulate; secondary veins 4 or 5 pairs, usually with pilosulous domatia; stipules fused into a tube, 2–6 mm, scarious to membranous, puberulent, broadly rounded to truncate, on each side with 2 bristles 0.5–1 mm, often caducous. Inflorescence terminal; peduncles 3–11, fasciculate, umbellate, or shortly racemiform, 4–11 mm, puberulent to glabrescent, subtended by 1 to several linear caducous bracts 1–2 mm; heads 1 per peduncle, subglobose to oblate, 1–10 mm in diam., 6–12-flowered. Flowers fused at base or for up to half of hypanthium, biology not noted. Calyx glabrous; limb 0.2–0.8 mm, truncate to denticulate. Corolla white, campanulate, outside glabrous to puberulent; tube 1.2–2 mm, inside densely villous from middle to throat; lobes 4 or 5, narrowly oblong to ligulate, 2.2–3 mm, apically thickened and hooked. Drupecetum subglobose or compressed globose, 7–12 mm in diam., glabrescent. Drupes mostly to fully fused, red, subglobose, 4–5 mm. Fl. Jun–Jul, fr. Oct–Nov.

Forests on mountains, sparse or dense thickets at streamsides and roadsides; 300–1200 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [India, Japan, Sri Lanka, S Thailand].

This is the most commonly collected species of *Morinda* in China. This species is here circumscribed broadly and a bit differently from FRPS (71(2): 190–191. 1999); in particular, the species is restricted to glabrous plants there but pubescent plants are included here. There seems to be no other difference among these two sets of plants, and on specimens there is continuous variation in pubescence that cannot be clearly partitioned into separate states.

- 1a. Leaf blade drying papery or leathery, ovate, obovate-lanceolate, or obovate-oblong; petioles puberulent to sparsely hirsute ..... 25a. subsp. *obovata*

- 1b. Leaf blade rigid-membranous, lanceolate to linear-lanceolate; petioles glabrous ..... 25b. subsp. *umbellata*

**25a. *Morinda umbellata* subsp. *obovata* Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 325. 1999.**

羊角藤 yang jiao teng

Petiole puberulent to sparsely hirsute; leaf blade drying papery or leathery, ovate, obovate-lanceolate, or obovate-oblong. Fl. Jun–Jul, fr. Oct–Nov.

● Forests on mountains, sparse or dense thickets at streamsides and roadsides; 300–1200 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang.

**25b. *Morinda umbellata* subsp. *umbellata***

印度羊角藤(原亚种) yin du yang jiao teng (yuan ya zhong)

Petiole glabrous; leaf blade drying rigid-membranous, lanceolate to linear-lanceolate. Fl. Jun–Jul, fr. Oct–Nov.

Forests on mountains, sparse or dense thickets at streamsides and roadsides; 300–1200 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [India, Japan, Sri Lanka].

**26. *Morinda undulata* Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 321. 1999.**

波叶木巴戟 bo ye mu ba ji

Small trees, to 20 m tall; branches glabrous, subquadrangular, smooth, reddish brown. Leaves opposite or solitary opposite an inflorescence; petiole 1–2 cm, glabrous; blade drying yellowish brown, linear-oblong, linear-oblong-lanceolate, or slightly lyrate, 18–20 × 4–5.5 cm, glabrous and shiny on both surfaces, base cuneate, margin irregularly undulate to lyrate, apex acute or acuminate; secondary veins 12–24 pairs; stipules interpetiolar, triangular to broadly triangular, acute to obtuse. Inflorescence solitary and leaf-opposed; peduncle 1, 1–6 cm, glabrous; heads 1 per peduncle, ellipsoid-oblong to cylindrical, many flowered; bracts absent or subulate. Flowers with hypanthia fully fused, biology not noted. Calyx limb truncate. Corolla white, salverform; tube 15–18 mm, densely villous in upper part and throat; lobes 4 or 5, triangular to ligulate, 3–4 mm, acute. Drupecetum mulberry-shaped to cylindrical or oblong, 1–1.5 × 0.6–0.8 cm. Fl. autumn, fr. winter.

● About 900 m. S Yunnan (also cultivated in villages).

The protologue described the corolla lobes as 4, but the protologue figure shows 5 lobes.

**27. *Morinda villosa* J. D. Hooker, Fl. Brit. India 3: 158. 1880.**

须弥巴戟 xu mi ba ji

Woody lianas; branches surrounded at base by persistent leafless stipules, densely ferruginous- or yellow villous, weakly quadrangular. Leaves opposite; petiole 0.5–1.5 cm, shorter at upper nodes, densely ferruginous- or yellow hirtellous; blade drying papery, darkened, narrowly elliptic-oblong, obovate-lanceolate, or lanceolate, 8–12 × 2–6 cm, adaxially sparsely stri-

gose or strigillose with pubescence denser along veins, abaxially densely ferruginous- or yellow hirtellous, base rounded, slightly oblique, or sometimes cordulate, apex caudate-acuminate or shortly acuminate; secondary veins 10–13 pairs, with pilosulous domatia; stipules interpetiolar or partially fused into a tube, ovate to elliptic, 7–12 mm, pilosulous or hirtellous, acute, obtuse, or truncate. Inflorescences terminal; peduncles 2–10, fasciculate or umbellate, 0.9–2.2 cm, villosulous, as a group subtended by 2 to several bracts 4–6 mm with 2 to several subulate lobes; heads 1 per peduncle, subglobose, 5–6 mm in

diam., 4–10-flowered; bracteoles linear, 0.2–0.5 mm. Flowers with hypanthia partially fused, biology not noted. Calyx villous, strigillose, or hirtellous; limb ca. 1 mm, with 4 or 5 rounded to obtuse teeth. Corolla greenish white, salverform, outside puberulent; tube 10–12 mm, densely barbate in throat; lobes 4 or 5, narrowly oblong, 3–4 mm, apically rostrate. Drupecetum compressed globose to subglobose, 1–1.5 cm in diam. Drupes fused at base, orange, obovoid, ca. 5 mm. Fl. May, fr. Jul–Sep.

Forests or thickets in valleys, at watersides, or at roadsides; 800–900 m. S Yunnan [N India, Thailand, Vietnam].

## 55. *MOURETIA* Pitard in Lecomte, Fl. Indo-Chine 3: 71. 1922.

杜丽草属 *du li cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

Perennial herbs or subshrubs, unarmed; stems sometimes becoming corky. Raphides present. Leaves opposite, sometimes anisophyllous, apparently without domatia; stipules persistent, interpetiolar, triangular to leaflike, often reflexed, acute to bifid. Inflorescences terminal, pseudoaxillary [or sometimes axillary, *Mouretia vietnamensis* Tange], capitate, subcapitate, or congested-cymose, several to many flowered, subsessile to pedunculate, bracteate. Flowers sessile to pedicellate, bisexual, distylous, sometimes fused by their ovaries. Calyx limb 5-lobed. Corolla white, yellow, or pink, tubular-funnelform to salverform, inside densely pubescent at middle and sometimes through throat; lobes 5, valvate in bud. Stamens 5, inserted near middle of corolla tube, included with anthers positioned near middle of corolla tube in long-styled form, exerted in short-styled form; filaments short or reduced in long-styled form, well developed in short-styled form; anthers dorsifixed near base. Ovary 2-celled, ovules numerous in each cell on axile placentas; disk puberulent; stigma 2-lobed, exerted in long-styled form, included in short-styled form. Fruit capsular, obconic to subglobose, dehiscent through apical portion or operculum inside persistent calyx limb, thinly to thickly papery; seeds numerous, small, angled.

Five species: E and SE Asia; one species in China.

This genus was revised by Tange (Nordic J. Bot. 17: 123–132. 1997), who recognized four species from Indochina but documented each with few specimens. *Mouretia* was studied in China by H. S. Lo (Bull. Bot. Res., Harbin 6(4): 48. 1986; Bull. Bot. Res., Harbin 18(3): 282. 1998), who apparently did not have communication with Tange: they independently described and named the same Chinese species, which are here synonymized (Tange's publication has priority). The known species of *Mouretia* are distylous (Tange, loc. cit.; Puff et al., Rubiaceae of Thailand, 182. 2005). The breeding biology of the Chinese plants has not been reported by Chinese authors and is not evident from the material available to us but is presumably similar. Lo (in FRPS 71(1): 183. 1999) described the stipules as caducous, but they are persistent on the specimens seen and according to Tange.

**1. *Mouretia inaequalis*** (H. S. Lo) Tange, Nordic J. Bot. 17: 127. 1997.

广东杜丽草 *guang dong du li cao*

*Mouretia tonkinensis* Pitard var. *inaequalis* H. S. Lo, Bull. Bot. Res., Harbin 6(4): 48. 1986; *M. guangdongensis* H. S. Lo.

Weak herbs, 30–40 cm tall; stems angled to subterete, densely puberulent or villosulous-tomentulose to glabrescent. Leaves subequal to distinctly unequal, varied along stems; petiole 5–15 mm, densely villosulous; blade drying thinly papery and olive-green, elliptic-oblong, elliptic, elliptic-ovate, or obovate, larger blades 4–9 × 2–4 cm, smallest blades 1.5–2 × 0.8–1 cm, adaxially glabrous, abaxially glabrescent on lamina and villosulous to strigillose-villous along principal veins, base cuneate, obtuse, or rounded, apex acute to obtuse and shortly acuminate; secondary veins 5–8 pairs; stipules leaflike, shortly stipitate with “blade portion” subovate to obovate or subreniform, (1–)2.5–5 mm, glabrescent, obtuse to rounded. Inflorescences congested-cymose, terminal and/or pseudoaxillary, several flowered, densely puberulent-tomentulose to strigillose;

peduncle 2–5 mm; bracts lanceolate to narrowly triangular, 1–2 mm; pedicels to 1.5 mm. Flowers free, subsessile to pedicellate. Calyx puberulent-hispidulous; hypanthium portion obovoid, 1–1.5 mm; limb lobed nearly to base; lobes lanceolate to narrowly triangular, 1.7–2(–2.5) mm, entire to ciliolate. Corolla yellow, white, or pink, tubular-salverform, densely hispidulous-puberulent with stout trichomes outside; tube 2–2.5 mm, internally with ring of trichomes near middle; lobes triangular, ca. 2 mm, abaxially appendaged near apex. Capsules obconical-subglobose, ca. 3 mm, glabrescent to puberulent, with persistent calyx limbs sometimes elongating to 3 mm; seeds 0.4–0.5 mm. Fl. Aug, fr. May.

On rocks in dense forests. Fujian, Guangdong, Guangxi (Qinzhou) [Vietnam].

The description above includes measurements from Tange based on specimens from Vietnam, including near the Chinese border. This species is illustrated by Tange (loc. cit.: 126, t. 2, f. D). Tange separated *Mouretia tonkinensis* from the Chinese plants by its consistently isophyllous leaves, fully capitate inflorescences, calyx lobes with tips quickly becoming scarious and whitened, smaller corollas (with tube ca. 2.5 and lobes 1.1 mm), and smaller fruit (ca. 1.5 mm).

## 56. MUSSAENDA Linnaeus, Sp. Pl. 1: 177. 1753.

玉叶金花属 *yu ye jin hua shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Belilla* Adanson.

Trees, shrubs, or clambering or twining lianas, rarely dioecious, unarmed. Raphides absent. Leaves opposite or occasionally in whorls of 3, with or usually without domatia; stipules persistent or caducous, interpetiolar, entire or 2-lobed. Inflorescences terminal and sometimes also in axils of uppermost leaves, cymose, paniculate, or thyriform, several to many flowered, sessile to pedunculate, bracteate. Flowers sessile to pedicellate, bisexual and usually distylous or rarely unisexual. Calyx limb 5-lobed nearly to base, frequently some or all flowers of an inflorescence with 1(–5) white to colored, petaloid, persistent or deciduous, membranous, stipitate calycophyll(s) with 3–7 longitudinal veins. Corolla yellow, red, orange, white, or rarely blue (*Mussaenda multinervis*), salverform with tube usually slender then abruptly inflated around anthers, or rarely constricted at throat (*M. hirsuta*), inside variously pubescent but usually densely yellow clavate villous in throat; lobes 5, valvate-reduplicate in bud, often long acuminate. Stamens 5, inserted in middle to upper part of corolla tube, included; filaments short or reduced; anthers basifixed. Ovary 2-celled, ovules numerous in each cell, inserted on oblong, fleshy, peltate, axile placentas; stigmas 2-lobed, lobes linear, included or exserted. Fruit purple to black, baccate or perhaps rarely capsular (*M. decipiens*), fleshy, globose to ellipsoid, often conspicuously lenticellate, with calyx limb persistent or caducous often leaving a conspicuous scar; seeds numerous, small, angled to flattened; testa foveolate-striate; endosperm abundant, fleshy.

About 200 species: widespread in tropical Africa, Asia, Madagascar, and Pacific islands; 29 species (18 endemic, one introduced) in China.

The characteristic large, petaloid calycophylls of *Mussaenda* are frequently but mistakenly considered to be bracts. *Mussaenda* is frequently confused with *Schizomussaenda*; *Schizomussaenda* can be recognized by its large shrub habit with relatively large leaves and calycophylls, its capsular fruit, and its flower buds with the corollas clavate and rather flat-topped with the acuminate ends of the corolla lobes then bent upward to form an erect appressed group of filaments on the top of the bud.

Several species of *Mussaenda* are frequently cultivated as ornamentals in tropical regions. *Mussaenda philippica* A. Richard is apparently the most commonly cultivated species and has numerous cultivar forms; Puff et al. (Rubiaceae of Thailand, 215. 2005) presented photos of several of the cultivated forms. This species is pilosulous to villous throughout, with white to pink flowers and calycophylls and with calyx lobes variously 1 to all modified into calycophylls. Also frequently cultivated are *M. frondosa* of our flora and *M. erythrophylla* Schumacher & Thonning of Africa; the latter has pilose to villous pubescence on all organs, including the corollas, and deep red inflorescence axes and flowers, including the calycophylls and the outside of the corolla but excepting the corolla limb, which is creamy white.

In addition to the species treated here, Hooker and Arnott (Bot. Beechey Voy. 265. 1838) reported *Mussaenda glabra* Vahl from “Loo Choo” in China. *Mussaenda glabra* was described from the Himalaya and has medium-sized leaves, a climbing habit, petioles 3–15 mm, a corymbiform branched inflorescence, calyx lobes 1–4 mm and deciduous in fruit, corolla tubes 13–18 mm, and corolla lobes 3–3.5 mm; this species is otherwise known from 300–1300 m in India and Bhutan and has not been confidently recorded from China. The name “*M. glabra*” has been frequently applied in herb. to Chinese specimens of both *M. erosa* and *M. frondosa*. Also Henry 8279 from Hainan was treated by C. E. C. Fisher (Bull. Misc. Inform. Kew 1928: 274. 1928) as *M. parryorum* C. E. C. Fischer, a species otherwise known only from Assam, NE India. This identification seems unlikely, especially given that *M. parryorum* has not otherwise been reported or treated from China or Indochina, so the Henry specimen will need re-examination. *Mussaenda parryorum* is included for reference in the key below, based on its protologue, but the species is not otherwise treated here.

H. H. Hsue and H. Wu (in FRPS 71(1): 283–306. 1999), Hutchinson (in Sargent, Pl. Wilson. 3: 395–400. 1916), and some other authors have distinguished *Mussaenda* species in large part based on leaf shape, ovary length, calyx lobe length, and corolla size, but the consistency and distinctiveness of these characters within species of *Mussaenda* have been questioned by some other authors. In particular, corolla size is apparently sometimes widely variable among living plants in a population (see comments by Wood, Fl. Bhutan 2(2): 781. 1999), and the flower buds of *Mussaenda* apparently often open prematurely when collected and thus are shorter than flowers at anthesis (pers. obs.). The calyx lobes and the ovary often elongate after fertilization of the ovary, and the calyx lobes then fall off; thus, fruiting plants are very difficult to identify. Also Hutchinson misidentified several widely distributed sets of Chinese *Mussaenda* specimens, generating confusion in this group (e.g., he identified Henry 12157 as *M. pubescens* in spite of its pedicellate flowers with corolla tubes ca. 32 mm, vs. sessile and 11–20 mm in *M. pubescens*); and he described only the “typical” leaf size and shape of several species although he saw material with more variability. The weakness in some cases of Hutchinson’s characters and species concepts is shown by his simultaneous description in his *Mussaenda* treatment of two new species that were separated primarily on vegetative features and actually are both based on different specimens of a single distinctive species, *Schizomussaenda dehiscens*.

As noted below, *Mussaenda multinervis* and *M. decipiens* were both described as having capsular fruit and most likely belong in other genera, but which other genus or genera is not yet clear so they are maintained here. The measurements below of inflorescence size do not include the corollas and calycophylls.

1a. Individual flowers with all 5 calyx lobes enlarged into petaloid calycophylls.

2a. Petiole 0.3–0.8 cm, leaf blade 2–9 × 1–4 cm; calyx lobes linear ..... 25. *M. pubescens*

2b. Petiole 1.5–3.5 cm, leaf blade 6–20 × 3.5–13 cm; calyx lobes lanceolate to ovate, 2–2.5 mm wide ..... 27. *M. shikokiana*

1b. Individual flowers with only 1 or 2 calyx lobes enlarged into a petaloid calycophyll, or without calycophylls.

3a. Calyx lobes (i.e., not calycophylls) subleaflike, 1.5–5 mm wide, lanceolate, oblanceolate, oblong-lanceolate, ligulate, or broadly triangular.

- 4a. Corolla tube 20–25 mm, sericeous with appressed indument, sericeous with apices of trichomes spreading, or villous.
- 5a. Stems sericeous with appressed indument; stipules 5–8 × 4–5 mm; calyx lobes 4–11 mm ..... 19. *M. macrophylla*
- 5b. Stems villous or hirsute with widely spreading trichomes; stipules 7–10 × 6–12 mm; calyx lobes 7–18 mm ..... 29. *M. treutleri*
- 4b. Corolla tube 9–14 mm, sericeous.
- 6a. Stipules triangular-ovate to broadly ovate, acute to cuspidate; corolla tube 10–11 mm; berries ellipsoid ..... 9. *M. emeiensis*
- 6b. Stipules triangular to ovate-lanceolate, acute; corolla tube 9–14 mm; berries ellipsoid to subglobose ..... 27. *M. shikokiana*
- 3b. Calyx lobes less than 1.5 mm wide, linear to narrowly triangular, not at all leaflike.
- 7a. Stipules 13–20 mm, lobed for less than half their length; corolla yellow or pale blue.
- 8a. Corolla pale blue; leaves 8.5–12 cm wide; calyx lobes ca. 2 mm; fruit baccate ..... 22. *M. multinervis*
- 8b. Corolla yellow; leaves 2.5–7.5 cm wide; calyx lobes 1–4 mm; fruit capsular.
- 9a. Calyx lobes 3–4 mm; leaves 6–7.5 cm wide ..... 5. *M. decipiens*
- 9b. Calyx lobes 1–2 mm; leaves 2.5–6 cm wide ..... *Schizomussaenda dehiscens*
- 7b. Stipules 2–8 mm, deeply 2-parted; corolla white, yellow, or orange.
- 10a. Leaves sessile, subsessile, or shortly petiolate with petioles to 3 mm, obtuse, rounded, truncate, or cordulate and then sometimes decurrent at base, if petioles more than 2 mm then leaves truncate or cordulate.
- 11a. Leaf blade obtuse to rounded then abruptly acuminate at apex; corolla tube outside densely villous with pubescence drying reddened; stems densely villous ..... 26. *M. sessilifolia*
- 11b. Leaf blade tapered to acuminate apex; corolla tube outside with sparse to dense villosulous, pilosulous, tomentulose, strigose, or strigillose pubescence drying clear, whitened, or reddened; stems strigillose, villous, villosulous, or tomentulose.
- 12a. Corolla tube 20–26 mm; inflorescences shortly branched, flowers with pedicels ca. 1 mm ..... 14. *M. hossei*
- 12b. Corolla tube 11–20 mm; inflorescences subcapitate to congested, flowers mostly or all sessile to subsessile.
- 13a. Calyx lobes ca. 2 mm ..... 2. *M. breviloba*
- 13b. Calyx lobes 3–6 mm ..... 25. *M. pubescens*
- 10b. Leaves distinctly petiolate with petioles 2–15 mm, truncate, obtuse, acute, or attenuate at base, if petioles 3 mm or shorter then leaves acute.
- 14a. Leaves glabrous throughout or sparsely strigose on principal veins, drying thickly papery and usually brown, with tertiary venation sparsely visible abaxially, widely spaced and subparallel, not areolate; stipules caducous exposing a persistent, reddish brown fringe of trichomes ..... 10. *M. erosa*
- 14b. Leaves glabrous or pubescent at least sparsely on veins abaxially, drying thinly to thickly papery or membranous and green to brown, with tertiary venation regularly visible abaxially, subparallel or areolate; stipules persistent or deciduous, without persistent fringe of trichomes or this present and clear or whitened.
- 15a. Corolla tube constricted at throat ..... 13. *M. hirsutula*
- 15b. Corolla tube uniformly cylindrical or inflated just below or at throat.
- 16a. Calyx lobes 25–30 mm, as long as or longer than corolla tube ..... 15. *M. kwangsiensis*
- 16b. Calyx lobes 1–15 mm, shorter than corolla tube.
- 17a. Corolla tube 5–8 mm; fruit stipitate or pedicellate, pedicels to 12 mm ..... 23. *M. parviflora*
- 17b. Corolla tube 5–40 mm; fruit sessile or subsessile to pedicellate, pedicels to 8 mm.
- 18a. Flowers sessile in 1–5 capitate groups; bracts and calyx lobes linear, 8–15 mm, and so densely hirsute as to obscure inflorescence morphology ..... 6. *M. densiflora*
- 18b. Flowers sessile to pedicellate in cymes with axes at least shortly developed; bracts and calyx lobes narrowly triangular to lanceolate, 1–15 mm, glabrous to variously pubescent, inflorescence morphology obscured or evident.
- 19a. Longest calyx lobes 6–15 mm on flowers at anthesis, longer than hypanthium portion.
- 20a. Corolla lobes 6–8 mm.
- 21a. Cultivated plants; leaves strigose, strigillose, or glabrescent abaxially ..... 11. *M. frondosa*
- 21b. Native plants; leaves hirsute, subappressed villous, pilose, or strigose abaxially.
- 22a. Calyx densely villous, with pubescence spreading ..... 3. *M. caudatiloba*
- 22b. Calyx hirsute ..... 6. *M. densiflora*
- 20b. Corolla lobes 2.5–6 mm, at least some shorter than 6 mm.
- 23a. Corolla tubes 26–30 mm.
- 24a. Inflorescences densely congested; flowers sessile or subsessile ..... 13. *M. hirsutula*
- 24b. Inflorescences congested to laxly cymose; flowers with pedicels 1–5 mm ..... 17. *M. laxiflora*
- 23b. Corolla tubes 11–25 mm.

- 25a. Fruit ellipsoid to ellipsoid-oblong, 18–20 × 11–12 mm, densely lenticellate, somewhat woody; stems and leaves abaxially densely villosulous to tomentulose; Hainan ..... 12. *M. hainanensis*
- 25b. Fruit subglobose to ellipsoid, 5–10 × 4–10 mm, smooth, fleshy or stiffly papery; stems and leaves abaxially glabrescent to variously pubescent; widespread.
- 26a. Corolla with tube ca. 14 mm, lobes ca. 2.5 mm; Yunnan, elevation not noted ... 24. *M. pingbianensis*
- 26b. Corolla with tube 11–23 mm, lobes 2.5–5 mm; widespread, below 100–1600 m.
- 27a. Leaves 2–11.5 × 1–4.5 cm; flowers sessile to pedicellate, white to yellow; below 100–900 m, throughout China ..... 25. *M. pubescens*
- 27b. Leaves 6–20 × 3–10 cm; flowers sessile, mixed sessile and pedicellate, or all pedicellate with pedicels to 3 mm, yellow-orange; S China, 300–1400 m.
- 28a. Corolla lobes rounded ..... 28. *M. simpliciloba*
- 28b. Corolla lobes acute or acuminate.
- 29a. Climbers; leaves 8–13 × 3–6 cm ..... 6. *M. densiflora*
- 29b. Erect shrubs; leaves 6–20 × 3–10 cm ..... 8. *M. elliptica*
- 19b. Longest calyx lobes 1–5.9 mm, shorter than to longer than hypanthium portion.
- 30a. Corolla tube ca. 40 mm ..... 16. *M. kwangtungensis*
- 30b. Corolla tube 5–37 mm.
- 31a. Stems densely tomentose.
- 32a. Erect shrubs; calyx lobes 3–4 mm; corolla lobes acuminate ..... 21. *M. mollissima*
- 32b. Climbers; calyx lobes 5–7 mm; corolla lobes rounded ..... 28. *M. simpliciloba*
- 31b. Stems appressed pubescent to glabrescent.
- 33a. Most or all calyx lobes 1–2 mm.
- 34a. Leaves with 4–6 pairs of lateral veins; Hainan.
- 35a. Corolla tube 25–31 mm; calycophylls elliptic to ovate ..... 1. *M. antiloga*
- 35b. Corolla tube 13–15 mm; calycophylls oblong-elliptic or oblanceolate ..... 18. *M. lotungensis*
- 34b. Leaves with 6–8 pairs of lateral veins; mainland.
- 36a. Corolla tube ca. 12.8 mm ..... 2. *M. breviloba*
- 36b. Corolla tube 18–21 mm.
- 37a. Leaves 5.5–7.5 × 3–4.7 cm; petioles 0.5–0.6 cm ..... 4. *M. chingii*
- 37b. Leaves 10–17 × 2.5–6 cm; petioles 0.5–1.6 cm ..... *Schizomussaenda dehiscens*
- 33b. Most or all calyx lobes 2.3–5.9 mm.
- 38a. Corolla with tube ca. 32 mm and lobes ca. 4 mm; Hainan ..... 20. *M. membranifolia*
- 38b. Corolla with tube 11–25 mm and lobes 2–6 mm; widespread, including Hainan.
- 39a. Corolla lobes ca. 2 mm.
- 40a. Corolla tube ca. 22 mm; Assam (not known from China, included here for reference) ..... *M. parryorum* (see comment above)
- 40b. Corolla tube 13–15 mm; Hainan ..... 18. *M. lotungensis*
- 39b. Corolla lobes 3.5–6 mm; widespread.
- 41a. Inflorescences subcapitate, mostly unbranched; flowers 3–20, sessile to subsessile (though fruit may be stipitate).
- 42a. Corolla tube 22–25 mm; stems generally without axillary short shoots ..... 6. *M. densiflora*
- 42b. Corolla tube 11–20 mm; stems often with axillary short shoots with small leaves ..... 25. *M. pubescens*
- 41b. Inflorescences branched, at least to one order, i.e., tripartite; flowers 5 to numerous, sessile to long pedicellate.
- 43a. Stems strigose; near sea level to 1400 m ..... 7. *M. divaricata*
- 43b. Plants tomentose to glabrescent; 1200–1400 m ..... 28. *M. simpliciloba*

**1. *Mussaenda antiloga*** Y. H. Chun & W. C. Ko, Fl. Hainan. 3: 582. 1974.

壮丽玉叶金花 *zhuang li yu ye jin hua*

Climbing shrubs; branches terete, sparsely strigillose to glabrescent. Leaves opposite; petiole 3–10 mm, densely strigillose to glabrescent; blade drying membranous, elliptic-oblong, elliptic, or oblanceolate, 7–11(–18) × 2–5.5 cm, adaxially sparsely strigillose to glabrescent, abaxially moderately to

sparsely strigillose with pubescence denser on veins, base acute to obtuse, apex acuminate; secondary veins 4–6 pairs, tertiary venation visible and reticulate; stipules deciduous, triangular to ovate, 3–6 mm, densely strigillose, deeply 2-lobed, lobes narrowly triangular to linear. Inflorescence laxly cymose, usually regularly dichotomous, ca. 5 × 4–5 cm, strigillose to glabrescent, pedunculate; peduncles 3.5–4 cm; bracts subulate, 1–3 mm; pedicels 1–5 mm. Flowers pedicellate (or on higher order inflorescence axes). Calyx with hypanthium portion ellipsoid to

turbinate, 2–3 mm, glabrous; lobes narrowly triangular to linear, 1–2 mm, strigillose, 1 lobe on 1 flower of most inflorescences enlarged into calycophyll, blade elliptic or ovate, 3–5 × 2–3 cm, sparsely puberulent to strigillose especially on veins, base obtuse, stipe 15–24 mm, apex acute to obtuse. Corolla yellow, outside sparsely to moderately strigillose; tube 22–31 mm, inside with clavate hairs at inflated throat; lobes broadly ovate, 3–4 mm, inside densely yellow papillose. Berry subglobose or ellipsoid, 8–10 × 5–7 mm, glabrous, with calyx limb caducous. Fl. May–Dec.

- Wet sites in dense forests; ca. 900 m. S Hainan.

H. H. Hsue and H. Wu (in FRPS 71(1): 296. 1999) gave the corolla tube length of this species as 22–25 mm, but the corolla tube of the type specimen is ca. 31 mm; this report is added here.

## 2. *Mussaenda breviloba* S. Moore, J. Bot. 43: 137. 1905.

短裂玉叶金花 *duan lie yu ye jin hua*

Shrubs to 1.5 m tall; branches terete, ferruginous tomentose. Leaves opposite; petiole 1–5 mm, tomentulose; blade drying stiffly papery, long elliptic to broadly elliptic, 5.5–10 × 3.5–5 cm, adaxially sparsely strigillose with pubescence denser along veins, abaxially pale tomentose along veins with indument grayish white and brownish, base obtuse, apex acuminate or acute; secondary veins 7 or 8 pairs; stipules triangular-ovate, 4–5 mm, deeply 2-lobed, lobes triangular-subulate. Inflorescence cymose to corymbiform, densely flowered to rather lax, ca. 4.5 × 7–8 cm, brown tomentose, pedunculate; bracts subulate, 3–5 mm, acute; pedicels 1–2 mm. Flowers sessile or pedicellate. Calyx tomentose; hypanthium portion ellipsoid to turbinate, 1.5–2.5 mm; lobes lanceolate or triangular-linear, ca. 2 mm, sometimes 1 lobe on 1 flower per inflorescence expanded into calycophyll, blade elliptic, 3–4 × 1–2 cm, both surfaces pubescent with pubescence denser along veins, base acute, stipe ca. 6 mm, apex acute or obtuse. Corolla pale yellow, externally densely tomentulose to strigose; tube ca. 12.8 mm, with clavate hairs in throat; lobes triangular, ca. 2.2 mm, acuminate. Berry unknown. Fl. Apr.

Roadsides in mountain forests; ca. 1300 m. Yunnan [Thailand].

This species was described from Thailand, and characters from there are added to the description here. H. H. Hsue and H. Wu (in FRPS 71(1): 291. 1999) described the corolla tubes as 20–23 mm, which would make this species very similar to *Mussaenda laxiflora*, but the protologue described them as ca. 12.8 mm.

## 3. *Mussaenda caudatiloba* D. Fang, Acta Phytotax. Sin. 40: 156. 2002.

尾裂玉叶金花 *wei lie yu ye jin hua*

Shrubs, erect to climbing, size not reported; branches terete, retrorsely to spreading villous. Leaves opposite; petiole 5–10 mm, villous; blade drying thinly papery, dark green adaxially, pale abaxially, ovate to lanceolate, 4–11 × 2–5 cm, both surfaces subappressed villous with pubescence denser on principal veins, base rounded to rarely cordate, apex acuminate to subcaudate; secondary veins 6–9 pairs; stipules persistent, deeply 2-lobed, villous, lobes linear-subulate, 7–10 mm. Inflorescences congested-cymose, several flowered, densely villous,

pedunculate; peduncle 0.5–1 cm; bracts linear, ca. 8 mm. Flowers sessile. Calyx densely spreading villous; hypanthium portion turbinate, ca. 2.5 mm; lobes linear, 10–13 mm, acute, 1 lobe on 1 or 2 flowers per inflorescence expanded into white calycophyll, blade ovate, 5–6.7 × 3–5.3 cm, appressed villous, base rounded, stipe 18–25 mm, apex acute. Corolla outside spreading grayish villous; tube ca. 25 mm, inside densely clavate puberulent in upper part; lobes triangular-lanceolate, ca. 8 mm, caudate. Berry unknown. Fl. May.

- Thickets. Guangxi.

The pubescence descriptions here are from the protologue.

## 4. *Mussaenda chingii* C. Y. Wu ex H. H. Hsue & H. Wu, Acta Phytotax. Sin. 24: 236. 1986.

仁昌玉叶金花 *ren chang yu ye jin hua*

Shrubs, ca. 1.5 m tall; branches terete, appressed pubescent. Leaves opposite; petiole 5–6 mm, sparsely appressed pubescent; blade drying papery, adaxially shiny green, abaxially glaucous, broadly ovate-elliptic or broadly ovate, 5.5–7.5 × 3–4.7 cm, both surfaces sparsely appressed pubescent with pubescence denser along veins, base rounded or obtuse, apex cuspidate, acute, or acuminate; secondary veins 6 or 7 pairs; stipules deciduous, lanceolate or ovate, ca. 6 mm, densely pubescent, deeply 2-lobed, lobes narrowly triangular. Inflorescences congested-cymose to somewhat lax, ca. 4 × 4.5 cm, densely pubescent, pedunculate or subsessile and tripartite; peduncle 1–1.5 cm; bracts linear, ca. 3.5 mm. Flowers shortly pedicellate. Calyx sparsely to densely pubescent; hypanthium portion cylindrical to ellipsoid, ca. 2.5 mm; lobes lanceolate-triangular, 1.5–2 mm, acuminate, 1 lobe on 1–3 flowers per inflorescence expanded into calycophyll, blade elliptic to obovate, ca. 2.4 cm × 9 mm, pubescent along veins on both surfaces, base cuneate, stipe ca. 10 mm, apex acute. Corolla yellow to orange, outside sparsely to densely appressed pubescent; tube ca. 21 mm, inside densely yellow clavate puberulent in upper part; lobes orbicular-ovate, ca. 2.5 mm, inside yellow papillose, acute to apiculate. Berry unknown. Fl. May.

- Thickets. Guangxi.

## 5. *Mussaenda decipiens* H. Li, Acta Phytotax. Sin. 18: 117. 1980.

墨脱玉叶金花 *mo tuo yu ye jin hua*

Shrubs, 1–2 m tall; branches villous, terete, drying dark green. Leaves opposite; petiole 1–5 cm, densely villous; blade drying papery, elliptic, 13–15 × 6–7.5 cm, adaxially subglabrous, abaxially hirsute with pubescence denser along veins, base narrowly cuneate and decurrent on petiole, apex acuminate; secondary veins 7–9 pairs, tertiary venation indistinct; stipules apparently persistent, linear-lanceolate to lanceolate, 15–20 mm, densely villous, shortly 2-lobed. Inflorescence laxly to rather congested-cymose, generally dichotomous, ca. 10 cm wide, branched 3 or 4 times, villous becoming glabrescent, pedunculate. Flowers subsessile, biology not noted. Calyx with hypanthium portion turbinate, ca. 5 mm, hirtellous; lobes linear, 3–4 mm, sparsely villous, with 1 lobe on ca. 5 flowers per inflorescence expanded into white calycophyll, blade elliptic, ca. 7.5

× 4 cm, base obtuse to cuneate, apex shortly acuminate. Corolla yellow, tubular-salverform, outside densely pale yellow strigose; tube ca. 18 mm; lobes ovate-lanceolate, ca. 6 × 3 mm, abaxially carinate, adaxially densely orange-yellow papillose, long caudate. Capsule or berry globose, ca. 6 mm in diam., smooth, glabrous, with calyx limb persistent. Fl. Aug.

• Broad-leaved forests or thickets on mountain slopes; 300–1700 m. Xizang (Médog), Yunnan (Gongshan).

The protologue described the fruit of this species as capsular, which would be anomalous in *Mussaenda*, although H. H. Hsue and H. Wu (in FRPS 71(1): 293. 1999) described it as a berry.

**6. *Mussaenda densiflora*** H. L. Li, J. Arnold Arbor. 24: 455. 1943.

密花玉叶金花 *mi hua yu ye jin hua*

Climbers, ca. 2 m tall; branches terete, densely yellowish brown villous or hirsute. Leaves opposite; petiole 5–7 mm, densely hirsute; blade drying membranous or thinly papery, broadly oblong-lanceolate or narrowly oblong-elliptic to usually ovate, 8–13 × 3–6 cm, adaxially moderately to sparsely strigose, hirsute, or hirsutulous, abaxially moderately to densely hirsute, pilose, or strigose with pubescence denser on principal veins, base obtuse to rounded and sometimes abruptly attenuate, apex acute or acuminate; secondary veins 8–10 pairs, tertiary venation visible and reticulate; stipules persistent, 8–10 mm, densely villous to hirsute, deeply 2-lobed, lobes lanceolate, narrowly triangular, or linear. Inflorescences capitate or subcapitate with 2–5 subglobose heads, 2–6 × 2–6 cm, densely villous, subsessile to pedunculate; peduncle to 3.5 cm; bracts lanceolate, narrowly triangular, narrowly elliptic, or linear, 10–15 mm. Flowers sessile, biology not noted. Calyx densely hirsute; hypanthium portion urceolate to ellipsoid, 2–3 mm; lobes linear-lanceolate to usually linear, 8–15 × 0.2–2 mm, sometimes 1 lobe of 1 or 2 flowers per inflorescence expanded into white calycophyll, blade ovate, 5–6 × 3–4 cm, moderately to densely strigose to pilose on both surfaces, base obtuse to cordulate, stipe 8–15 mm, apex acute to acuminate. Corolla yellow, outside moderately to densely hirsute; tube 22–25 mm, sometimes contracted around anthers; lobes narrowly lanceolate or orbicular-lanceolate, 6–8 mm, inside densely yellow papillose, long acuminate. Berry ovoid, 8–9 × 6–7 mm, glabrous, with calyx limb deciduous. Fl. May.

Sparse thickets; 300–800 m. Guangxi [Vietnam (Tsang 29049, P!)].

This species is said in the protologue to be similar to *Mussaenda subsessilis* Pierre, and it may be that with more specimens the distinctions between them (smaller calycophylls and longer narrower corolla lobes in *M. densiflora*) may turn out to be endpoints of continuous variation. H. H. Hsue and H. Wu (in FRPS 71(1): 300. 1999) described the stipules as caducous, but this has not been seen on specimens studied. The protologue described the corolla tube as 3–3.5 cm, but this does not match specimens seen, including the type; this may have been the length of the entire corolla that was labeled incorrectly in the final article.

**7. *Mussaenda divaricata*** Hutchinson in Sargent, Pl. Wilson. 3: 394. 1916.

展枝玉叶金花 *zhan zhi yu ye jin hua*

Climbing or suberect shrubs; branchlets terete, sparsely or moderately strigose to densely mixed strigose, -strigillose, and -hirtellous, sometimes becoming glabrescent, sometimes with congested groups of leaves borne on reduced axillary buds. Leaves opposite; petiole 0.5–1 cm, densely strigose; blade drying thinly papery, adaxially pale to bright green or brown, abaxially pale gray to bright green, elliptic, lanceolate, elliptic-oblong, or ovate-elliptic, 3.5–12 × 1.5–7 cm, adaxially sparsely strigillose on lamina and densely strigillose on principal veins, abaxially strigillose to glabrous on lamina and densely strigillose along veins, base obtuse to acute, apex acute to abruptly acuminate; secondary veins 5–11 pairs, tertiary venation reticulate to subparallel; stipules usually deciduous, ovate to triangular, 3–7 mm, moderately to densely strigose, deeply 2-lobed, lobes narrowly triangular to subulate. Inflorescence congested to somewhat laxly cymose, 1–2 × 3–4 cm, densely strigose, tripartite and sessile or pedunculate; peduncle 0.3–3.5 cm; bracts narrowly triangular to linear, 1–7 cm, strigose to glabrescent; pedicels to 1.5 mm. Flowers subsessile to pedicellate, biology not noted. Calyx with hypanthium portion ellipsoid to turbinate, 1.5–2 mm, sparsely strigose; lobes subulate, 2.2–5 mm, densely strigillose to strigose, with 1 lobe on 1–3 flowers per inflorescence expanded into white calycophyll, blade broadly elliptic or ovate, 3.5–6 × 3–5 cm, sparsely strigillose on lamina and densely strigillose along veins on both surfaces, base cuneate to truncate, stipe 10–25 mm, apex obtuse to shortly acuminate. Corolla yellow, salverform, densely strigillose outside; tube 18–25 mm, densely yellow clavate pubescent inside upper part; lobes ovate, 3.5–4 mm, adaxially densely yellow papillose, acute to shortly acuminate. Berry ellipsoid, 1–1.2 × 0.4–0.6 cm, sparsely strigillose, on pedicels or stipes to 6 mm. Fl. May–Sep, fr. Oct.

Thickets at riversides, in fields, or in valleys; near sea level to 1400 m. Guangdong, Guangxi, Guizhou, Hubei, Sichuan, Yunnan [Vietnam].

The illustration of this species presented by H. H. Hsue and H. Wu (in FRPS 71(1): 304, t. 80, f. 1–3. 1999) is difficult to separate from the plants included here in *Mussaenda frondosa*.

- 1a. Branches and abaxial surface of leaf  
blades sparsely pubescent ..... 7a. var. *divaricata*
- 1b. Branches and abaxial surface of leaf  
blades densely pubescent ..... 7b. var. *mollis*

**7a. *Mussaenda divaricata* var. *divaricata***

展枝玉叶金花(原变种) *zhan zhi yu ye jin hua* (yuan bian zhong)

Branches sparsely pubescent. Leaf blade sparsely pubescent abaxially. Fl. Jun–Sep.

• Thickets at riversides or in fields; near sea level to 1200 m. Guangdong, Guangxi, Guizhou, Hubei, Sichuan, Yunnan.

**7b. *Mussaenda divaricata* var. *mollis*** Hutchinson in Sargent, Pl. Wilson. 3: 398. 1916.

柔毛玉叶金花 *rou mao yu ye jin hua*

Branches densely pubescent. Leaf blade densely pubescent abaxially. Fl. May, fr. Oct.

Thickets in valleys; ca. 1400 m. Yunnan [Vietnam].

**8. *Mussaenda elliptica*** Hutchinson in Sargent, Pl. Wilson. 3: 395. 1916.

椭圆玉叶金花 *tuo yuan yu ye jin hua*

Shrubs, 1–2 m tall; branchlets terete, sparsely strigillose. Leaves opposite; petiole 0.7–1 cm, strigillose to strigose; blade drying thinly papery, elliptic, 6–20 × 3–10 cm, both surfaces glabrous to strigillose at least on veins, base rounded to cuneate, apex acuminate; secondary veins 6 or 7 pairs, tertiary venation apparently reticulate; stipules deciduous, ovate-triangular, ca. 8 mm, sparsely puberulent, deeply 2-lobed, lobes narrowly triangular, acuminate. Inflorescence congested-cymose, ca. 1.5 × 1.5 cm, strigillose or strigose, subsessile to pedunculate; bracts linear-subulate, to 8 mm. Flowers pedicellate, biology not noted. Calyx strigillose; hypanthium portion turbinate, ca. 2 mm; lobes subulate, 6–7 mm, with 2 lobes on 2–5 flowers per inflorescence expanded into white calycophyll, blade broadly ovate, 5–7.5 × 3.5–5 cm, strigillose along veins, base obtuse to truncate, stipe 7–15 mm, apex acute to shortly acuminate. Corolla yellow, salverform, outside strigose; tube ca. 20 mm, densely yellow clavate pubescent inside upper part; lobes triangular-ovate, ca. 3 mm, mucronate with appendage ca. 1 mm. Berry unknown. Fl. May–Jun.

• Forests in valleys, forest margins; 600–1000 m. Guangxi, Sichuan, Yunnan.

It is implied in the protologue that the stipules are entire, but on an isotype specimen (*E. H. Wilson 4604*, US – bar code 00137848, Web!) they are deeply bilobed; also the protologue described the inflorescences as pedunculate, but they are subsessile on this isotype. In FRPS (71(1): 302. 1999), the leaves were described as sparsely pubescent and the calyx lobes as 4.5–5.5 mm, but in the protologue they were described as glabrous and 6–7 mm, respectively.

**9. *Mussaenda emeiensis*** Z. Y. Zhu & S. J. Zhu, Bull. Bot. Res., Harbin 28: 257. 2008.

峨眉玉叶金花 *e mei yu ye jin hua*

Weak shrubs, to 5 m tall; branches compressed, shortly pubescent. Leaves opposite; petiole 2–3.5 cm, shortly pubescent; blade drying thickly papery, green adaxially, pale abaxially, 7–18(–20) × 4.5–12(–15) cm, both surfaces pilose on veins to glabrescent, base obtuse to acute, apex acute to acuminate; secondary veins 7–9 pairs; stipules triangular-ovate to broadly ovate, 6–7 mm, shortly pubescent, acute to cuspidate or 2-lobed. Inflorescence cymose or fasciculate, ca. 1 × 1.5 cm, many flowered, densely pubescent, sessile; bracts ovate-lanceolate, 4–10 mm, acuminate; pedicels ca. 2 mm. Flowers pedicellate, biology not noted. Calyx obovoid, ca. 4 mm, pilosulous; lobes oblong-lanceolate to lanceolate, 8–10 × 2–2.5 mm, pilosulous, acute, with 1 lobe in ca. 2 flowers per inflorescence expanded into calycophyll, blade ovate to elliptic, 2.5–5.5 cm, pubescent to glabrous, base obtuse, stipe 8–10 mm, apex obtuse to acute. Corolla yellow or orange, tubular, outside densely pubescent; tube 10–11 mm, inside densely clavate pilose; lobes broadly ovate, 3–4 mm, inside verrucose, acute to acuminate. Berry ellipsoid, ca. 10 × 8 mm, pilosulous to glabrescent, calyx limb deciduous.

• Mixed forests on slopes; 700–900 m. Sichuan (Emei Shan).

**10. *Mussaenda erosa*** Champion ex Bentham, Hooker's J. Bot. Kew Gard. Misc. 4: 193. 1852.

楠藤 *nan teng*

Climbing shrubs, to 5 m tall; branches glabrous, terete, sparsely lenticellate. Leaves opposite; petiole 0.3–1.5 cm, glabrous; blade drying thickly papery, brown, ovate, oblanceolate, lanceolate, or oblong-elliptic, 5.5–14 × 2.4–6 cm, both surfaces glabrous or sparsely strigose on principal veins, base acute, cuneate, or occasionally obtuse, apex acute to acuminate; secondary veins 4–6 pairs, without domatia, tertiary venation only sparsely visible abaxially; stipules caducous exposing a fringe of persistent reddish brown trichomes, narrowly triangular, 3–8 mm, glabrous, deeply 2-parted, lobes acute to acuminate. Inflorescence compound-cymose to compound-corymbiform, 2–8 × 2–12 cm, congested when young becoming lax with age, glabrous, pedunculate or sessile and 3- or 5-partite; peduncles 1–2.5 cm; bracts triangular to linear-lanceolate, 1.5–7 mm, sparsely strigillose to glabrous; pedicels 1–5 mm. Flowers pedicellate, biology not noted. Calyx with hypanthium portion ellipsoid, 2.5–3.5 mm, glabrous; lobes linear-lanceolate to narrowly triangular, 2–4.5 mm, often unequal on an individual flower, strigillose or hispidulous, with 1 lobe on 1–6 flowers per inflorescence expanded into white calycophyll, blade broadly elliptic to ovate, 3.5–6.5 × 3–5 cm, glabrous except sparsely strigillose on principal veins, base cuneate, rounded, or truncate, stipe 9–20 mm, apex rounded to acute. Corolla yellow to orange-yellow, outside densely strigillose to strigose; tube 22–24 mm; lobes ovate, 4–5 mm, adaxially yellow papillose, rounded then abruptly shortly acuminate. Berry ellipsoid to subglobose, 10–13 × 8–10 mm, glabrous, smooth or sparsely lenticellate, calyx limb deciduous. Fl. Apr–Jul, fr. Sep–Dec.

Sparse evergreen forests, streamsides, along roads; 300–800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Japan (Ryukyu Islands), Vietnam].

**11. *Mussaenda frondosa*** Linnaeus, Sp. Pl. 1: 177. 1753.

洋玉叶金花 *yang yu ye jin hua*

Climbing shrubs; branches terete to compressed, moderately to densely pale red sericeous to hirsute becoming glabrescent, red-brown or brown, rather densely lenticellate. Leaves opposite; petiole 4–10 mm, densely sericeous; blade drying thinly papery or leathery, adaxially dark green to brownish green, abaxially pale green to yellowed, broadly elliptic, elliptic-oblong, ovate, or oblanceolate, 8–15 × 3–8 cm, both surfaces sparsely strigillose on lamina and strigose to sericeous on principal veins, base acute, obtuse, or rounded, apex acute to caudate-acuminate; secondary veins 7–10 pairs, tertiary venation visible and reticulate; stipules persistent, triangular, 5–10 mm, densely strigose to pilose, deeply 2-lobed, lobes lanceolate to narrowly triangular, acute to acuminate. Inflorescences congested-cymose becoming lax with lateral axes elongating markedly, 4–8 × 8–20 cm with lateral axes to 8 cm, sparsely to moderately pubescent with 2 types of pubescence, mixed strigillose to appressed puberulent and hirsute to villous, pedunculate or sessile and 3-partite; peduncles 1–3 cm; bracts triangular

or elliptic, 4–10 mm, usually 2- to multifid, acute to acuminate; pedicels 1–6 mm. Flowers pedicellate, biology not noted. Calyx with hypanthium portion ellipsoid, 3–4 mm, strigose to sericeous; lobes narrowly triangular to narrowly ligulate, 7–12 mm, hirsute, acute to acuminate, with 1 lobe of 1–4 flowers per inflorescence sometimes expanded into calycophyll, blade elliptic-oblong to ovate, 6–8 × 2.5–5 cm, both surfaces glabrescent on lamina and strigillose on principal veins, base acute to cuneate, stipe 10–30 mm, apex acute or acuminate. Corolla salverform, outside hirsute; tube 22–25 mm; lobes ovate, 6–7 mm, acuminate. Berry ovoid or ellipsoid, ca. 10 × 7 mm, strigose to glabrescent, calyx limb deciduous. Fl. Apr–May.

Cultivated in Guangdong and Hainan [native to Cambodia, India, Indonesia, Sri Lanka, and Vietnam].

**12. *Mussaenda hainanensis*** Merrill, Lingnan Sci. J. 14: 58. 1935.

海南玉叶金花 *hai nan yu ye jin hua*

Climbing shrubs; branches terete, densely ferruginous- or gray villosulous to tomentulose. Leaves opposite; petiole 2–5 mm, densely velutinous to hirtellous; blade drying papery, adaxially dark green, abaxially pale, oblong-elliptic, obovate, or lanceolate, 3–12 × 1.5–4 cm, adaxially sparsely to densely villosulous to strigillose or hispid, abaxially densely villosulous or tomentulose, both surfaces with pubescence denser along principal veins, base cuneate to acute, apex acute to shortly acuminate; secondary veins 7 or 8 pairs, tertiary venation visible and reticulate; stipules persistent, triangular to ovate, 3–7 mm, densely pilosulous to villosulous, entire or usually deeply 2-lobed, lobes lanceolate to linear, acuminate. Inflorescence subcapitate to congested-cymose, 3–5 × 3–5 cm, densely pilosulous to villosulous, pedunculate or sessile and 3-partite; peduncle 1–3 cm; bracts linear-lanceolate, 3–6 mm. Flowers sessile or subsessile, biology not noted. Calyx densely strigose to sericeous or pilose; hypanthium portion ellipsoid to turbinate, 1.5–2 mm; lobes linear-lanceolate to narrowly elliptic, 6–8 mm, acute to acuminate, with 1 lobe on 1 or 2 flowers per inflorescence expanded into calycophyll, blade broadly elliptic to ovate, 1.5–4 × 1–3.5 cm, moderately to sparsely strigillose or sericeous, base obtuse, truncate, or cordulate, stipe 10–16 mm, apex acute. Corolla yellow, salverform, densely strigose outside; tube 20–25 mm; lobes triangular-ovate, 3–5 mm, adaxially densely yellow papillose, acuminate. Berry ellipsoid to ellipsoid-oblong, 18–20 × 11–12 mm, pilosulous to hirtellous, densely lenticellate, somewhat woody, with calyx limb deciduous, with pedicels sometimes elongating, to 4 mm. Fl. Mar–Jun, fr. Jul–Aug.

• Forests at middle elevations; 300–800 m. Hainan.

The protologue and H. H. Hsue and H. Wu (in FRPS 71(1): 297. 1999) described the “calyx tube” as 3–4 mm, but this has not been seen on specimens studied.

**13. *Mussaenda hirsutula*** Miquel, J. Bot. Néerl. 1: 109. 1861.

粗毛玉叶金花 *cu mao yu ye jin hua*

*Mussaenda inflata* H. S. Hsue & H. Wu.

Climbing shrubs; branches terete, densely ferruginous- or gray villosulous, hirtellous, or tomentulose. Leaves opposite;

petiole (2–)3–15 mm, moderately to densely villosulous, tomentulose, or velutinous; blade drying papery to subleathery, abaxially pale, oblong-elliptic, lanceolate, or ovate, (4–)7–13 × (2–)2.5–4 cm, adaxially sparsely to moderately hirtellous or hispid with pubescence usually denser along principal veins, abaxially moderately to densely villosulous, hirtellous, or strigose-hirsute, base acute, cuneate, or rounded, apex acute or acuminate; secondary veins 5–8 pairs, tertiary venation visible and reticulate; stipules persistent (or in *M. inflata* form deciduous), triangular, (4–)5–10 mm, densely strigose, villosulous, or pilose, deeply 2-lobed, lobes lanceolate, narrowly triangular, or linear. Inflorescence subcapitate to congested-cymose, (1–)1.5–4 × 1.5–4 cm, densely villosulous to hirsute, pedunculate; peduncle 0.3–1.5 cm; bracts linear-lanceolate, 4–6 mm. Flowers subsessile or sessile, biology not noted. Calyx sparsely to densely villosulous or villous; hypanthium portion ellipsoid to subglobose, 1.5–2 mm; lobes linear to narrowly triangular, (4–)7–10(–13) mm, sometimes 1 lobe on 1–3 flowers per inflorescence expanded into calycophyll, blade broadly elliptic to ovate, (2.5–)4–6 × (2–)3–5 cm, sparsely strigillose to villosulous with pubescence usually denser on veins, base cuneate to rounded, stipe 10–14 mm, apex rounded or acute. Corolla yellow to orange-yellow, salverform, outside densely strigose to sericeous; tube cylindrical and 26–28 mm (or constricted in throat and 18–19 mm in *M. inflata* form); lobes elliptic to lanceolate, 4–6 mm, adaxially densely yellow papillose, acute to acuminate. Berry ellipsoid or subglobose, 14–20 × 9–12 mm, lenticellate, with calyx limb persistent, with pedicels sometimes elongating, to 4 mm. Fl. Apr–Jun (Nov in *M. inflata* form), fr. Jul–Jan of following year.

• Thickets in fields, at streamsides, or in valleys, often on tree crowns; 300–800 m. Guangdong, Guizhou, Hainan, Hunan, Yunnan.

The name *Mussaenda inflata* was based on a single specimen distinguished primarily by a notably swollen corolla. Deng and Zhang (Acta Phytotax. Sin. 44: 608–609. 2006) studied this and concluded that *M. inflata* is a synonym of *M. hirsutula* and was described based on a specimen with malformed corollas. In the description above, in general, the measurements in parentheses apply only to the plants previously included in *M. inflata*.

**14. *Mussaenda hossei*** Craib, Beih. Bot. Centralbl. 28(2): 444, 457. 1911.

红毛玉叶金花 *hong mao yu ye jin hua*

*Mussaenda rehderiana* Hutchinson.

Shrubs, to 2 m tall; branches densely whitened, reddish, or brownish villosulous, tomentulose, or villous, terete, sometimes becoming glabrescent. Leaves opposite; petiole 0.5–3 mm, villosulous to villous; blade drying thickly papery, oblanceolate, oblong-oblanceolate, elliptic, lanceolate, or ovate, 3–14 × 1.5–4 cm, adaxially sparsely to densely pilosulous to villosulous, abaxially densely hirtellous, villosulous, or villous, base obtuse, subcordate, or rounded, apex acuminate or acute; secondary veins 8–10 pairs, tertiary venation not readily visible; stipules usually persistent, lanceolate to triangular, 5–7 × 2–3 mm, densely strigose, villosulous, or villous, entire or usually 2-lobed for up to 1/2, segments acute to acuminate. Inflorescence congested-cymose, densely tomentose to villous, pedunculate or

sessile and 3(or 5)-partite; peduncle 1–5 cm; bracts lanceolate, narrowly triangular, or linear, 1–10 mm; pedicels to 1 mm. Flowers subsessile to shortly pedicellate, biology not noted. Calyx densely villous to hirtellous; hypanthium portion subellipsoid to oblanceoid, 2–2.5 mm; lobes lanceolate to narrowly triangular, 2–2.2 mm, acute, with 2 lobes on 4–6 flowers of each inflorescence expanded into white calycophyll, blade elliptic to suborbicular,  $2.5\text{--}5.5 \times 2\text{--}4$  cm, base cuneate to cordulate, stipe 12–15 mm, apex obtuse or rounded and shortly acuminate. Corolla orange-yellow, salverform, outside densely pilosulous, villous, or tomentulose; tube 20–26 mm; lobes suborbicular, 2.5–3 mm, obtuse then abruptly acuminate or acute. Berry oblong-ellipsoid, ca.  $18 \times 8$  mm, calyx lobes persistent. Fl. Nov–Mar.

Forests; 600–1600 m. S Yunnan [Laos, Myanmar, Thailand, Vietnam].

In the protologue, Craib noted variation in density of the pubescence among the few specimens he studied; continuous variation in density and length of the trichomes is evident among the specimens collected since then.

**15. *Mussaenda kwangsiensis*** H. L. Li, J. Arnold Arbor. 24: 455. 1943.

广西玉叶金花 *guang xi yu ye jin hua*

Climbing shrubs; branches terete, densely strigillose, sometimes with congested groups of leaves borne on reduced axillary buds. Leaves opposite; petiole 5–8 mm, appressed pubescent; blade drying thinly papery, oblong-lanceolate or lanceolate,  $8\text{--}11 \times 2.5\text{--}4$  cm, adaxially sparsely strigillose with pubescence denser along veins, abaxially densely villous, sparsely villous, or hirtellous, base attenuate or cuneate, apex acuminate or shortly acuminate; secondary veins 6–8 pairs, with tertiary venation not readily visible; stipules caducous, deeply 2-parted, lobes linear, ca. 6 mm. Inflorescence congested-cymose, ca. 4 cm, moderately to densely strigillose; bracts linear, 5–15 mm. Flowers densely grouped, sessile, biology not noted. Calyx with hypanthium portion ellipsoid, ca. 5 mm, densely pubescent; lobes linear,  $25\text{--}30 \times 1\text{--}2$  mm, sparsely pilose, with 1 lobe on 1(or ?more) flower in each inflorescence enlarged into white calycophyll, blade ovate, ca. 6 cm, sparsely pubescent on both surfaces, base rounded, stipe ca. 8.5 mm, apex acuminate. Corolla yellow, slenderly salverform, outside gray pubescent; tube 20–25 mm; lobes ovate, ca.  $3 \times 1.5$  mm, adaxially densely yellow papillose, acuminate, acute, or mucronate. Berry not seen. Fl. Sep–Jan.

• Sparse forests at streamsides in valleys. Guangxi.

**16. *Mussaenda kwangtungensis*** H. L. Li, J. Arnold Arbor. 25: 427. 1944.

广东玉叶金花 *guang dong yu ye jin hua*

Climbing shrubs, 1–2.5 m tall; branches terete, brown, densely strigillose becoming glabrescent. Leaves opposite; petiole 3–5 mm, strigillose; blade drying thinly papery, lanceolate-elliptic to elliptic-oblong,  $3\text{--}9 \times 1\text{--}3$  cm, adaxially sparsely strigillose to glabrescent, abaxially sparsely to densely strigillose or strigillose with pubescence denser along principal veins, base acute to obtuse, apex acute to acuminate with tips to 1 cm; sec-

ondary veins 3–6 pairs, apparently without domatia, tertiary venation not visible; stipules caducous, 1.5–3 mm, densely strigillose, deeply 2-lobed, lobes linear, 1.5–2 mm. Inflorescence compact-cymose to subcapitate, ca.  $1 \times 1\text{--}1.5$  cm, few to several flowered, densely strigillose, pedunculate; peduncles 2–10 mm; bracts linear, ca. 1 mm. Flowers subsessile, biology not noted. Calyx strigillose to glabrescent; hypanthium portion ellipsoid, 2–3 mm; lobes linear, 2.5–3.5 mm, with 1 lobe on 2–4 flowers per inflorescence sometimes expanded into calycophyll, blade oblong-ovate, elliptic, or elliptic-ovate,  $3.5\text{--}5 \times 1.5\text{--}2.5$  cm, strigillose, base cuneate, stipe 12–15 mm, apex acute to obtuse. Corolla yellow, salverform, outside strigillose to strigillose; tube (31–)39–42 mm; lobes ovate, 4.5–5 mm, adaxially densely yellow papillose, acuminate. Berry not seen. Fl. May–Sep.

• Thickets on mountains. S Guangdong.

**17. *Mussaenda laxiflora*** Hutchinson in Sargent, Pl. Wilson. 3: 399. 1916.

疏花玉叶金花 *shu hua yu ye jin hua*

Shrubs, to 3 m tall; branches terete, densely strigillose, strigose, or appressed tomentose. Leaves opposite; petiole 4–10 mm, densely strigillose or appressed tomentulose; blade drying papery, elliptic, obovate, or obovate-ob lanceolate,  $6.5\text{--}14 \times 2.5\text{--}5$  cm, adaxially sparsely strigillose especially along veins, abaxially densely strigillose to strigose along veins and glabrescent on lamina, base cuneate, apex caudate to acuminate; secondary veins 6–9 pairs, apparently without domatia, tertiary venation visible and subparallel; stipules deciduous, 4–8 mm, densely strigillose, deeply 2-lobed, lobes narrowly triangular, acute. Inflorescences congested to laxly cymose,  $2\text{--}5 \times 3\text{--}7$  cm, densely strigose to strigillose, pedunculate or sessile and tripartite; peduncle 20–25 mm; bracts linear, 1–10, usually caducous; pedicels 1–5 mm. Flowers pedicellate in umbelliform groups of 2 or 3, biology not noted. Calyx moderately to densely strigose; hypanthium portion narrowly ellipsoid to turbinate, ca. 3 mm; lobes linear to narrowly triangular, 5–7 mm, with 1 lobe in 1–3 flowers per inflorescence sometimes expanded into calycophyll, blade lanceolate or ovate,  $3.5\text{--}7 \times 1.5\text{--}2.5$  cm, sparsely strigillose with pubescence usually denser on veins, base cuneate to obtuse, stipe 10–12 mm, apex acute to subacuminate. Corolla yellow or orange-yellow, salverform, outside densely sericeous; tube 26–30 mm, inside densely yellow clavate pubescent in upper part; lobes triangular-lanceolate, 3–4 mm, adaxially densely yellow papillose, acuminate to long acuminate. Berry ellipsoid, ca. 1 cm, sparsely pubescent. Fl. Jun–Jul, fr. Aug–Dec.

• Forests, thickets; ca. 1600 m. Yunnan.

**18. *Mussaenda lotungensis*** Y. H. Chun & W. C. Ko, Fl. Hainan. 3: 581. 1974.

乐东玉叶金花 *le dong yu ye jin hua*

Climbing shrubs; branches terete, sparsely strigillose to glabrescent. Leaves opposite; petiole 4–12 mm, moderately to densely strigillose; blade drying papery, lanceolate or oblong-lanceolate,  $5\text{--}10 \times 1.5\text{--}3$  cm, adaxially glabrous or sparsely strigillose along principal veins, abaxially sparsely strigillose to glabrous with pubescence denser along veins, base cuneate or obtuse, apex acuminate; secondary veins 4 or 5 pairs, tertiary

venation subparallel; stipules deciduous, triangular, 3–6 mm, moderately strigillose, deeply 2-lobed, lobes narrowly triangular to subulate. Inflorescences terminal on main stems and sometimes short lateral stems, congested to somewhat laxly cymose, 1–3 × 1.5–3 cm, moderately to densely strigillose and strigose, pedunculate; peduncles 1.5–2 cm; bracts triangular, 3–3.5 mm; pedicels 1–3 mm. Flowers pedicellate, biology not noted. Calyx with hypanthium portion ellipsoid to subtrubinate, 2–2.5 mm, sparsely strigillose; lobes narrowly triangular, 1.5–2.5 mm, densely strigillose, with 1 lobe on 1–3 flowers per inflorescence expanded into calycophyll, blade narrowly oblong-elliptic to oblanceolate, 3–4 × 0.8–1.2 cm, both surfaces sparsely to moderately strigillose, base acute, stipe 5–16 mm, apex obtuse or acute. Corolla yellow, salverform, outside moderately to densely strigillose; tube 13–15 mm, with yellow clavate pubescence in throat; lobes triangular to ovate, ca. 2 mm, adaxially densely yellow papillose, acuminate. Berry unknown. Fl. Apr–Jun.

- Wet soil in dense forests. Hainan (Ledong).

**19. *Mussaenda macrophylla*** Wallich in Roxburgh, Fl. Ind. 2: 228. 1824.

大叶玉叶金花 *da ye yu ye jin hua*

*Mussaenda hispida* D. Don; *M. kotoensis* Hayata.

Erect or climbing shrubs; branches terete to quadrangular, sparsely to moderately sericeous. Leaves opposite; petiole 4–35 mm, sparsely hirsute to glabrescent; blade drying membranous to papery, green to brownish, paler below when specimen well preserved, elliptic-oblong, elliptic, or ovate, 12–21 × 8–11 cm, both surfaces sparsely strigillose to pilose on lamina and moderately hirsute along principal veins, base cuneate to obtuse, apex acute to acuminate; secondary veins 6–8 pairs, without domatia, tertiary venation reticulate; stipules deciduous, ovate to triangular, 5–8 mm, sparsely brown hirsute to glabrescent, deeply 2-lobed, lobes acute to acuminate. Inflorescences laxly cymose, 6–15 cm, hirsute, sessile with arching lateral axes; bracts lanceolate or 2- or 3-parted, 5–10 mm, obtuse to acuminate. Flowers subsessile, biology not noted. Calyx with hypanthium portion campanulate to obconic, 3–4 mm, densely brown strigose to sericeous; lobes lanceolate, ligulate, or oblanceolate, 4–11 × 1.5–3 mm, often unequal on an individual flower, densely to moderately strigillose to strigose, acute, with 1 lobe on 1 to several flowers in each inflorescence expanded into white calycophyll, blade broadly ovate or rhombic, 5–12 cm, both surfaces sparsely hirsute to glabrescent on lamina and moderately to densely pilosulous to puberulent on principal veins, base obtuse to truncate, stipe 18–37 mm, apex obtuse to shortly acuminate. Corolla orange-yellow to golden yellow, salverform, outside densely sericeous; tube 20–25 mm; lobes ovate, 7–10 mm, acute to acuminate. Berry ellipsoid, 10–15 mm, strigose, lenticellate, calyx limb deciduous. Fl. Jun–Jul, fr. Aug–Nov.

Thickets or forests on mountains; sea level to 1300 m. Guangdong, Guangxi, Taiwan [Indonesia, Malaysia, Philippines].

This species is circumscribed somewhat differently here than by H. H. Hsue and H. Wu (in FRPS 71(1): 287–289. 1999); see comments under *Mussaenda treutleri*.

**20. *Mussaenda membranifolia*** Merrill, Philipp. J. Sci. 23: 267. 1923.

膜叶玉叶金花 *mo ye yu ye jin hua*

Climbing shrubs; branches terete, glabrous. Leaves opposite; petiole 3–30 mm, hispid to strigillose; blade drying membranous, oblanceolate, elliptic, or elliptic-oblong, 9–15 × 2.5–4.5 cm, both surfaces sparsely strigose with pubescence denser along veins abaxially, base obtuse to acute, apex long acuminate; secondary veins 6–9 pairs, tertiary venation visible, reticulate; stipules generally deciduous, triangular, 3–5 mm, strigose, deeply 2-lobed, lobes linear. Inflorescences laxly dichotomous, 10–12 × 10–13 cm, strigillose to glabrescent, pedunculate or apparently sessile and tripartite; peduncles 4.5–6 cm; bracts linear, ca. 3 mm; pedicels 0.5–1 mm. Flowers pedicellate (or borne on higher order inflorescence axes), biology not noted. Calyx glabrous; hypanthium portion subellipsoid, 2–2.5 mm; lobes linear, 3–4 mm, with 1 lobe on 1 flower per inflorescence expanded into calycophyll, blade ovate to elliptic, 3–7.5 × 2–5 cm, strigose along veins on both surfaces, base cuneate to obtuse, stipe ca. 22 mm, apex acute to subacuminate. Corolla white, slenderly salverform, outside sparsely strigose; tube ca. 32 mm, densely yellow clavate pubescent in throat; lobes lanceolate or ovate-lanceolate, ca. 4 mm, adaxially yellow papillose, acute to acuminate. Berry subglobose or ellipsoid, 10–13 × 5–7 mm, glabrous, calyx lobes caducous. Fl. Apr–Jun, fr. Aug–Oct.

- Humid sites in forests. Hainan.

**21. *Mussaenda mollissima*** C. Y. Wu ex H. H. Hsue & H. Wu, Acta Phytotax. Sin. 24: 235. 1986.

多毛玉叶金花 *duo mao yu ye jin hua*

Shrubs, 1–7 m tall; branches terete, densely pale yellow-to brown tomentose, -hirtellous, or -hirsute. Leaves opposite; petiole 9–12 mm, sparsely to moderately strigose, hirtellous, or hirsute; blade drying subleathery, elliptic, broadly elliptic, or broadly ovate, 8–11 × 4–7.2 cm, both surfaces densely pale yellow tomentose to -hirtellous, base cuneate or obtuse, apex acute to shortly acuminate; secondary veins 9 or 10 pairs, apparently without domatia, tertiary venation reticulate to subparallel; stipules deciduous, ovate, ca. 6 mm, densely tomentose, deeply 2-lobed, lobes linear, ca. 3.5 mm. Inflorescence congested-cymose to subcapitate, ca. 4 × 4 cm, densely tomentose to hirtellous; peduncles 3–4 cm; bracts lanceolate, ca. 6 mm. Flowers subsessile, biology not noted. Calyx densely tomentose to hirtellous; hypanthium cylindrical to ellipsoid, 2.5–3.5 mm; lobes narrowly lanceolate to narrowly triangular, 3–4 mm, with 1 lobe in 1–4 flowers per inflorescence sometimes expanded into calycophyll, blade elliptic to obovate, ca. 5.5 × 2.8 cm, densely tomentose, base acute, stipe ca. 14 mm, apex obtuse to acute. Corolla orange, salverform, outside densely yellowish brown villous; tube ca. 22.5 mm, inside densely yellow clavate pubescent in upper part; lobes ovate, ca. 4 mm, adaxially densely yellow papillose, acuminate. Berry ellipsoid, ca. 12 × 9 mm, sparsely tomentose to hirtellous. Fl. May, fr. Jun.

- Forest margins, roadsides. S Yunnan.

**22. *Mussaenda multinervis*** C. Y. Wu ex H. H. Hsue & H. Wu, *Acta Phytotax. Sin.* 24: 237. 1986.

多脉玉叶金花 *duo mai yu ye jin hua*

Shrubs, 2–3 m tall; branches terete to angled, densely white pubescent to glabrescent. Leaves opposite; petiole ca. 3 cm, sparsely pubescent; blade drying membranous, adaxially drying pale green, abaxially gray, broadly elliptic or broadly ovate, 16–22 × 8.5–12 cm, adaxially sparsely appressed pubescent with pubescence denser on principal veins, abaxially glabrescent except densely appressed pubescent on principal veins, base acute, apex acute; secondary veins 11 or 12 pairs; stipules ovate-lanceolate, ca. 13 mm, acuminate and shortly 2-lobed. Inflorescence congested-cymose, ca. 4 × 8 cm, densely pale gray pilose, pedunculate or sessile and tripartite; bracts lanceolate, ca. 9 mm; pedicels ca. 1 mm. Flowers pedicellate, biology not noted. Calyx sparsely pubescent; hypanthium portion urceolate to ellipsoid, ca. 2.5 mm; lobes lanceolate, ca. 2 mm, with 1 lobe in ca. 3 flowers per inflorescence expanded into calycophyll, blade ovate, ca. 4 × 2.1 cm, densely pubescent along veins on both surfaces, base broadly cuneate, stipe ca. 19 mm, apex acute. Corolla pale blue, salverform, outside densely pubescent; tube ca. 23 mm, inside densely yellow clavate puberulent at upper part; lobes orbicular-ovate, ca. 2.5 mm, adaxially sparsely yellow papillose, mucronate. Berry globose, ca. 5 × 5 mm. Fl. May.

• Thickets, jungles; ca. 1500 m. S Yunnan.

The blue flowers, the lack of barbate pubescence in the throat of the tubular corolla (according to the protologue figure), and the apparently exerted stigmas (all these features are illustrated or described in the protologue) are quite anomalous features in *Mussaenda*.

**23. *Mussaenda parviflora*** Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 3: 110. 1867.

小玉叶金花 *xiao yu ye jin hua*

*Mussaenda albiflora* Hayata; *M. parviflora* var. *formosana* Matsumura; *M. taihokuensis* Masamune.

Climbing shrubs or lianas; branches terete, sparsely to densely strigillose or glabrescent. Leaves opposite; petiole 1–2.3 cm, sparsely to densely strigillose; blade drying thickly papery, ovate, elliptic, or lanceolate, 7–15 × 2.3–6 cm, adaxially glabrous or strigillose on principal veins, abaxially sparsely to densely strigillose to appressed villous especially along veins, base acute to obtuse or subrounded, apex acuminate to caudate; secondary veins 5–7 pairs, tertiary venation rather finely reticulate; stipules usually deciduous, triangular, 5–7 mm, moderately to densely strigillose, deeply 2-lobed, lobes narrowly triangular to linear. Inflorescences laxly cymose, 4–8 × 3–8 cm, terminal and often in uppermost leaf axils, axes often somewhat scorpioid, sparsely to densely strigillose, pedunculate; peduncle 2–5 cm; bracts broadly triangular to linear, 1–7 mm, often caducous; pedicels 2–5 mm. Flowers pedicellate (or borne on higher order inflorescence axes), floral biology not noted. Calyx sparsely to densely strigillose; hypanthium portion ellipsoid to turbinate, 1.5–5 mm; lobes linear to narrowly triangular, 3–6 mm, with 1 lobe on 1–3 flowers of some inflorescences expanded into white calycophyll, blade broadly ovate or elliptic, 3–4.5 cm,

sparsely strigillose to glabrescent, base obtuse to rounded, stipe 4–10 mm, apex obtuse to shortly acuminate. Corolla yellow, salverform to tubular-funnelform, outside puberulent to glabrous; tube 5–8 mm, densely yellow clavate pubescent in throat; lobes ovate, 2–3 mm, abaxially densely yellow papillose, acute to cuspidate. Berry ellipsoid to subglobose, 10–15 mm, glabrescent, calyx limb caducous, with pedicels sometimes elongating, to 12 mm. Fl. Mar–May, fr. Aug–Dec and Jan of following year.

Forests, thickets; 100–1700 m. Guangdong, Taiwan [Japan].

**24. *Mussaenda pingbianensis*** C. Y. Wu ex H. H. Hsue & H. Wu, *Acta Phytotax. Sin.* 24: 233. 1986.

屏边玉叶金花 *ping bian yu ye jin hua*

Shrubs, ca. 3 m tall; branchlets glabrous. Leaves opposite; petiole ca. 6 mm, sparsely appressed pubescent; blade drying papery, adaxially shiny green, abaxially pale, elliptic or ovate, 7–8.5 × 2.5–3.2 cm, adaxially glabrous, abaxially pubescent along veins, base cuneate, apex acuminate; secondary veins ca. 7 pairs; stipules caducous to persistent, ovate, ca. 3.5 mm, pubescent, deeply 2-lobed, lobes narrowly triangular. Inflorescences congested-cymose, ca. 6 × 10 cm, many flowered, densely pubescent, sessile and tripartite or pedunculate; peduncles 1–2 cm; bracts lanceolate, 8–12 mm, densely pubescent. Flowers subsessile, biology not noted. Calyx sparsely pubescent; hypanthium portion turbinate, ca. 3 mm; lobes linear to narrowly triangular, ca. 8.5 mm, with 1 lobe in ca. 4 flowers per inflorescence expanded into white calycophyll, blade ovate to obovate, 5.5–6 cm, base obtuse to acute, stipe 10–14 mm, apex obtuse to shortly acuminate. Corolla orange to orange-red, salverform, outside sparsely to densely pubescent; tube ca. 14 mm, inside densely yellow clavate pubescent in upper part; lobes ovate, ca. 2.5 mm, adaxially densely yellow papillose, acuminate to mucronate. Berry unknown. Fl. May.

• Valleys. SE Yunnan.

The protologue described the stipules as caducous, but the protologue figure showed them as persistent. The specific epithet was written as “*pingpiensis*” by H. H. Hsue and H. Wu (in *FRPS* 71(1): 299. 1999), but it was originally published with the spelling above.

**25. *Mussaenda pubescens*** W. T. Aiton, *Hort. Kew.*, ed. 2, 1: 372. 1810.

玉叶金花 *yu ye jin hua*

*Mussaenda bodinieri* H. Léveillé & Vaniot; *M. pubescens* var. *alba* X. F. Deng & D. X. Zhang; *M. pubescens* f. *clematidiflora* Chun ex H. H. Hsue & H. Wu.

Climbing shrubs, often extensively twining; branches terete, densely strigillose and sometimes also villosulous, sometimes with congested groups of leaves borne on reduced axillary buds. Leaves opposite or perhaps rarely whorled; petiole 3–8 mm, moderately to densely strigillose; blade drying membranous or thinly papery, ovate-oblong, ovate-lanceolate, elliptic, lanceolate, or oblanceolate, 2–9 × 1–4 cm, adaxially sparsely strigillose to glabrescent on lamina and moderately to densely strigillose on veins, abaxially sparsely to densely strigillose with pubescence denser on veins, base acute to obtuse, apex

acute to slightly acuminate; secondary veins 4–7 pairs, tertiary venation reticulate; stipules usually deciduous, triangular, 3–7 mm, moderately to densely strigillose, deeply 2-lobed, lobes narrowly triangular to subulate. Inflorescences terminal, subcapitate to congested-cymose, unbranched or sometimes tripartite, 1–3 × 1–3 cm, densely strigillose to villosulous, sessile to pedunculate; peduncles 0.1–1.4 cm; bracts linear, 3–5 mm; pedicels to 1 mm. Flowers sessile or infrequently pedicellate, biology not noted. Calyx moderately to densely strigillose to strigose; hypanthium portion ellipsoid to turbinate, 1.5–3 mm; lobes linear to narrowly triangular, 3–6 mm, with 1 (or 5) lobes on 1–3 flowers per inflorescence of some plants expanded into white calycophyll, blade elliptic, broadly elliptic, ovate, or lanceolate, (0.4–)2.5–5 × (0.2–)2–3.5 cm, sparsely to moderately puberulent or strigillose on both surfaces, base acute to rounded, stipe 3–28 mm, apex obtuse to acute. Corolla white or yellow, salverform, outside moderately to densely strigillose or strigose; tube 11–20 mm, densely clavate pubescent in throat; lobes oblong-lanceolate to lanceolate, 2.5–4 mm, adaxially densely golden yellow papillose, acuminate. Berry subglobose, 8–10 × 6–7.5 mm, sparsely strigillose to glabrescent, smooth or finely lenticellate, calyx limb caducous, sometimes stipitate with stipe to 5 mm. Fl. Apr–Jul, fr. Jun–Dec.

Thickets in ravines, on hill slopes, or at village margins or roadsides; below 100–900 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Taiwan, Zhejiang [Vietnam].

This species is widespread, common, and morphologically variable. H. H. Hsue and H. Wu (in FRPS 71(1): 296. 1999) described the leaf arrangement as opposite or whorled, but only opposite leaves have been seen on the numerous specimens studied.

One plant from Guangdong (Gaoyao) has all five of the calyx lobes petaloid and enlarged on each flower, though these structures are smaller than calycophylls that are borne singly on a flower. These plants have been separated as *Mussaenda pubescens* f. *clematidiflora*; this case was studied by Deng and Zhang (Acta Phytotax. Sin. 44: 611. 2006), who concluded that this plant is better regarded as developmentally abnormal and formally synonymized this name here. Plants with white corollas have been separated as *M. pubescens* var. *alba*; at least a third of the specimens of *M. pubescens* studied belong to this group, and considering that this color variation is common in other Rubiaceae species the variety is not recognized taxonomically here.

**26. *Mussaenda sessilifolia*** Hutchinson in Sargent, Pl. Wilson. 3: 397. 1916.

无柄玉叶金花 wu bing yu ye jin hua

Climbing shrubs; branches subterete, pale red- or red villous. Leaves opposite; petiole 1–3 mm, villous; blade drying thickly papery, oblong-elliptic, 6–10 × 3–4.5 cm, densely red villous on both surfaces with pubescence denser on principal veins abaxially, base rounded to subtruncate, apex subacute then abruptly narrowed and acuminate; secondary veins 9 or 10 pairs; stipules generally deciduous, ca. 8 mm, densely villous, deeply 2-lobed, lobes linear-subulate. Inflorescence congested-cymose with developed principal axes, 1.5–7.5 × 1.5–4.5 cm, densely villous, pedunculate; peduncles 0.75–2.2 cm; bracts subulate, ca. 8 mm. Flowers subsessile, biology not noted. Calyx densely villous; hypanthium portion ca. 3 mm; lobes subulate, 2–3.5 mm, with 1 lobe of 1–5 flowers of each inflores-

cence expanded into calycophyll, blade broadly ovate, 5–8.5 × 3–6.5 cm, slightly pubescent, base rounded, stipe ca. 15 mm, apex obtuse. Corolla yellow, salverform, outside densely villous; tube ca. 17 mm; lobes ovate, shortly acuminate. Berry not seen. Fl. spring.

• Forests; ca. 1300 m. S Yunnan.

The protologue described the calyx lobes as ca. 2 mm, while H. H. Hsue and H. Wu (in FRPS 71(1): 289. 1999) described them as ca. 3.5 mm.

**27. *Mussaenda shikokiana*** Makino, Bot. Mag. (Tokyo) 18: 44. 1904.

大叶白纸扇 da ye bai zhi shan

*Mussaenda anomala* H. L. Li; *M. esquirolii* H. Léveillé; *M. taiwaniana* Kanehira; *M. wilsonii* Hutchinson.

Erect or climbing shrubs, 1–3 m tall; branches terete, densely strigillose and sometimes also strigose, villosulous, or tomentulose to occasionally glabrescent. Leaves opposite; petiole 1.5–3.5 cm, moderately to densely strigillose; blade drying thinly papery, adaxially green to pale green, abaxially pale gray to whitened, broadly ovate, ovate, or broadly elliptic, 6–20 × 3.5–13 cm, both surfaces sparsely strigillose to glabrescent with pubescence denser along veins, base cuneate or usually obtuse to rounded, apex abruptly acuminate or acute; secondary veins 7–10 pairs, tertiary venation regularly areolate; stipules caducous, triangular to ovate-lanceolate, 6–10 mm, sparsely to densely strigillose, often deeply 2-lobed, segments acute. Inflorescences subcapitate becoming laxly cymose, 2–5 × 2–7 cm, densely strigillose and/or tomentulose, many flowered, sessile and tripartite or pedunculate; peduncle 1.5–3 cm; bracts deciduous, ovate, lanceolate, or bilobed, 4–10 mm, sparsely to moderately strigose to strigillose; pedicels 1–4 mm. Flowers pedicellate, biology not noted. Calyx with hypanthium portion turbinate to ellipsoid, 2.5–5 mm, densely strigose; lobes subleaf-like, white, lanceolate to ligulate, 5–10 × 2–2.5 mm, moderately to densely strigillose to strigose, acute to long acuminate, with 1 lobe of 1 or few flowers on each inflorescence (or rarely all lobes of all flowers, *M. anomala*) usually expanded into calycophyll, blade obovate, ovate, or elliptic, (2–)3–4.5 cm, glabrescent on lamina and densely villosulous to strigillose on veins, base cuneate, stipe 5–15(–25) mm, apex acute to shortly acuminate. Corolla yellow, salverform-funnelform, outside densely sericeous; tube 9–14 mm; lobes ovate, 2–3 mm, abruptly acuminate. Infructescences to 6 × 12 cm. Berry subglobose to ellipsoid, ca. 10 × 10 mm, moderately to densely strigose, sparsely lenticellate, calyx limb deciduous. Fl. May–Jul, fr. Jul–Oct.

Roadsides or sparse forests on hills; 100–1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Zhejiang [Japan].

The names *Mussaenda shikokiana* and *M. taiwaniana* were not cited by H. H. Hsue and H. Wu (in FRPS 71(1): 283–306. 1999). No differences are apparent between *M. shikokiana* and *M. esquirolii*, as noted by Japanese taxonomists (in herb.), and the latter are accordingly synonymized here.

*Mussaenda anomala* was described based on one specimen that appears to represent only an aberrant form of *M. shikokiana* with all its

calyx lobes expanded and petaloid. This name was formally synonymized by Deng and Zhang (Acta Phytotax. Sin. 44: 609–611. 2006, under *M. esquirolii*), who reported visiting the type locality where they were unable to find a similar plant.

**28. *Mussaenda simpliciloba*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 147. 1925.

单裂玉叶金花 dan lie yu ye jin hua

Climbing shrubs; branches subterete, grayish brown tomentose becoming glabrescent. Leaves opposite; petiole to 4 cm, glabrous; blade drying papery, adaxially dark green, abaxially pale green, broadly ovate or elliptic-ovate, 6–15 × 3–7.5 cm, both surfaces densely pubescent and villous along veins, base acute or rounded, apex acuminate; secondary veins 8 or 9 pairs; stipules triangular, ca. 6 mm, abaxially hispidulous, adaxially densely hirsute, 2-lobed. Inflorescences laxly cymose; bracts lanceolate; pedicels 2–3 mm. Flowers sessile or lateral flowers pedicellate (or on expanded axes), biology not noted. Calyx with hypanthium campanulate, ca. 4 mm, sparsely pubescent; lobes linear-lanceolate, 5–7 mm, densely pubescent, with ?1 lobe on 1(or ?more) flower per inflorescence expanded into calycophyll, blade ovate, ca. 6 × 5–6 cm, densely pubescent along veins, base obtuse, stipe ca. 2 mm, apex acute. Corolla orange-yellow, salverform, outside pubescent; tube ca. 23 mm, densely yellow clavate pubescent inside upper part; lobes rounded, ca. 5 mm, adaxially yellow papillose. Berry globose, 8–9 × 8–9 mm, calyx limb deciduous. Fl. Jun–Jul, fr. Aug.

• Thickets in valleys or at riversides; 1200–1400 m. Guizhou, Sichuan, Yunnan.

The rounded corolla lobes described for this species are very unusual in *Mussaenda*.

**29. *Mussaenda treutleri*** Stapf, Bot. Mag. 135: t. 8254. 1909.

贡山玉叶金花 gong shan yu ye jin hua

Erect or climbing shrubs; branches terete, moderately to densely villous or hirsute. Leaves opposite; petiole 4–10 mm, hirsute or villous; blade drying membranous to papery, green to brownish, paler below when specimen well preserved, elliptic to ovate, 2.5–21 × 4–11 cm, both surfaces moderately strigillose to pilose on lamina and moderately to densely strigillose to hirsute along principal veins, base cuneate to obtuse, truncate,

or rounded, apex acute to acuminate; secondary veins 6–8 pairs, without domatia, tertiary venation reticulate; stipules generally persistent, ovate, 7–12 × 6–12 mm, moderately to densely hirsute or pilose, entire to deeply 2-lobed, segments acute to acuminate. Inflorescences subcapitate to congested-cymose or sometimes with axes later elongating, 2–6 × 2–8 cm, hirsute, sessile to subsessile; bracts lanceolate, 0.5–1 cm, obtuse to acuminate or 2- or 3-parted. Flowers subsessile, biology not noted. Calyx with hypanthium portion campanulate to obconic, 3–4 mm, densely brown strigose to -sericeous; lobes lanceolate, ligulate, or oblanceolate, 7–18 × 3–4 mm, often markedly unequal on an individual flower, densely brown strigillose to -strigose, acute, with 1 lobe on 1 to several flowers on each inflorescence sometimes expanded into white calycophyll, blade ovate or rhombic, 5–7 × 3.5–4 cm, both surfaces sparsely hirsute to glabrescent on lamina and moderately to densely pilosulous to puberulent on principal veins, base obtuse to truncate, stipe 25–37 mm, apex obtuse to shortly acuminate. Corolla orange-yellow, salverform, outside densely spreading villous; tube ca. 22 mm; lobes ovate, 5–7 mm (to 10 mm in other regions), acute to acuminate. Berry ellipsoid, 10–12 × 10–12 mm, strigose, lenticellate, calyx limb deciduous. Fl. Jul–Sep.

Thickets or dense forests on mountains; [600–]1000–1500[–2000] m. Yunnan [Bhutan, NE India, Nepal].

The description of the fruit here is based on specimens from outside our flora region.

This species is similar to *Mussaenda macrophylla*, and in the protologue *M. treutleri* was explicitly separated from plants commonly called *M. macrophylla*, both in the wild and in cultivation; in fact, the protologue noted that *M. treutleri* was already widely distributed in cultivation at that time incorrectly under the other name. *Mussaenda treutleri* subsequently has apparently still been confused with or combined with *M. macrophylla*, including by recent authors (e.g., Springate et al., Fl. Bhutan 2(2): 783. 1999). *Mussaenda treutleri* is here circumscribed somewhat differently than by H. H. Hsue and H. Wu (in FRPS 71(1): 301. 1999): the plants from montane Yunnan and adjacent regions with broad, generally persistent stipules were separated by Stapf from *M. macrophylla* and included in *M. treutleri*, and this distinction is followed here.

The illustration presented for *Mussaenda treutleri* by Fu et al. (Higher Pl. China 10: 575. 2004) is incorrect; this figure shows a species of Asteraceae.

## 57. MYCETIA Reinwardt, Syll. Pl. Nov. 2: 9. 1825.

腺萼木属 xian e mu shu

Chen Tao (陈涛); Charlotte M. Taylor

*Adenosacme* Wallich ex Miquel, nom. illeg. superfl.

Small shrubs, unarmed, usually rather succulent; bark often straw-yellow to nearly white, soft, often corky. Raphides present. Leaves opposite, sometimes weakly to markedly anisophyllous, frequently somewhat asymmetrical or falcate, apparently without domatia, often with margins crisped; tertiary venation often closely reticulate and prominulous below and frequently also above; stipules persistent with leaves or caducous, interpetiolar, triangular or sometimes leaflike, often well developed, sometimes with glands. Inflorescences terminal, pseudoaxillary, cauline, or perhaps sometimes axillary, cymose to paniculiform or subcapitate, several to many flowered, pedunculate, bracteate or bracts reduced; bracts sometimes leaflike, sometimes glandular. Flowers pedicellate, bisexual, at least usually distylous. Calyx limb deeply (4 or)5(or 6)-lobed; lobes frequently somewhat unequal, usually with sessile to stalked marginal glands. Corolla yellow or white, tubular, funnelform, salverform, or campanulate, sometimes gibbous at base, inside glabrous or usually pubescent; lobes (4 or)5(or 6), in bud valvate-induplicate. Stamens (4 or)5(or 6), inserted in throat or above mid-

dle of corolla tube in short-styled flowers, inserted near base of corolla tube in long-styled flowers; filaments short or reduced; anthers apparently dorsifixed, included or partially exerted. Ovary 2(–5)-celled, ovules numerous in each cell on fleshy axile placentas; stigmas 2(–5), included in short-styled flowers or exerted in long-styled flowers. Fruit white or perhaps brown, baccate or perhaps capsular and irregularly dehiscent, leathery to fleshy or spongy, subglobose, with calyx limb persistent; seeds numerous, small, angled, with testa somewhat granular.

About 45 species: tropical and subtropical Asia; 15 species (ten endemic) in China.

This genus was reviewed for Thailand by Fukuoka (Acta Phytotax. Geobot. 40: 107–118. 1989), for the Indian subcontinent by Deb (Bull. Bot. Surv. India 28(1–4): 114–132. 1986), and for China by H. S. Lo (Guihaia 11: 105–116. 1991). *Mycetia* is said to belong to Iseretiae but also, anomalously, to have raphides. H. S. Lo (in FRPS 71(1): 314. 1999) reported that the inflorescences may sometimes be axillary, but this has not been noted by other authors; this description may be using the term “axillary” for the position elsewhere considered “pseudoaxillary.” Lo also reported that the anthers may sometimes be partially exerted, which has not been reported by other authors nor seen on specimens studied by us.

- 1a. Pedicels mostly or all 9–20 mm.
  - 2a. At least some nodes with markedly anisophyllous leaves, larger leaf 3–10 × (or more) as long as smaller leaf; calyx lobes 2.5–3 mm; corolla tube 12–16 mm ..... 7. *M. gracilis*
  - 2b. Leaves generally isophyllous, larger leaf at most 2 × as long as smaller leaf; calyx lobes 0.8–6 mm; corolla tube 5–10 mm (unknown in *M. yunnanica*).
    - 3a. Calyx lobes 3–6 mm, markedly longer than length of hypanthium together with unlobed basal part of limb ..... 2. *M. bracteata*
    - 3b. Calyx lobes 0.8–3 mm, shorter than or ± equal to length of hypanthium together with unlobed basal part of limb.
      - 4a. Inflorescences terminal and pseudoaxillary; calyx lobes 0.8–1 mm ..... 4. *M. brevisepala*
      - 4b. Inflorescences pseudoaxillary or possibly axillary at lower stem nodes, often below leaves; calyx lobes 2.5–3 mm ..... 15. *M. yunnanica*
- 1b. Flowers subsessile or with pedicels mostly or all 8 mm or shorter.
  - 5a. At least some calyx limbs and sometimes also bracts bearing few to numerous marginal glands on short to well-developed flexuous stipules.
    - 6a. Stipules elliptic-oblong, obovate, or suborbicular and narrowed to stipitate at base, at base less than 1/2 as wide as maximum width; calyx lobes with 1–3 pairs of glands ..... 14. *M. sinensis*
    - 6b. Stipules lanceolate, oblong-lanceolate, or ovate, at base straight or narrowed but more than 2/3 as wide as maximum width; calyx lobes with numerous stipitate glands.
      - 7a. Corolla with tube 4–6 mm; leaves moderately to densely hispidulous or hirtellous adaxially ..... 9. *M. hirta*
      - 7b. Corolla with tube 7–14 mm; leaves glabrous or sparsely strigillose or hispidulous adaxially.
        - 8a. Petioles 1–15 mm; calyx lobes 1–1.5 mm; corolla tube 7–10 mm ..... 6. *M. glandulosa*
        - 8b. Petioles 6–60 mm; calyx lobes 1.5–4 mm; corolla tube 10–14 mm ..... 11. *M. longifolia*
  - 5b. Calyx limbs and bracts without raised or stipitate marginal glands.
    - 9a. Calyx lobes 1.5–2 mm; corolla tube 5–7 mm (mature corollas unknown in *M. hainanensis*).
      - 10a. Calyx densely hirtellous; flowers sessile or subsessile; stipules ovate, not strongly contracted at base ..... 8. *M. hainanensis*
      - 10b. Calyx glabrous; flowers pedicellate; stipules elliptic-oblong, obovate, or suborbicular, contracted to stipitate at base ..... 14. *M. sinensis*
    - 9b. Calyx lobes 3–6 mm; corolla tube 7–17 mm (corolla unknown in *M. macrocarpa*).
      - 11a. Stipules broadly elliptic, subovate, or suborbicular, 5–10 mm.
        - 12a. Leaves glabrous on both surfaces; fruit ca. 6 mm; Yunnan ..... 12. *M. macrocarpa*
        - 12b. Leaves strigillose to hirtellous abaxially; fruit 7–8 mm; Xizang ..... 13. *M. nepalensis*
      - 11b. Stipules triangular, lanceolate, suborbicular, or ovate, 3–6 mm.
        - 13a. Corolla tube 7–8 mm; leaves subsessile or with petioles up to 15 mm.
          - 14a. Leaves subsessile; inflorescences several flowered (i.e., with 5–7 flowers) ..... 3. *M. brevipes*
          - 14b. Leaves with petioles 3–15 mm; inflorescences many flowered (i.e., with 9–40 flowers) ..... 5. *M. coriacea*
        - 13b. Corolla tube 10–17 mm; leaves with petioles 10–70 mm.
          - 15a. Flowers sessile or subsessile; petioles 10–20 mm ..... 1. *M. anlongensis*
          - 15b. Flowers pedicellate with pedicels 2.5–7 mm; petioles 20–70 mm ..... 10. *M. longiflora*

**1. *Mycetia anlongensis* H. S. Lo, Guihaia 11: 108. 1991.**

安龙腺萼木 an long xian e mu

Shrubs, ca. 40 cm tall; branches glabrous or sparsely villosulose. Leaves generally isophyllous; petiole 1–2 cm, densely

villosulose (var. *anlongensis*) or villous and sometimes with black glandular hairs at each side (var. *multiciliata*); blade drying membranous, elliptic-oblong or long elliptic, 12–17 × 5–7 cm, adaxially sparsely strigillose (var. *anlongensis*) or sparsely hirsute (var. *multiciliata*), abaxially densely villosulose at least

along midrib and lateral veins (var. *anlongensis*) or sparsely hirsute (var. *multiciliata*), base cuneate, apex acute to shortly or long acuminate; secondary veins 14–18 pairs; stipules persistent, suborbicular or elliptic, 5–6 mm, obtuse. Inflorescences terminal, congested-cymose, several to many flowered; peduncle ca. 5 mm. Flowers sessile to subsessile. Calyx glabrescent; hypanthium portion obconic, ca. 2 mm; limb lobed nearly to base; lobes narrowly triangular, ca. 6 mm. Corolla yellow, tubular, outside glabrous; tube 10–13 mm (var. *multiciliata*) or 15–17 mm (var. *anlongensis*), sparsely villous inside; lobes triangular, ca. 3 mm. Berries unknown. Fl. Apr–May.

• Streamsides in dense forests, sometimes on limestone hill slopes; 1200–1700 m. Guangxi, Guizhou.

H. S. Lo (in FRPS 71(1): 316. 1999) intended to describe two varieties of this species but did not provide a validating Latin description or diagnosis or designate a type for *Mycetia anlongensis* var. *multiciliata*. Chen et al. (J. Fairylake Bot. Gard. 7(2): 21. 2008) have re-evaluated these taxa with new collections; in particular, they noted that they cannot confirm the description by H. S. Lo of black glandular trichomes on the petioles in var. *multiciliata*, a character not otherwise reported from this genus and considered questionable.

- 1a. Leaves shortly acuminate at apex; petioles without black glandular hairs at base; corolla 18–20 mm ..... 1a. var. *anlongensis*
- 1b. Leaves long acuminate at apex, with tip 1–3 cm; petioles sometimes with black glandular hairs at base; corolla 13–15 mm ..... 1a. var. *multiciliata*

#### 1a. *Mycetia anlongensis* var. *anlongensis*

安龙腺萼木(原变种) an long xian e mu (yuan bian zhong)

Petiole without black glandular hairs at base on each side; leaf blade adaxially sparsely strigillose, abaxially densely villous at least along midrib and lateral veins, shortly acuminate at apex. Corolla 18–20 mm. Fl. May.

• Streamsides in dense forests; 1200–1700 m. Guizhou (Anlong).

1b. *Mycetia anlongensis* var. *multiciliata* H. S. Lo ex Tao Chen, K. J. Yan & D. Fang, J. Fairylake Bot. Gard. 7(2): 21. 2008.

那坡腺萼木 na po xian e mu

Petiole sometimes with black glandular hairs at each side; leaf blade sparsely hirsute on both surfaces, long acuminate at apex, with tip 1–3 cm. Corolla 13–15 mm. Fl. Apr.

• Limestone hill slopes; ca. 1200 m. Guangxi (Napo).

2. *Mycetia bracteata* Hutchinson in Sargent, Pl. Wilson. 3: 409. 1916.

长苞腺萼木 chang bao xian e mu

Shrubs, ca. 1 m tall; branches puberulent becoming glabrescent. Leaves generally isophyllous; petiole 0.5–1 cm, puberulent; blade drying thinly leathery to membranous, long oblanceolate or lanceolate, 9–16 × 1.5–4 cm, both surfaces glabrous except puberulent along principal veins, base attenuate or acute, apex acuminate; secondary veins 16–20 pairs; stipules

persistent, broadly triangular-ovate, 7–10 mm, veined, stiffly papery, puberulent, acute. Inflorescences terminal, laxly cymose, several flowered, puberulent; branched portion to 7 cm; bracts persistent, lanceolate or leaflike, to 1.5 cm, acuminate or shortly acuminate; pedicels 10–15 mm. Flowers pedicellate. Calyx glabrescent; hypanthium portion obconic, ca. 2 mm; limb deeply lobed; lobes 5 or 6, filiform, 3–6 mm. Corolla yellow, in bud glabrous, ca. 10 mm. Berries not seen.

• About 1300 m. Yunnan (Simao).

3. *Mycetia brevipes* F. C. How ex S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 188. 1999.

短柄腺萼木 duan bing xian e mu

Shrubs, ca. 1 m tall. Branchlets glabrous. Leaves generally isophyllous, subsessile; blade drying membranous and fuscous or dark brown, elliptic or obovate, 12–15 × 4.5–6.5 cm, both surfaces glabrous or puberulent on principal veins, base cuneate to obtuse, apex acuminate to caudate; secondary veins 8–11 pairs; stipules persistent, ovate, 4–5 mm, membranous. Inflorescences terminal, congested-cymose, 5–7-flowered; peduncle ca. 1.6 cm; bracts linear, ca. 3 mm; pedicels 1–3 mm. Flowers pedicellate. Calyx puberulent; hypanthium portion obconic, ca. 1.8 mm; limb lobed nearly to base; lobes linear-lanceolate, ca. 3 mm. Corolla yellow, tubular, outside glabrous; tube ca. 7 mm, sparsely villous inside; lobes broadly ovate-triangular, ca. 1.5 mm. Berries not seen. Fl. Sep.

• Bamboo forests; ca. 1500 m. NW Yunnan.

4. *Mycetia brevisepala* H. S. Lo, Guihaia 11: 113. 1991.

短萼腺萼木 duan e xian e mu

Shrubs, 0.5–1.5(–2) m tall; branches densely puberulent or strigillose to glabrous. Leaves generally isophyllous to slightly anisophyllous; petiole 0.2–1 cm, puberulent; blade drying thinly leathery to papery and grayish green, elliptic-oblong, elliptic, obovate, or oblong-lanceolate, 6–18 × 2.5–6 cm, adaxially glabrous and rather shiny, abaxially glabrescent or densely puberulent to hispidulous on principal veins, base cuneate to obtuse, apex acuminate; secondary veins 7–12 pairs; stipules quickly deciduous, narrowly triangular, 3–6 mm, densely puberulent to strigillose, acuminate. Inflorescences terminal becoming displaced to pseudoaxillary, laxly cymose, several flowered, puberulent to glabrous; peduncle 1–2 cm; branched portion 3–5 × 5–8 cm; bracts narrowly triangular to lanceolate, 1–3 mm; pedicels 9–20 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion turbinate to subglobose, 1.2–2 mm; limb deeply lobed; lobes triangular to narrowly triangular, 0.8–1 mm. Corolla yellow, narrowly tubular, outside glabrous; tube ca. 5 mm, inside sparsely pubescent; lobes subtriangular, ca. 2 mm. Berries subglobose, 3.5–4 mm in diam. Fl. Aug–Sep, fr. Dec.

Dense forests; 200–1100 m. Yunnan [N Vietnam].

5. *Mycetia coriacea* (Dunn) Merrill, Philipp. J. Sci., C, 13: 159. 1918.

革叶腺萼木 ge ye xian e mu

*Adenosacme coriacea* Dunn, Bull. Misc. Inform. Kew, Addit. Ser. 10: 130. 1912.

Shrubs, 1–2 m tall; branches glabrous. Leaves isophyllous to slightly anisophyllous; petiole 3–15 cm, glabrous; blade drying thinly leathery or subpapery, lanceolate, oblanceolate, or obovate, 6–15 × 2–5.5 cm, glabrous on both surfaces, base acuminate to cuneate, apex acute or acuminate; secondary veins 8–11 pairs; stipules persistent, triangular to ovate, 3–5 mm, glabrous except sometimes ciliolate marginally, acute to acuminate. Inflorescences terminal and/or pseudoaxillary, cymose, many flowered, glabrous; peduncle 0.8–3.5 cm; branched portion 2–6 × 3–7 cm; bracts reduced or triangular, 0.5–3 mm; pedicels 0.5–3 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion turbinate to obconic, 1.5–2.5 mm; limb lobed to base; lobes narrowly triangular to linear, 2.5–6 mm, sometimes unequal. Corolla pale yellow or white, tubular, outside glabrescent; tube ca. 8 mm, villous at throat; lobes triangular, ca. 2 mm. Fruit capsular, dry, ovoid to subglobose, 2.5–4 mm, irregularly dehiscent or regularly loculicidal through disk portion, with calyx lobes elongating, up to 15 mm. Fl. Apr, fr. Sep.

• Roadsides or streamsides in dense forests; 700–1200 m. S Fujian, E Guangdong.

**6. *Mycetia glandulosa*** Craib, Bull. Misc. Inform. Kew 1914: 125. 1914.

腺萼木 xian e mu

Shrubs, ca. 1 m tall; branches villosulous to hirtellous becoming glabrescent. Leaves isophyllous or slightly anisophyllous; petiole 1–8 mm, moderately to densely villosulous or hirtellous; blade drying papery, oblanceolate, oblong-oblanceolate, narrowly elliptic, or narrowly lanceolate, 7–22 × 2–5.5 cm, adaxially sparsely hispidulous, abaxially moderately to densely hirtellous, base cuneate to attenuate and often long decurrent, apex acuminate; secondary veins (7–)12–23 pairs; stipules persistent, lanceolate, 4–10 mm, densely villosulous to glabrescent, acuminate. Inflorescences terminal, congested to laxly cymose, many flowered, hirtellous to glabrous; peduncles 0.4–1.4 cm; branched portion 3–5 × 4–8 cm; bracts ovate to reniform, 1–3 mm, marginally ciliate or lacerate with stipitate glands; pedicels 1.5–5 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion hemispherical to subglobose, ca. 1.5 mm; limb deeply lobed; lobes ovate to lanceolate or triangular, 1–1.5 mm, marginally fimbriate or ciliate with stipitate glands, these 0.2–0.6 mm. Corolla white or yellow, tubular, outside pilose or glabrous; tube 7–10 mm, villous inside; lobes triangular, 1–1.5 mm. Berries subglobose, ca. 5 mm in diam., subglabrous. Fl. May, fr. autumn.

Forests; 900–1500 m. Yunnan [N Thailand].

**7. *Mycetia gracilis*** Craib, Bull. Misc. Inform. Kew 1914: 125. 1914.

纤梗腺萼木 xian geng xian e mu

Shrubs, ca. 1.5 m tall; branches densely puberulent or strigillose becoming glabrescent. Leaves markedly anisophyllous; petiole 0.1–0.5 cm, densely puberulent to strigillose; blade drying thinly leathery, oblanceolate, elliptic, or narrowly lanceolate, larger 5–15 × 2–3.5 cm and smaller 1–4 × 0.5–1.5 cm, glabrous throughout or puberulent abaxially on principal veins, base acute to cuneate, apex acute to acuminate; secondary veins

8–14 pairs; stipules persistent, narrowly triangular to lanceolate, 4–8 mm, puberulent to glabrescent, acuminate. Inflorescences terminal and/or pseudoaxillary, laxly cymose, several flowered, puberulent to glabrescent; peduncle 1–2.5 cm; branched portion 2–9 × 2–8 cm; bracts linear, 1.5–3 mm; pedicels 9–15 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion turbinate to obovoid, 2–2.5 mm; limb lobed to base; lobes linear to narrowly triangular, 2.5–3 mm. Corolla yellow, tubular, outside glabrous; tube 12–16 mm, pilose inside; lobes triangular to ovate, ca. 3 mm. Berries globose or slightly compressed, 4–6 mm in diam., glabrous. Fl. Aug–Sep, fr. Nov–Dec.

Streamsides in forests; 600–1300 m. S Yunnan [N Thailand, Vietnam].

**8. *Mycetia hainanensis*** H. S. Lo, Guihaia 11: 112. 1991.

海南腺萼木 hai nan xian e mu

Subshrubs, 10–25 cm tall; branches hirtellous or villosulous. Leaves generally isophyllous; petiole 1–2.5 cm, villosulous to glabrescent; blade drying papery, adaxially grayish brown or nearly grayish black, abaxially grayish brown, oblanceolate or narrowly elliptic, 5–12 × 3–4 cm, adaxially glabrous, abaxially glabrescent on lamina and villosulous on veins, base acute to attenuate, apex acute or weakly acuminate; secondary veins 9–12 pairs; stipules persistent, ovate, 5–9 mm, puberulent to glabrescent, obtuse. Inflorescences terminal, capitate or subcapitate, villosulous, sessile to pedunculate; peduncles when present 1.5–3.5 cm, villosulous; head ca. 1.5 × 1.5 cm; bracts apparently reduced. Flowers subsessile to sessile. Calyx densely hirtellous; hypanthium portion obconical-ovoid, ca. 1.5 mm; limb deeply lobed; lobes triangular-ovate, ca. 1.5 mm, obtuse. Corolla in bud white, tubular, outside hirtellous; tube to ca. 5 mm, subglabrous inside; lobes ovate, to ca. 2 mm. Berries not seen. Fl. Apr.

• Dense forests on mountains; ca. 800 m. Hainan.

**9. *Mycetia hirta*** Hutchinson in Sargent, Pl. Wilson. 3: 410. 1916.

毛腺萼木 mao xian e mu

Shrubs, 1–2 m tall; branches densely villosulous, hirtellous, or tomentose sometimes becoming glabrescent. Leaves isophyllous to slightly anisophyllous; petiole 0.7–3 cm, densely villosulous to hirtellous; blade drying papery, oblong-elliptic to elliptic or ovate, 8–25 × 3.5–9 cm, both surfaces moderately to densely hispidulous to hirtellous, base obtuse to acute and often long decurrent, apex acute to acuminate; secondary veins 12–23 pairs; stipules usually persistent with leaves, oblong-lanceolate to ovate, 0.8–2 cm, glabrous except villous along midrib and sometimes margins, acute, acuminate, or shortly 2-lobed. Inflorescences terminal, congested- to laxly cymose, several to many flowered, densely villosulous or hirtellous; peduncle 0.7–3 cm; branched portion 1.5–6 × 2.5–9 cm; bracts ovate, lanceolate, suborbicular, reniform, or stipuliform, 2–10 mm, often marginally sparsely to densely stipitate-glandular; pedicels 1.5–4 mm. Flowers pedicellate. Calyx densely hirtellous; hypanthium portion subglobose-campanulate, ca. 2 mm; limb deeply lobed; lobes broadly triangular, 2–2.5 mm, marginally densely stipitate-glandular and sometimes appearing lacerate, glands 0.3–0.6

mm. Corolla yellow, tubular, outside sparsely to densely villosulous or hirtellous; tube 4–6 mm, sparsely villous inside; lobes triangular, 1–1.8 mm. Berries capsular, subglobose, 3.5–4.5 mm in diam., densely hirtellous or villosulous. Fl. Jun–Jul, fr. Sep–Oct.

- Forests; 500–1600 m. Hainan, Yunnan.

**10. *Mycetia longiflora*** F. C. How ex H. S. Lo, *Guihaia* 11: 107. 1991.

长花腺萼木 *chang hua xian e mu*

*Mycetia longiflora* f. *howii* H. S. Lo.

Shrubs, 0.6–2 m tall; branches puberulent becoming glabrescent. Leaves generally isophyllous; petiole 2–7 cm, densely tomentulose or puberulent; blade drying thinly papery, elliptic-oblong, obovate, or elliptic, 10–25 × 4–10.5 cm, adaxially glabrous or sparsely puberulent along midrib, abaxially glabrous or puberulent to tomentulose along principal veins, base cuneate to acute and often long decurrent, apex acute to acuminate; secondary veins 10–15 pairs; stipules persistent, triangular to ovate, 3–5 mm, puberulent, obtuse, acute, or shortly 2-lobed. Inflorescences terminal, laxly cymose, densely puberulent to tomentulose, many flowered, often deflexed to pendulous; peduncle 0.3–1 cm; branched portion 4–5 × 7–10 cm; bracts reduced or narrowly triangular to lanceolate, 2–5 mm; pedicels 2.5–7 mm. Flowers pedicellate. Calyx densely puberulent, tomentulose, or glabrescent; hypanthium portion subglobose to obconic, 1.5–2.5 mm; limb lobed to base; lobes narrowly triangular to narrowly lanceolate, 4–6.5 mm. Corolla yellow, tubular, densely puberulent to glabrescent outside; tube 14–16 mm, white villous above middle inside or in throat; lobes broadly ovate-triangular, 2–2.5 mm. Berries subglobose, ca. 5 mm in diam., puberulent to glabrescent. Fl. Jul–Aug, fr. Oct–Jan.

- Dense forests; 600–1700 m. Yunnan.

Two forms of this species were separated in the protologue and by H. S. Lo in FRPS (71(1): 315. 1999). Lo distinguished *Mycetia longiflora* f. *howii* by its glabrous corollas and glabrous smaller leaves though no measurements were given. Presumably f. *longiflora* thus comprised plants with pubescent to subglabrous corollas and pubescent, larger leaves. The characters used to distinguish these forms vary continuously within most populations and species of Rubiaceae; accordingly, they are not recognized here.

**11. *Mycetia longifolia*** (Wallich) Kuntze, *Revis. Gen. Pl.* 1: 289. 1891.

长叶腺萼木 *chang ye xian e mu*

*Rondeletia longifolia* Wallich in Roxburgh, *Fl. Ind.* 2: 137. 1824; *Adenosacme longifolia* (Wallich) J. D. Hooker; *Wendlandia longifolia* (Wallich) Candolle.

Shrubs, to 2 m tall; branches hirtellous or villosulous becoming glabrescent. Leaves isophyllous or slightly anisophyllous; petiole 0.6–2.5(–6) cm, hirtellous or villosulous; blade drying papery, elliptic-lanceolate or elliptic, 5–18(–35) × 3–7(–10) cm, adaxially sparsely strigillose, hispidulous, or glabrous, abaxially sparsely to densely puberulent or hirtellous to glabrescent, base cuneate to acute and often decurrent, apex acu-

minate to caudate; secondary veins 13–20 pairs; stipules usually persistent, oblong-lanceolate to ovate, 5–15 mm, villosulous or hirtellous, acute to acuminate and sometimes shortly 2-lobed. Inflorescences terminal or sometimes pseudoaxillary, laxly cymose, villosulous to glabrous, subsessile to pedunculate; peduncle 0.5–1.5 cm; branched portion 3–4 × 5–6 cm; bracts elliptic to ovate, 1–3 mm, marginally sparsely stipitate-glandular; pedicels 2–5 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion subglobose, 1.5–2 mm; limb deeply lobed; lobes triangular, 1.5–4 mm, with 1 or 2 pairs of stipitate glands on margins, these 0.2–0.5 mm. Corolla yellow, tubular, outside glabrous to villosulous; tube 10–14 mm, inside villous; lobes broadly ovate, 1–1.5 mm. Berries subglobose, 4–5 mm in diam., glabrescent. Fl. summer and autumn.

Forests. Xizang (Mêdog), S Yunnan [Bangladesh, Bhutan, NE India, Malaysia, Myanmar, Nepal].

Springate et al. (*Fl. Bhutan* 2(2): 784. 1999) observed that this species sometimes grows as an epiphyte.

**12. *Mycetia macrocarpa*** F. C. How ex H. S. Lo, *Guihaia* 11: 111. 1991.

大果腺萼木 *da guo xian e mu*

Shrubs; branches glabrous. Leaves generally isophyllous; petiole 1–1.5 cm, glabrous; blade drying papery, narrowly elliptic-oblong or narrowly lanceolate, 8–14 × 2–3.5 cm, glabrous on both surfaces, rather shiny adaxially, base cuneate, apex caudate-acuminate; secondary veins 10–12 pairs; stipules persistent, suborbicular to broadly elliptic, 7–10 mm, parallel-veined, glabrous, rounded. Inflorescences and flowers not seen. Infructescences terminal, cymose, with ca. 5 fruit. Fruit obovoid to subglobose, ca. 6 mm, with persistent calyx lobes lanceolate, 5–6 mm. Fr. Jan.

- Forests; ca. 100 m. Yunnan (Malipo).

**13. *Mycetia nepalensis*** H. Hara, *J. Jap. Bot.* 52: 198. 1977.

垂花腺萼木 *chui hua xian e mu*

Shrubs, 0.5–2 m tall; branches strigillose or hirtellous becoming glabrescent. Leaves generally isophyllous; petiole 2–4.5 cm, strigillose to hirtellous; blade drying papery, elliptic, obovate, or ovate-elliptic, 10–25 × 3.5–10 cm, adaxially glabrous or hispidulous along veins, abaxially strigillose to hirtellous, base cuneate to acute or attenuate, apex acute to acuminate; secondary veins 10–18 pairs; stipules persistent or deciduous, subovate to suborbicular, 5–10 mm, strigillose, acute and shortly 2-lobed. Inflorescences terminal, often pendulous, laxly cymose, many flowered, strigillose to glabrescent; peduncle 1–2 cm; branched portion 4–7 × 4–7 cm; bracts lanceolate to triangular, 3–10 mm; pedicels 1.5–5 mm. Flowers pedicellate. Calyx puberulent to hispidulous; hypanthium portion narrowly turbinate, 2–3 mm; limb lobed to base; lobes narrowly triangular, 3–5.5 mm. Corolla yellow to deep yellow, tubular, glabrescent outside; tube 8–12 mm, villous inside; lobes lanceolate, 1.2–2 mm. Berries subglobose, 7–8 mm in diam., glabrescent. Fl. Apr–May, fr. Aug.

Broad-leaved rain forests; ca. 1000 m. Xizang (Mêdog) [NE India, Nepal, ?Vietnam].

H. S. Lo (in FRPS 71(1): 320. 1999) reported that the calyx lobes have glands on each side at their bases, but the protologue, Springate et

al. (Fl. Bhutan 2(2): 785. 1999), and Deb (Bull. Bot. Surv. India 28(1-4): 124. 1986) said explicitly that this species does not have glands on the calyx lobes. "*Adenosacme nepalensis*" (Wallich, Numer. List, no. 6281. 1832) belongs here but is a nomen nudum and was therefore not validly published (*Vienna Code*, Art. 32.1(d)).

**14. *Mycetia sinensis*** (Hemsley) Craib, Bull. Misc. Inform. Kew 1914: 29. 1914.

华腺萼木 hua xian e mu

*Adenosacme longifolia* (Wallich) J. D. Hooker var. *sinensis* Hemsley, J. Linn. Soc., Bot. 23: 379. 1888; *Mycetia oligodonta* Merrill; *M. sinensis* f. *angustisepala* H. S. Lo.

Shrubs or subshrubs, 0.2–0.5(–1) m tall; branches densely hirtellous or strigillose to glabrous. Leaves isophyllous or slightly anisophyllous; petiole 0.2–2 cm, hirtellous or strigillose to glabrous; blade drying submembranous, usually pale, and slightly grayish green, oblong-lanceolate to elliptic-oblong, ovate, or elliptic, 8–20 × 3–5 cm, adaxially sparsely hispid to glabrous, abaxially glabrous or puberulent, hirtellous, or hispidulous at least on veins, base obtuse to cuneate then usually long decurrent, apex acute to acuminate; secondary veins 5–20 pairs; stipules usually persistent, elliptic-oblong, obovate, or suborbicular, markedly contracted to stipitate at base, 3–18 mm, sometimes veined, hispidulous, hirtellous, or glabrous, obtuse or rounded. Inflorescences terminal, laxly cymose, many flowered, glabrous, deflexed to pendulous; peduncles 3.5–7 cm; branched portion 2–7 × 2–16 cm; bracts elliptic, obovate, reniform, or stipuliform, sometimes fused in pairs, 1–3 mm, marginally entire or with stipitate glands, these 0.2–0.5 mm; pedicels 1–2.5 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion subglobose to obconic, 1–2 mm; limb deeply lobed; lobes lanceolate, spatulate, or triangular, 1–2 mm, entire or with 1–3 pairs of stipitate glands. Corolla white, tubular, outside glabrous; tube 5–7 mm, inside apparently glabrous; lobes

ovate, 1.5–2 mm. Berries subglobose, 4–4.5 mm in diam., glabrous. Fl. Jul–Aug, fr. Sep–Nov.

• Streamsides or roadsides in dense forests; 200–1000 m. S Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Yunnan.

This species is said to be locally common in the notes on several specimens.

H. S. Lo (Guihaia 11: 115–116. 1991) described three forms of this species, which were recognized in FRPS (71(1): 322–323. 1999). *Mycetia sinensis* f. *angustisepala* was described from Guangxi and distinguished by its narrowly lanceolate calyx lobes that are ± as long as the "calyx tube" (i.e., the hypanthium portion together with the unlobed portion of the calyx limb); f. "*trichophylla*" (not a validly published name: *Vienna Code*, Art. 37.6) was described from Guangdong and distinguished by its leaf blades that are sparsely villous throughout; and f. *sinensis* presumably has broader and/or differently shaped calyx lobes that are longer than or shorter than the "calyx tube" and glabrous or appressed pubescent leaves. The distinctions used to separate these forms do not seem taxonomically meaningful; accordingly, these forms are not recognized here.

**15. *Mycetia yunnanica*** H. S. Lo, Guihaia 11: 116. 1991.

云南腺萼木 yun nan xian e mu

Shrubs or subshrubs, ca. 1.5 m tall; branches glabrous. Leaves generally isophyllous; petiole 1–3 cm, subglabrous; blade drying thinly leathery, elliptic, elliptic-oblong, or obovate, 10–20 × 3.5–6 cm, adaxially glabrous, abaxially glabrescent or hirtellous along midrib, base cuneate or attenuate, apex abruptly acuminate; secondary veins 12–18 pairs; stipules elliptic-oblong, 8–12 mm, glabrous, obtuse. Inflorescences and flowers not seen. Infructescences pseudoaxillary or perhaps axillary, often on lower leafless nodes, glabrous; peduncle ca. 3 cm. Berries subglobose, ca. 4 mm in diam., with persistent calyx lobes ovate-triangular, 2.5–3 × 2–2.5 mm, obtuse. Fr. Oct.

• Streamsides in forests. Yunnan (Dehong).

## 58. MYRIONEURON R. Brown ex Bentham & J. D. Hooker, Gen. Pl. 2: 69. 1873.

密脉木属 mi mai mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Small shrubs, subshrubs, or large herbs, unarmed, often succulent; bark often soft or spongy, usually grayish white. Raphides absent. Leaves opposite, apparently without domatia, sometimes with crisped margins; stipules persistent or deciduous, interpetiolar, generally triangular, often closely densely parallel- to palmately veined, entire or shortly bilobed. Inflorescences terminal and/or pseudoaxillary, laxly cymose or usually congested-cymose to subcapitate, several to many flowered, sessile to pedunculate, bracteate with bracts usually well developed, often densely veined to stipuliform, sometimes outermost (i.e., basalmost) 4 or 6 bracts shortly fused at base into an involucre. Flowers sessile to pedicellate, bisexual, distylous. Calyx limb 5-lobed; lobes often densely parallel-veined. Corolla white or yellow, tubular to salverform, villous in throat; lobes 5, valvate in bud. Stamens 5, inserted in corolla tube, included or perhaps partially exserted; filaments short; anthers apparently dorsifixed, included. Ovary 2-celled, ovules numerous in each cell on presumably axile placentas; stigma 2-lobed with lobes linear, included or shortly exserted. Fruit white, baccate, fleshy to rather dry, ovoid to globose, with calyx limb persistent; seeds numerous, small, angled, with endosperm fleshy; embryo small; testa areolate.

About 14 species: Bhutan, China, India, Nepal, Vietnam; four species (one endemic) in China.

H. S. Lo (in FRPS 71(1): 309. 1999) described the inflorescences as sometimes axillary, but this has not been noted elsewhere; the term here may be used to include the position separated elsewhere as "pseudoaxillary." Lo also reported that the anthers are sometimes partially exserted in long-styled flowers of *Myrioneuron faberi* and *M. effusum* (loc. cit.: 310, 313), which is a new condition not previously noted for the genus.

The number of pairs of lateral leaf veins described by H. S. Lo (loc. cit.: 310–313) for *Myrioneuron* species and used in part to distinguish species does not correspond to the secondary veins on specimens cited and apparently includes both secondary and intersecondary veins; thus, the

counts disagree with those of Wright (Fl. Bhutan 2(2): 786. 1999, *M. nutans*) and the illustrations of Fu and Hong (Higher Pl. China 10: 577–578. 2004), which consider only the secondary veins as done by most Rubiaceae authors.

- 1a. Corolla with tube 5–6 mm; calyx lobes 10–12 mm ..... 3. *M. nutans*  
 1b. Corolla with tube 7.5–10 mm; calyx lobes 6–14 mm.  
     2a. Shrubs; leaves with secondary veins 15–25 pairs; calyx lobes 6–7 mm ..... 1. *M. effusum*  
     2b. Herbs, sometimes becoming suffrutescent; leaves with secondary veins 9–18 pairs; calyx lobes 6–14 mm.  
         3a. Stipules 6.5–15 mm; inflorescences shortly pedunculate; corolla with tube 9–10 mm and lobes 1.5–2 mm ... 2. *M. faberi*  
         3b. Stipules 12–25 mm; inflorescences subsessile; corolla with tube 7.5–8 mm and lobes 2.5–3 mm ..... 4. *M. tonkinense*

**1. *Myrioneuron effusum*** (Pitard) Merrill, J. Arnold Arbor. 23: 195. 1942.

大叶密脉木 *da ye mi mai mu*

*Myrioneuron nutans* Wallich ex Kurz var. *effusum* Pitard in Lecomte, Fl. Indo-Chine 3: 192. 1923.

Shrubs, to 2 m tall; branches densely puberulent or often papillose to glabrous. Petiole 0.5–4 cm, densely puberulent; leaf blade in life adaxially dark green, abaxially pale white, drying papery, elliptic-oblong, oblanceolate, or obovate, 13–25 × 5.5–14 cm, adaxially glabrous, abaxially densely puberulent at least on veins, base acute to cuneate, apex acute; secondary veins 15–23 pairs; stipules ovate to lanceolate, 1.5–2.2 cm, densely puberulent, distinctly palmately veined, acute to shortly bilobed. Inflorescences pseudoaxillary and/or infrequently terminal, congested-cymose, subglobose to ovoid, subsessile, 1.5–2 cm; bracts lanceolate or ovate, 8–10 mm, densely puberulent, densely longitudinally veined, acuminate. Flowers subsessile. Calyx puberulent to glabrous; hypanthium portion obconic, 1.5–3 mm; limb lobed to base; lobes lanceolate to narrowly triangular or linear, 6–7 mm. Corolla tubular; tube ca. 10 mm; lobes oblong-ovate, ca. 2.5 mm. Berries subglobose, 3–4 × 4–5 mm, glabrescent. Fl. Jul–Aug, fr. Oct–Nov.

On rocks in ravines; 500–700 m. Guangxi (Longzhou) [N Vietnam].

**2. *Myrioneuron faberi*** Hemsley, J. Linn. Soc., Bot. 23: 380. 1888 [*“faberii”*].

密脉木 *mi mai mu*

*Myrioneuron oligoneuron* Handel-Mazzetti.

Large to suffruticose herbs, 0.2–1 m tall; branches densely puberulent, shortly pilosulous, or tomentulose. Leaves sometimes crowded at upper part of branches; petiole 0.7–1(–2) cm, densely puberulent to tomentulose; blade drying papery and grayish green, pale abaxially, obovate, elliptic, or oblong-obovate, (10–)12–23 × 4.5–10 cm, adaxially glabrous, abaxially densely puberulent to glabrescent on lamina and densely puberulent to tomentulose along veins, base acute to obtuse, apex cuspidate or acute; secondary veins 9–15 pairs; stipules lanceolate-oblong to ovate or narrowly triangular, 6.5–15 mm, glabrous to densely puberulent, densely parallel-veined to palmately veined, acute to shortly bilobed. Inflorescences terminal, globose; peduncle 3–10 mm; branched portion subcapitate to congested-cymose, subglobose, 2–3.5 cm; bracts ovate to lanceolate or obovate, 8–20 mm, densely puberulent, densely parallel-veined to palmately veined, acute to acuminate. Flowers subsessile. Calyx puberulent to glabrous; hypanthium portion subglobose to obconic, 1.5–2 mm; limb divided to base; lobes

narrowly triangular to linear, 6–12 mm, densely longitudinally veined. Corolla yellow, tubular, outside puberulent to glabrous; tube 9–10 mm; lobes triangular to ovate, 1.5–2 mm. Berries subglobose, ca. 3.5 mm in diam., glabrous to puberulent, with pedicels often elongating, to 8 mm. Fl. Aug, fr. Oct–Dec.

• Forests, often by streams; 500–1500 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Yunnan.

This name was originally published as *“faberii”* and has been cited thus by several authors; however, current guidelines for orthography require correction to the form used here.

**3. *Myrioneuron nutans*** Wallich ex Kurz, Forest Fl. Burma 2: 55. 1877.

垂花密脉木 *chui hua mi mai mu*

Small shrubs, ca. 1 m tall. Petiole 0.5–2 cm; leaf blade drying leathery and green, broadly elliptic or obovate, 10–25(–35) × 6–14(–18) cm, adaxially glabrous, abaxially puberulent at least on veins, base acute to attenuate, apex abruptly acuminate; secondary veins 11–20 pairs; stipules triangular-lanceolate, 10–20 mm. Inflorescences terminal or pseudoaxillary, globose, 2.5–6 cm in diam., congested-cymose or rarely laxly cymose; peduncle short; bracts ovate or lanceolate, 8–15 mm, acuminate. Calyx glabrous to scabridulous; limb lobed to base; lobes linear-lanceolate, 10–12 mm. Corolla white or yellow, tubular, outside puberulent; tube 5–6 mm; lobes ovate, ca. 1.8 mm. Berries fleshy to dry, 4–7 mm in diam., glabrescent. Fl. Mar.

Forests; ca. 700 m [to only ca. 300 m in Bhutan]. Xizang (Mêdog), Yunnan (Mengzi) [Bangladesh, Bhutan, N India].

**4. *Myrioneuron tonkinense*** Pitard in Lecomte, Fl. Indo-Chine 3: 193. 1923.

越南密脉木 *yue nan mi mai mu*

Herbs, sometimes suffruticose, to 1(–2) m tall; branches densely puberulent, papillose, or tomentulose. Petiole 0.8–3 cm, densely puberulent to tomentulose; leaf blade drying papery and grayish green, obovate, elliptic-oblong, or elliptic, 12–28 × 4–11 cm, adaxially glabrous, abaxially densely puberulent, base acute to cuneate, apex acute or rounded then abruptly acuminate; secondary veins 9–18 pairs; stipules ovate to oblong, 12–25 mm, densely puberulent, densely striate veined, acute or shortly 2-lobed. Inflorescences terminal and/or usually pseudoaxillary, subsessile, congested-cymose to subcapitate to shortly racemiform, subglobose to ovoid, 1–3 cm; bracts ovate or ovate-lanceolate, 10–25 mm, densely puberulent, densely longitudinally veined, acute to acuminate. Flowers subsessile or with pedicels to 3 mm. Calyx densely puberulent; hypanthium portion subglobose to ovoid, ca. 2 mm; limb divided to base; lobes linear-subulate, 6–14 mm. Corolla yellow, tubular; tube 7.5–8

mm; lobes 2.5–3 mm. Berries subglobose, 3–4 mm in diam. Fl. Jun–Aug, fr. Oct–Dec.

Dense forests; below 100–1700 m. Guangdong, Guangxi, Hainan, Yunnan [N Vietnam].

H. S. Lo (in FRPS 71(1): 312. 1999) recognized two forms of this species: “*f. tonkinensis*” [sic!] and “*f. longipes* Lo.” However, Lo failed to provide the latter name with a Latin description or diagnosis (*Vienna Code*, Art. 36.1) and an indication of a type (Art. 37.1); therefore, neither name was validly published.

## 59. NAUCLEA Linnaeus, Sp. Pl., ed. 2, 1: 243. 1762.

乌檀属 *wu tan shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Bancalus* Kuntze.

Trees, unarmed; buds strongly compressed with stipules erect and pressed together [rarely subconical]. Raphides absent. Leaves opposite, usually with domatia; stipules caducous or persistent, interpetiolar, generally elliptic or obovate. Inflorescences terminal and sometimes also axillary, capitate with heads 1–5, globose, and solitary to fasciculate, many flowered, pedunculate, bracteate; peduncles articulate and often bracteate near middle. Flowers sessile, fused by their ovaries, bisexual, monomorphic. Calyx limb 4- or 5-lobed. Corolla white to yellow, funnelform to salverform, inside glabrous; lobes 4 or 5, imbricate in bud. Stamens 4 or 5, inserted in upper part of corolla tube, exserted; filaments short; anthers basifixed. Ovary 2-celled, ovules numerous in each cell, pendulous to horizontal on Y-shaped axile placentas attached to upper third of septum; stigma fusiform, exserted. Infructescences with fruiting heads each comprising a globose multiple fruit (i.e., syncarp). Fruit (i.e., fruitlets, arising from one flower) baccate, fleshy or fibrous, with calyx limb deciduous; seeds numerous, small, ovoid or ellipsoid, sometimes slightly compressed, without aril.

About ten species: tropical Africa, Asia, and Australia; one species in China.

The wood of several *Nauclea* species is strong and used for lumber.

The S Asian species *Nauclea orientalis* (Linnaeus) Linnaeus is occasionally cultivated; this can be recognized by its elliptic-oblong leaves 6–12 cm wide, its flowering heads 15–20 mm in diam. across the calyces, and its fruiting heads to 5 cm in diam. Both *N. officinalis* and *N. orientalis* species are encountered and occasionally confused in cultivation with the more commonly cultivated *Neolamarckia cadamba*, which has free (i.e., distinct or separate) flowers and free dehiscent fruit (see p. 255).

**1. *Nauclea officinalis*** (Pierre ex Pitard) Merrill & Chun, Sunyatsenia 5: 188. 1940.

乌檀 *wu tan*

*Sarcocephalus officinalis* Pierre ex Pitard in Lecomte, Fl. Indo-Chine 3: 26. 1922.

Trees, apparently evergreen, to 12 m tall; branchlets angled and rather flattened becoming terete, puberulent to glabrescent. Petiole 10–15[–20] mm; leaf blade drying papery, elliptic to broadly elliptic or infrequently ovate or obovate, 7–11[–15] × 3.5–7[–10] cm, glabrous, adaxially dark brown and matte to shiny, abaxially pale brown and matte, base cuneate to obtuse, apex shortly acuminate with tip slightly blunt; secondary veins 5–7 pairs, usually with tiny foveolate domatia in abaxial axils; stipules caducous, obovate to elliptic, 6–10 mm,

glabrous, smooth, rounded. Inflorescences terminal, puberulent to glabrous; peduncles 1–3.5[–4.5] cm, in lower part articulate, bearing caducous bracts 2–4 mm; flowering heads 1–3, 5–6 mm in diam. across calyces, ca. 15 mm in diam. across corollas. Calyx limb<sup>5</sup> deeply lobed; lobes 5, oblanceolate to spatulate, ca. 1 mm, glabrescent, fleshy, rounded to subtruncate. Corolla color unknown, narrowly funnelform, glabrous outside and apparently inside; tube 3–4 mm; lobes 5, ligulate to elliptic, 1–1.5 mm, obtuse to rounded. Stigmas 1.5–2 mm, exserted for ca. 3 mm. Fruiting heads (i.e., multiple fruit) yellow, 9–15 mm in diam., fleshy, with surface rough (i.e., pitted with calyx limb scars); seeds ca. 1 mm, with testa shiny black, foveolate. Fl. summer, fr. Jul, Sep.

Forests at middle elevations. Guangdong, Guangxi, Hainan [Borneo, Cambodia, Indonesia (Sumatra), Laos, Malaysia, ?Philippines, Thailand, Vietnam].

## 60. NEANOTIS W. H. Lewis, Ann. Missouri Bot. Gard. 53: 34. 1966.

新耳草属 *xin er cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

Herbs, annual or perennial, unarmed, often procumbent, often fetid when bruised, often fleshy, often drying blackened. Raphides present. Leaves opposite, without domatia; stipules persistent, interpetiolar and usually fused to petioles, truncate to triangular, lacinate to setose, sometimes glandular. Inflorescences axillary and/or terminal and sometimes displaced to pseudoaxillary, laxly cymose to capitate, few to many flowered, pedunculate to sessile, bracteate or bracts reduced. Flowers sessile to pedicellate, bisexual, at least sometimes distylous. Calyx limb deeply 4(or 5)-lobed. Corolla white, pink, or purple, funnelform to tubular, inside glabrous or villous in tube and/or throat; lobes 4(or 5), valvate in bud. Stamens 4(or 5), inserted usually in corolla throat, exserted or included; filaments short to developed; anthers dorsifixed near base. Ovary 2[–4]-celled, ovules several or rarely numerous or 1 in each cell on ascending axile placenta attached to septum near base; stigmas 2(–4), linear, included or exserted. Fruit capsular or rarely

indehiscent, subglobose, turbinate, obconic, ovoid, or dicocous, often laterally compressed, loculicidally dehiscent through apical portion, this portion plane or sometimes shortly raised into a beak, leathery to membranous, with calyx limb persistent; seeds few to numerous, small, disciform to plano-convex, rounded or rarely winged, scabrous foveolate; endosperm corneous; embryo clavate.

About 30 species: mainly in tropical Asia and Australia; eight species (two endemic) in China.

When proposing this generic name, Lewis showed that *Anotis* Candolle, as then circumscribed, included a broadly heterogeneous group of both New and Old World species that shared only a herbaceous habit and fruit with few peltate seeds under an illegitimate name. Accordingly he transferred the Asian species to *Neanotis*, without descriptions or keys, although this name has sometimes been overlooked. The fruit and seed morphology of several species was studied by Terrell and Robinson (J. Bot. Res. Inst. Texas 1(1): 373–384. 2007), including *N. calycina* and *N. hirsuta* of our flora. The description here of the placenta attachment position and the seeds of other species are all from W. C. Ko (in FRPS 71(1): 77–86. 1999); no other authors seen have described these features. The floral biology of *Neanotis* has not been described in the literature but the flowers appear to be distylous in at least some Chinese species.

The treatment here differs from that of W. C. Ko (loc. cit.) in the circumscription of several species. In particular, the application of the name *Neanotis hirsuta* is applied more narrowly, and many specimens previously included there are here treated as *N. kwangtungensis*, including one variety named in *N. hirsuta*.

Some plants from Sichuan that are shorter than 40 cm tall with leaf blades narrowly ovate and  $1.5\text{--}2.5 \times 0.7\text{--}1$  cm have been called *Neanotis ingrata* f. *parvifolia* How ex W. C. Ko (J. S. China Agric. Univ. 16(4): 46. 1995); no specimens of this have been seen, and no more information was provided in the protologue. Due to the limited available information and the narrowed circumscription of species here, the identity of this name is not clear, and it is neither accepted nor synonymized here.

- 1a. Inflorescences axillary at various nodes all below stem apex, flowers solitary to few, subsessile to shortly fasciculate; at least older stems prostrate and regularly rooting at nodes ..... 1. *N. boerhaavioides*
- 1b. Inflorescences terminal and/or axillary at least at some uppermost nodes, flowers solitary to numerous, sessile to pedicellate and/or pedunculate; stems prostrate and rooting at nodes to erect.
- 2a. At least some flowers and fruit pedicellate with pedicels 2–10 mm.
  - 3a. Flowers mixed pedicellate and subsessile, with pedicels of various lengths; corollas tubular, with tube longer than lobes, tube ca. 2 mm and lobes ca. 1 mm ..... 2. *N. calycina*
  - 3b. Flowers all pedicellate, with most pedicels well developed; corollas campanulate to rotate, with tube shorter than lobes, tube 1–1.5 mm and lobes 2.5–3.5 mm ..... 7. *N. thwaitesiana*
- 2b. Flowers and fruit subsessile to sessile in small glomerules or mixed sessile and pedicellate, glomerules sometimes separated by developed inflorescence axes, pedicels when present to 1.5 mm.
  - 4a. Plants mostly procumbent; inflorescences capitate or branched to 1 order, sessile or on peduncles to 1 cm, flowers in heads or congested cymes; corolla with tube 1–2.5 mm and lobes 0.2–2 mm.
    - 5a. Leaves  $1\text{--}6.5 \times 0.5\text{--}2$  cm, with 3–9 pairs of secondary veins; corolla with tube 1–1.5 mm and lobes 1.5–2 mm; fruit ca.  $3 \times 4$  mm ..... 6. *N. kwangtungensis*
    - 5b. Leaves  $0.5\text{--}2.5 \times 0.3\text{--}1.8$  cm, with 2 or 3 pairs of secondary veins; corolla with tube 1.3–2.5 mm and lobes 0.2–1.5 mm; fruit  $1.5\text{--}2 \times 1.5\text{--}2.5$  mm ..... 8. *N. wightiana*
  - 4b. Plants weak to procumbent or erect; inflorescences congested to laxly cymose, branched for 2–4 orders, on peduncles 0.8–4.5 cm, flowers pedicellate or sessile in heads or glomerules; corolla with tube 3.5–6 mm and lobes 2.2–3.2 mm.
    - 6a. Leaves  $4\text{--}11.5 \times 1\text{--}4$  cm; stipules with setae or lobes 3 to numerous per side, 3–15 mm with at least 1 of them longer than 5 mm; corolla tube 4–6 mm ..... 5. *N. ingrata*
    - 6b. Leaves  $1\text{--}5.5 \times 1\text{--}4$  cm; stipules with setae or lobes 3–7 per side, 0.5–5 mm; corolla tube 3.5–5.5 mm.
      - 7a. Flowers some or all pedicellate, pedicels 0.5–1.5 mm; Taiwan ..... 3. *N. formosana*
      - 7b. Flowers all sessile; widespread ..... 4. *N. hirsuta*

1. *Neanotis boerhaavioides* (Hance) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 37. 1966.

卷毛新耳草 juan mao xin er cao

*Hedyotis boerhaavioides* Hance, J. Bot. 8: 73. 1870;  
*Anotis boerhaavioides* (Hance) Maximowicz.

Herbs, annual or perhaps perennial, procumbent, fleshy, regularly rooting at nodes; stems subterete to 4-angled and sulcate, moderately to densely pilosulous to hirtellous and/or hirsute in lines. Leaves subsessile or petiolate; petiole to 3 mm, pilosulous or hirtellous to glabrous; blade drying papery, ovate, lanceolate, ovate-orbicular, or lanceolate-elliptic,  $1\text{--}2 \times 0.4\text{--}1.5$

cm, adaxially hirtellous, pilosulous, and/or hispidulous near margins, abaxially hirtellous to pilosulous, base cuneate to rounded or truncate, apex obtuse to acute; secondary veins 2 or 3 pairs; stipules triangular to rounded, 1–3 mm, hirtellous or pilosulous, lobe or bristle 1, 2–2.5 mm, ciliate, sometimes with 2 lateral bristles to 1.5 mm. Inflorescences axillary at middle and lower stem nodes, fasciculate, (1 or) 2–5-flowered, hirtellous; bracts linear, 0.5–2 mm; peduncles 0.5–3.5 mm. Calyx moderately to densely pilosulous to hirtellous; hypanthium portion subglobose to obconic, 0.8–1 mm; limb divided essentially to base; lobes 4, narrowly triangular, 1.6–3 mm, ciliate, acute. Corolla white to pale blue, shortly funnelliform, outside glabrous; tube 2–3 mm, apparently pilose in throat; lobes narrowly

ligulate to narrowly triangular, 3–4 mm. Capsule compressed globose to subglobose, 1.5–2 mm, hirtellous, smooth to weakly ridged. Fl. Apr–Aug, fr. Jul–Aug.

• Sparse forests on mountain slopes at middle elevations; 100–600 m. Fujian, Guangdong, Jiangxi, Zhejiang.

This species appears to be distylous (long-styled, *Zhang Shaoyao* 5681, short-styled *Zhang Shaoyao* 2416, both MO!). It is very similar to *Hedyotis chrysotricha*, which has calyx lobes ca. 2 mm and the corolla lobes 2.5–3 mm.

**2. *Neanotis calycina*** (Wallich ex J. D. Hooker) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 37. 1966.

紫花新耳草 *zi hua xin er cao*

*Anotis calycina* Wallich ex J. D. Hooker, Fl. Brit. India 3: 73. 1880.

Herbs, erect to ascending, annual or perhaps perennial; stems 4-angled to subterete or sulcate, glabrous or sparsely puberulent. Leaves subsessile or petiolate; petiole to 3 mm, glabrous; blade drying papery, lanceolate to ovate-lanceolate or lanceolate-elliptic, 1–3.5 × 0.5–1.5 cm, adaxially sparsely scaberrulous to puberulent, abaxially glabrous or puberulent to scaberrulous on principal veins, base cuneate to acute, margins ciliate to scaberrulous, apex acute to acuminate; secondary veins 3 or 4 pairs; stipules broadly triangular, 1–3 mm, glabrescent, subentire or with 1 or 3 bristles to 1 mm, entire or ciliate. Inflorescences axillary and/or terminal, 1-flowered or cymose, several flowered, and dichotomous, glabrous; peduncles 0.5–2.5 cm; pedicels to 7 mm. Flowers sessile to pedicellate. Calyx glabrous; hypanthium portion obconic, ca. 0.8 mm; limb divided essentially to base; lobes triangular, 0.5–1.3 mm, entire to ciliate, acute. Corolla white, pale pink, or pale purple, tubular to tubular-funnelform, outside glabrous; tube 1.5–2 mm, apparently glabrous in throat; lobes triangular to lanceolate, 0.5–1 mm, obtuse to acute. Capsule compressed globose, 1.5–2 × ca. 3 mm, glabrous. Fl. Sep–Oct.

Streamsides, slightly shady mountain slopes, valleys; 1100–1700 m. Yunnan [Bhutan, India (Darjeeling), Nepal].

R. R. Mill in Fl. Bhutan (2(2): 770. 1999) described this as annual, but it is keyed there (p. 767) as a perennial.

**3. *Neanotis formosana*** (Hayata) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966.

台湾新耳草 *tai wan xin er cao*

*Anotis formosana* Hayata, Icon. Pl. Formosan. 9: 54. 1920.

Herbs, perhaps perennial, stems decumbent near base and ascending in upper parts, to 30 cm; stems terete to angled and sometimes sulcate, glabrous. Leaves subsessile or petiolate; petiole to 3 mm, sparsely hirtellous to glabrous; blade drying papery or membranous, ovate, ovate-oblong, or lanceolate, 1–3 × 0.5–1.6 cm, adaxially sparsely to moderately hirtellous, scaberrulous, or hispid, abaxially glabrous or sparsely to moderately hirtellous along principal veins, base obtuse to subrounded, apex acute; secondary veins 3 or 4 pairs; stipules triangular, 1–2 mm, hirtellous, erose to pectinate or with 3–5 bristles or lobes 1–5 mm, sometimes glandular. Inflorescences terminal or rarely

pseudoaxillary, cymose, lax with flowers in groups of 2–5, branched to 2 or 3 orders, glabrous; peduncle 0.8–2.5 cm; bracts lacinate or stipuliform, 0.5–2 mm; pedicels 0.5–1.5 mm. Calyx glabrous; hypanthium portion subcupuliform to obconic; limb divided to base; lobes triangular, 1.5–2 mm, acute. Corolla white, funnelform, outside glabrous; tube 4–5.5 mm, puberulent-papillose to perhaps pubescent inside; lobes triangular, 3–3.2 mm. Capsule compressed globose, 2–2.5 × 3–3.5 mm, glabrous. Fl. Apr–Jul, fr. Jun–Jul.

Mountain slopes, roadsides; 1100–1700 m. Taiwan [Japan, Malaysia].

**4. *Neanotis hirsuta*** (Linnaeus f.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966.

薄叶新耳草 *bao ye xin er cao*

*Oldenlandia hirsuta* Linnaeus f., Suppl. Pl. 127. 1782; *Anotis hirsuta* (Linnaeus f.) Boerlage; *Hedyotis hirsuta* (Linnaeus f.) Smith (1811), not Lamarck (1789); *H. stipulata* R. Brown ex J. D. Hooker, nom. illeg. superfl.; *O. japonica* Miquel.

Herbs, perennial, lower stems decumbent and upper stems apparently ascending; stems terete to 4-angled, glabrous to hirtellous in lines or throughout, angles sometimes thickened. Leaves petiolate; petiole 1–5 mm, glabrous to hirtellous or hispid; blade drying papery, ovate, lanceolate, or elliptic, 1–5.5 × 0.5–2 cm, adaxially glabrous or sparsely to moderately strigillose, scaberrulous, or hirtellous, abaxially densely hirtellous or glabrous except sparsely strigillose or puberulent on principal veins, base rounded to cuneate, apex acute; secondary veins 3–5 pairs; stipules rounded to triangular, 1–2 mm, glabrous to hirtellous, lacinate to setose, lobes or bristles 3–7, 0.5–5 mm, glabrous to ciliate. Inflorescences terminal and/or pseudoaxillary, laxly cymose, branched to 2 or 3 orders often asymmetrically, with flowers borne separately or in glomerules of 2–5, glabrous or hirtellous; peduncle 0.8–3 cm; bracts lacinate or stipuliform, 0.5–2 mm. Flowers sessile or subsessile, floral biology unknown. Calyx glabrous to densely hirtellous; hypanthium portion obconic, ca. 1 mm; limb divided essentially to base; lobes linear-lanceolate, 1–2 mm. Corolla white, funnelform, outside glabrous; tube 3.5–4 mm, puberulent or perhaps pubescent inside; lobes ovate to triangular, 2.2–3 mm. Capsule compressed globose, 2–2.5 × 2.5–3 mm, glabrous to hirtellous. Fl. and fr. Jun–Oct.

Wet sites at streamsides or in forests; 500–1000(–1500) m. Guangdong, Hainan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [?Bhutan, Cambodia, India, Japan, Korea, Laos, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

The application of this name is problematic, and it seems to have been used in the literature and the herbarium for different species in different regions (e.g., cf. Fl. Bhutan 2(2): 768. 1999; Fl. Japan 3a: 218–219. 1993). The confusion probably started with Hooker's circumscription of this species (Fl. Brit. India 3: 63. 1880), which included three other names in synonymy to circumscribe morphologically highly varied group of plants from India through Java and Japan. Here *Neanotis hirsuta* is circumscribed more narrowly. The varieties of *N. hirsuta* recognized by W. C. Ko (in FRPS 71(1): 84–85. 1999) are not completely distinct morphologically and fall within *N. kwangtungensis* as circumscribed here.

**5. *Neanotis ingrata*** (Wallich ex J. D. Hooker) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 39. 1966.

臭味新耳草 chou wei xin er cao

*Anotis ingrata* Wallich ex J. D. Hooker, Fl. Brit. India 3: 71. 1880.

Herbs, perennial, erect to procumbent, to 1 m tall; stems terete to flattened or ridged, often sulcate, glabrous or sometimes sparsely hirtellous to puberulent near nodes. Leaves sessile or petiolate; petiole to 12 mm; blade drying papery, lanceolate, elliptic, ovate-lanceolate, or rarely ovate, 4–11.5 × 1–4 cm, adaxially glabrous or sparsely to moderately strigillose, pilosulous, pilose, or hispid, abaxially glabrous except usually densely puberulent, hirtellous, or pilosulous on principal veins, base obtuse to acute, apex acute to acuminate; secondary veins 4–9 pairs; stipules rounded to broadly triangular, 1–2.5 mm, puberulent, hirtellous, or glabrescent, with 3 to numerous setae or linear lobes 3–15 mm, glabrous to ciliolate, often inserted below top of sheath. Inflorescences terminal, subterminal, or pseudo-axillary, cymose, lax, dichasial with axes often asymmetrical, branched to 2–4 orders, glabrous; peduncle 1–4.5 cm; bracts stipuliform to reduced and erose or ciliate, 0.2–1.5 mm; pedicels to 0.5 mm. Calyx glabrous; hypanthium portion obconic, 0.8–1 mm; limb divided to base; lobes narrowly triangular, linear, or narrowly ligulate, 1.2–2 mm, entire to ciliolate. Corolla white, funnelform, outside glabrous; tube 4–6 mm, apparently pubescent inside; lobes narrowly triangular to ligulate, 2.5–3 mm, often puberulent adaxially. Capsule compressed globose, ca. 2 × 3 mm, slightly dicocous, glabrous, with calyx lobes often elongating, to 4 mm, with pedicels sometimes elongating, to 2 mm. Fl. Jun–Sep, fr. Jul.

Grassy slopes on riverbanks, forests on mountain slopes; 500–1500 m. Fujian, Guizhou, Hubei, Hunan, Jiangsu, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, India, Nepal].

Several specimens from Sichuan have been suggested (in herb.) to belong to *Neanotis urophylla* (Wallich ex Wight & Arnott) W. H. Lewis (Ann. Missouri Bot. Gard. 53: 40. 1966; *Hedyotis urophylla* Wallich ex Wight & Arnott, Prodr. Fl. Ind. Orient. 404. 1834), but they are provisionally included here pending further study, including clarification of the identity of *N. urophylla* (W. P. Fang 2148, 2182, 3061, all P!).

The identity of the name *Neanotis mairei* (H. Léveillé) Lauener & D. K. Ferguson (Notes Roy. Bot. Gard. Edinburgh 32: 110. 1972; *Ophiorrhiza mairei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 177. 1914, from Yunnan) is not entirely clear. This name was found to belong to *Neanotis* after Lewis's work and was said by Lauener to be similar to *N. urophylla* and *N. ingrata*. The characters used by Lauener to distinguish *N. mairei* from *N. ingrata* fall within the circumscription of *N. ingrata* here, so this name is probably a synonym; however, until authentic material is seen this cannot be conclusively synonymized.

**6. *Neanotis kwangtungensis*** (Merrill & F. P. Metcalf) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 39. 1966.

广东新耳草 guang dong xin er cao

*Anotis kwangtungensis* Merrill & F. P. Metcalf, Lingnan Sci. J. 16: 177. 1937; *Hedyotis lindleyana* Hooker ex Wight & Arnott f. *glabricalycina* (Honda) S. S. Ying; *H. lindleyana* var.

*glabricalycina* (Honda) H. Hara; *Neanotis hirsuta* (Linnaeus f.) W. H. Lewis var. *glabricalycina* (Honda) W. H. Lewis; *Oldenlandia hirsuta* Linnaeus f. var. *glabricalycina* Honda.

Herbs, perhaps perennial, procumbent or ascending in upper parts; stems subterete to angled or compressed, smooth to ridged and/or sulcate, glabrous. Leaves subsessile or petiolate; petiole to 10 mm, glabrous; blade elliptic, lanceolate, or ovate, 1–5 × 0.5–2 cm, glabrous or sparsely strigillose or scaberulous adaxially at least near margins, abaxially glabrous or sometimes puberulent on principal veins, base acute to obtuse, apex acuminate to acute; secondary veins 3–9 pairs; stipules sheath rounded to broadly triangular, 0.8–1.5 mm, glabrous to puberulent, with 2–7 bristles or linear lobes 0.3–3 mm, glabrous, often glandular. Inflorescences terminal and/or pseudoaxillary at upper nodes on principal and short axillary stems, capitate to congested-cymose, 1 to usually several flowered, glabrous, sessile or peduncle to 3 mm; bracts reduced, stipuliform, to 0.5 mm; pedicels to 2 mm. Flowers subsessile to pedicellate. Calyx glabrous; hypanthium portion cupuliform to turbinate, 0.8–1.2 mm; limb lobed to base; lobes triangular or ligulate, 1.5–2.5 mm. Corolla white, shortly tubular to rotate, outside glabrous or puberulent; tube 1–1.5 mm, apparently glabrous in throat; lobes narrowly triangular-oblong to ligulate, 1.5–2 mm. Capsule compressed subglobose to obovoid, ca. 3 × 4 mm, slightly dicocous, glabrous, smooth. Fl. and fr. Jul–Oct.

Forests on gentle slopes or at streamsides; 200–800 m. Guangdong, Guangxi, Jiangxi, Sichuan, Taiwan [Japan, Thailand].

This name is applied here more broadly than by previous authors; many of the plants that now belong to this species were formerly included in a more broadly circumscribed *Neanotis hirsuta*. The varieties of *N. hirsuta* recognized by W. C. Ko (in FRPS 71(1): 84–85. 1999) are not completely distinct from each other and belong to *N. kwangtungensis* as circumscribed here. The name *Hedyotis lindleyana* as used for specimens from Japan appears to be a synonym of *N. kwangtungensis* rather than of *N. hirsuta*, and the range of this species is here extended to include Japan; *N. kwangtungensis* as treated here is apparently equivalent to "*N. hirsuta*" of the Fl. Japan (3a: 218–219. 1993). The name "*Hedyotis kwangtungensis* (Merrill & Metcalf) Ko" is annotated on some specimens but does not appear to have been published.

**7. *Neanotis thwaitesiana*** (Hance) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 40. 1966.

新耳草 xin er cao

*Hedyotis thwaitesiana* Hance, J. Bot. 6: 298. 1868; *Anotis thwaitesiana* (Hance) Maximowicz.

Herbs, apparently perennial, weak to procumbent in lower parts and ascending in upper parts of stems; stems terete to 4-angled with angles often thickened, glabrous. Leaves sessile or petiolate; petiole to 1.5 mm, puberulent to glabrous; blade drying papery, ovate or ovate-lanceolate, 0.8–2.2 × 0.3–1.5 cm, adaxially puberulent or scaberulous at least on midrib and margins, abaxially glabrous, base cuneate to rounded, apex obtuse to acute; secondary veins 2 or 3 pairs or not evident; stipules triangular to ligulate, 1–2 mm, puberulent to hirtellous or glabrous, erose or with 1–3 irregular lobes or bristles 0.5–3.5 mm, often glandular. Inflorescences pseudoaxillary at upper stem nodes and/or occasionally terminal, laxly cymose, several flow-

ered, branched to 1–3 orders, glabrous; peduncles slender, 1.5–3 cm; bracts linear-lanceolate or stipuliform, 1–3 mm; pedicels slender, 2–10 mm. Calyx glabrous; hypanthium portion cupular to obconic, ca. 1 mm; limb lobed to base; lobes triangular, 1.2–2 mm, entire. Corolla white or pale red, campanulate to rotate, outside glabrous; tube 1–1.5 mm, apparently pilosulous in throat; lobes ligulate to narrowly triangular, 2.5–3.5 mm. Capsules compressed globose to compressed turbinate, ca. 2 × 3 mm, glabrous. Fl. Feb–May, fr. May.

● Wastelands or streamsides in valleys. Guangdong.

This species is clearly distylous. W. C. Ko (in FRPS 71(1): 82. 1999) described the corollas as soft hairy outside, but these features have not been seen on the specimens studied.

**8. *Neanotis wightiana*** (Wallich ex Wight & Arnott) W. H. Lewis, *Ann. Missouri Bot. Gard.* 53: 40. 1966.

西南新耳草 *xi nan xin er cao*

*Hedyotis wightiana* Wallich ex Wight & Arnott, *Prodr. Fl. Ind. Orient.* 1: 410. 1834; *Anotis wightiana* (Wallich ex Wight & Arnott) J. D. Hooker.

Herbs, perennial, mostly procumbent and rooting at nodes; stems angled to subterete, sometimes sulcate, glabrous to hirtellous or hirsute at least near nodes. Leaves sessile or petiolate; petiole to 4 mm, hirtellous to glabrescent; blade drying papery to subleathery, ovate to lanceolate, 0.5–1.8(–2.5) × 0.3–1.2

(–1.8) cm, adaxially sparsely to moderately puberulent, scaberrulous, or scabrous at least on midrib and margins, abaxially glabrous except hirtellous on midrib and sometimes principal veins, base broadly cuneate to subrounded, apex acute to obtuse; secondary veins 2 or 3 pairs; stipules rounded to triangular, ca. 1 mm, hirtellous or pilosulous, erose to pectinate or with 1–7 bristles or linear lobes 0.2–2 mm, often glandular. Inflorescences capitate to congested-cymose, terminal or pseudoaxillary at upper nodes on principal stems and short lateral stems, several flowered, sessile or with peduncle to 1 cm; bracts reduced. Flowers sessile or subsessile. Calyx glabrous to puberulent; hypanthium portion obconic to turbinate, ca. 1 mm; limb divided to base; lobes triangular, 1–1.5 mm, entire to ciliate. Corolla white or rarely pale red, tubular to tubular-funneliform, outside glabrous; tube 1.3–2.5 mm, inside glabrous; lobes 0.2–1.5 mm, obtuse to acute. Capsule compressed globose, 1.5–2 × 1.5–2.5 mm, often markedly dicocous, glabrous, smooth. Fl. May–Jul, fr. Jun–Oct.

Grassy slopes, roadsides, banks at streamsides; 900–1900 m. Guangxi (Damao Shan), Guizhou, Sichuan, Yunnan (Pingbian) [Bhutan, India, Vietnam].

The inflorescences were described by W. C. Ko (in FRPS 71(1): 84. 1999) as usually having two leaflike bracts, but here these structures are considered leaves subtending the inflorescence, similarly to the morphological interpretation by Mill (Fl. Bhutan 2(2): 770–771. 1999); these leaves are small when the flowers form but enlarge to the size of the other vegetative leaves as the fruit develop.

## 61. *NEOHYMENOPOGON* Bennet, *Indian Forester* 107: 436. 1981.

石丁香属 *shi ding xiang shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Hymenopogon* Wallich in Roxburgh, *Fl. Ind.* 2: 156. 1824, not *Hymenopogon* P. Beauvois (1804) [Musci].

Shrubs, usually epiphytic, unarmed, often deciduous, often rather succulent. Raphides presumably absent. Leaves opposite, apparently without domatia; stipules persistent, interpetiolar or shortly united around stem, generally ovate, acute to rounded. Inflorescences terminal, corymbose-cymose, many flowered, pedunculate, bracteate; bracts subtending 2 or more cymes per inflorescence enlarged, petaloid, stipitate (i.e., similar to a calycophyll). Flowers pedicellate, bisexual, monomorphic. Calyx limb 5-lobed. Corolla white to pale green, salverform or salverform-funneliform with tube prolonged, inside reflexed villous in throat and on lobes; lobes 5, valvate in bud. Stamens 5, inserted below corolla throat, included; filaments short; anthers dorsifixed, shortly bifid at base. Ovary 2-celled, ovules numerous in each cell on peltate axile placentas; stigmas 2, linear, partially exserted to included. Fruit capsular, oblong-ellipsoid, obovoid, or turbinate, apically prolonged into short beak, septicidally dehiscent through beak or sometimes splitting deeply into 2 valves, papery to slightly woody, with calyx limb persistent; seeds numerous, medium-sized, fusiform, acute to caudate at each end, with hilum lateral; testa membranous; endosperm rich; embryo minute; cotyledon ovate; radicle short.

About three species: Bhutan, China, India, Myanmar, Nepal, Thailand, Vietnam; two species (one endemic) in China.

The lack of raphides has not been specifically noted but is presumed here based on the classification of this genus in Cinchoneae in FRPS (71(1): x. 1999). The enlarged petaloid bracts of the inflorescences resemble the calycophylls of many other Rubiaceae species, but in *Neohymenopogon* many of these structures are inserted below the base of the hypanthium and are thus actually considered bracts. Puff et al. (Rubiaceae of Thailand, 172. 2005) noted that *N. parasiticus* grows in a variety of seasonal to evergreen epiphytic and epilithic [micro]habitats, that, not surprisingly, it is very variable morphologically, probably in correlation with habitat, and that the petaloid bracts persist on the fruit and appear to function in seed dispersal as well as in pollination. The length of the corollas of *N. parasiticus* for example is notably variable, by 300%, but there seems to be continuous variation and no clearly separable subgroups. Raizada and Bennet (*Indian Forester* 107: 432–437. 1981) noted that the name *Hymenopogon*, long used for these plants, was a later homonym of a moss genus and published a new name for the genus; their article contained no information about the plants apart from a summary of general geographic ranges, which were not entirely correct even then. The specific epithets of these species have sometimes been spelled as “*parasiticum*” and “*oligocarpum*,” but the “-us” ending is correct (*Vienna Code*, Art. 62.2(a)).

1a. Leaves elliptic-oblong, oblanceolate, or elliptic, with apex acuminate, with secondary lateral veins to 11 pairs and well separated, i.e., 8–16 mm apart at midrib; fruit pilosulous to glabrous ..... 1. *N. oligocarpus*

1b. Leaves elliptic-obovate, lanceolate, oblanceolate, or obovate, with apex obtuse to acute, with secondary veins 15–28 pairs and closely set, i.e., 5–11 mm apart at midrib; fruit villous to pilosulous or strigillose ..... 2. *N. parasiticus*

**1. *Neohymenopogon oligocarpus*** (H. L. Li) Bennet, Indian Forester 107: 436. 1981.

疏果石丁香 shu guo shi ding xiang

*Hymenopogon oligocarpus* H. L. Li, J. Arnold Arbor. 25: 316. 1944.

Shrubs, ca. 2 m tall; branches flattened to subterete, glabrous. Leaves often crowded at stem apices; petiole 0.6–3 cm, pilosulous to strigillose; blade drying membranous, green adaxially, often whitened abaxially, elliptic-oblong, oblanceolate, or elliptic, 10–21 × 3–6 cm, strigillose to pilosulous on both surfaces with pubescence denser on principal veins, base cuneate to obtuse, apex slightly to markedly acuminate; secondary veins 7–11 pairs; stipules ovate, 3–5 mm, perhaps strigillose. Inflorescences strigillose to pilosulous; peduncle 1–5 cm; branched portion ca. 2 × 3 cm (not including petaloid bracts); bracts triangular, ca. 2 mm, petaloid bracts with blade portion elliptic-oblong to lanceolate, 2–3 × 0.5–1 cm, strigillose to pilosulous, with 3 principal veins, with stipe 1–3 cm; pedicels 0.5–1 cm. Flowers unknown. Capsules ellipsoid, ca. 1 × 0.5 cm, glabrous to pilosulous, with persistent calyx lobes lanceolate, ca. 5 mm, acute; seeds black, ca. 6 mm. Fr. Aug.

• Forests on mountains; ca. 2400 m. W Yunnan.

The only description of the flowers was given by W. C. Chen (in FRPS 71(1): 233. 1999), who listed the corolla as green-white and gave the flowering period as Aug. Chen distinguished this species in part by its glabrous fruit, but the accompanying illustration (p. 232, t. 57, f. 4) shows pilosulous fruit, as added to the description here.

**2. *Neohymenopogon parasiticus*** (Wallich) Bennet, Indian Forester 107: 436. 1981.

石丁香 shi ding xiang

*Hymenopogon parasiticus* Wallich in Roxburgh, Fl. Ind. 2:

157. 1824; *H. parasiticus* var. *longiflorus* F. C. How ex W. C. Chen.

Small shrubs, 0.3–2 m tall; branches stout, villousulous to hirtellous sometimes becoming glabrescent with age. Leaves sometimes grouped at apex of shortened branches; petiole 0.4–2 cm, villousulous to hirsutulous; blade drying papery or membranous, often grayish black, elliptic-obovate, lanceolate, oblanceolate, or obovate, 5–25 × 1.5–11 cm, adaxially puberulent to hirtellous, strigillose, or glabrescent, abaxially strigillose to pilosulous at least on principal veins, base obtuse to acute, apex obtuse, acute, or rarely acuminate; secondary veins 15–28 pairs; stipules ovate to suborbicular, 6–12 mm, strigillose to glabrous, cuspidate or obtuse to rounded. Inflorescences tomentulose to villousulous or villous, sessile and 3- or 5-partite, 4–18 × 4–24 cm (including petaloid bracts); bracts stipuliform, ovate, 5–15 mm, acuminate to 2-lobed, petaloid bracts white to cream, with blade portion drying papery to stiffly papery, elliptic-oblong to elliptic, 3–10 × 1.5–3.3 cm, strigillose to pilosulous or glabrescent, obtuse to acute, with stipe 2.5–4 cm; pedicels 0.8–1.2 cm. Calyx densely villousulous to tomentulose; ovary portion obconic, ca. 3 mm; limb deeply lobed, strigillose to glabrous; lobes lanceolate to narrowly triangular, 6–10 mm, acute. Corolla white [to pale green in Thailand], outside crisped villousulous to strigillose or strigose; tube 25–60 mm; lobes ovate-oblong to ovate, 5–10 mm, acute to obtuse. Capsules ellipsoid-oblong to ellipsoid, smooth or longitudinally weakly ridged, 1.5–3 × 0.6–1 cm, villousulous to pilosulous or strigillose; seeds 5–6 mm. Fl. Jun–Aug, fr. Sep–Dec.

On trees or rocks in thickets or forests in valleys; 1200–2700 m. Xizang, Yunnan [Bhutan, N India, Myanmar, Nepal, Thailand, Vietnam].

*Hymenopogon parasiticus* var. *longiflorus* was originally distinguished by its corolla length (5–7 cm vs. 2.5–4 cm in var. *parasiticus*). W. C. Chen (in FRPS 71(1): 233. 1999) synonymized these with some commentary.

## 62. *NEOLAMARCKIA* Bosser, Bull. Mus. Natl. Hist. Nat., B, Adansonia 6: 247. 1985.

团花属 tuan hua shu

Chen Tao (陈涛); Charlotte M. Taylor

Trees, unarmed; buds conical. Raphides absent. Leaves opposite, usually with domatia; stipules caducous, interpetiolar, triangular. Inflorescences terminal, capitate with heads globose and solitary, many flowered, pedunculate, bracteate. Flowers sessile, bisexual, monomorphic. Calyx limb 5-lobed; lobes sometime spatulate. Corolla yellow to white, salverform to funnelform, glabrous inside; lobes 5, imbricate in bud. Stamens 5, inserted in upper part of corolla tube, partially exserted; filaments short; anthers basifixed. Ovary 2-celled in basal portion, 2–4-celled in upper portion, ovules several in each cell on axile, simple or 2-forked placentas attached to upper third of septum; stigma cylindrical or fusiform, at apex bifid, exserted. Fruiting head with central axis becoming markedly enlarged and fleshy to fibrous. Fruit drupaceous, indehiscent or tardily dehiscent into 4 indehiscent segments or perhaps dehiscent valves, ellipsoid to cylindrical or obconic, with exocarp somewhat fleshy to membranous or papery, with endocarp cartilaginous to bony, with calyx limb persistent; seeds several, small, compressed, fusiform to angled, with testa membranous; endosperm fleshy; embryo small, cylindrical.

Two species: S and SE Asia, Australia, and New Guinea, one species occasionally cultivated for lumber worldwide; one species in China.

The flowers are tightly packed on the thickened axis of the inflorescence heads but not actually fused to each other as has sometimes been (incorrectly) suggested.

The name of this species and its genus have long been confused. Ridsdale (Blumea 24: 307–366. 1979) in his revision of the Naucleaeae treated

this species as *Anthocephalus chinensis* (Lamarck) A. Richard ex Walpers, as done by several other authors; however, the nomenclature here follows the conclusions of Bosser (loc. cit.: 243–248; *Adansonia* 21: 93–95. 1999) and Razafimandimbison (Tribal Delimit. Naucleae (Ph.D. Diss.): 70–75. 2000).

1. *Neolamarckia cadamba* (Roxburgh) Bosser, Bull. Mus. Natl. Hist. Nat., B, *Adansonia* 6: 247. 1985.

团花 tuan hua

*Nauclea cadamba* Roxburgh, Fl. Ind. 2: 121. 1824; *Anthocephalus cadamba* (Roxburgh) Miquel; *A. indicus* A. Richard; *A. indicus* var. *glabrescens* H. L. Li; *Sarcocephalus cadamba* (Roxburgh) Kurz.

Trees, deciduous, to 30 m tall; trunk with small buttresses; bark thin, grayish brown, fissured and scabrous when old; branches horizontally spreading, flattened becoming subterete, glabrescent. Petiole 20–35 mm, glabrous; leaf blade drying thinly leathery, elliptic or oblong-elliptic, on juvenile growth 50–60 × 15–30 cm, on adult growth 15–25 × 7–12 cm, adaxially shiny and glabrous, abaxially glabrous to densely puberulent, base shallowly cordate on juvenile growth, rounded or

truncate on adult growth, apex acute; secondary veins 8–12 pairs, apparently without domatia; stipules lanceolate, 12–20 mm, acute. Inflorescences with peduncle 2–4 cm, rather stout; flowering heads 35–45 mm across calyces, 40–60 mm across corollas. Calyx puberulent to pilosulous; ovary portion ellipsoid to obovoid, ca. 1.5 mm; limb 3–4 mm, partially to deeply lobed; lobes oblong to spatulate, obtuse to rounded. Corolla yellowish white, funnelform, outside glabrous; tube ca. 10 mm; lobes lanceolate, ca. 2.5 mm. Fruiting heads yellowish green, 30–40 mm in diam., with peduncles markedly thickened. Fruit cylindrical to ellipsoid or obovoid, 2–2.5 × ca. 1 mm, glabrous; seeds 3-angled, 0.5–0.7 mm. Fl. and fr. Jun–Nov.

Broad-leaved forests, streamsides in valleys. Guangdong, Guangxi, Yunnan [Bhutan, India, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

This species is occasionally cultivated for lumber in Asia, including probably in China, and in the Neotropics.

### 63. NEONAUCLEA Merrill, J. Wash. Acad. Sci. 5: 538. 1915.

新乌檀属 xin wu tan shu

Chen Tao (陈涛); Charlotte M. Taylor

*Nauclea* Korthals, Observ. Naubl. Indic. 17. 1839, not Linnaeus (1762).

Trees or shrubs, unarmed; buds flattened with stipules erect and pressed together [to conical], [sometimes with fusiform swellings housing ants in branches]. Raphides absent. Leaves opposite, sometimes with numerous foveolate domatia; stipules caducous [or rarely persistent], interpetiolar, generally ligulate, entire. Inflorescences terminal, capitate with 1–9 globose heads in fascicles or cymes, many flowered, pedunculate, bracteate; peduncles and axes articulate near middle; bracts enclosing heads involucre and caducous; bracteoles spatulate to conical or sometimes absent. Flowers sessile, bisexual, monomorphic. Calyx limb deeply 5-lobed; lobes prolonged into a slender shaft bearing thickened to rhomboidal apical portion, this often ornamented and/or pubescent differently from shaft and frequently deciduous before shaft. Corolla pale green to white or red, salverform to narrowly funnelform, inside glabrous or glabrescent; lobes 5 [or rarely 6], imbricate in bud. Stamens 5, inserted in corolla throat, partially to fully exserted; filaments short; anthers basifixed. Ovary 2-celled, ovules numerous in each cell, pendulous on axile placentas attached in upper third of septum; stigma globose to obovoid, exserted. Fruiting heads globose. Fruit capsular, obconic, septicidally then loculicidally dehiscent into 4 valves from base to apex, with valves separating from septum, with septum persistent on inflorescence or later deciduous, woody to cartilaginous, with calyx limb deciduous with capsule valves; seeds numerous, small, fusiform, flattened, winged; embryo ellipsoid, somewhat bilaterally compressed.

About 62 species: tropical Asia and Pacific islands, perhaps ten species in continental Asia; four species (one endemic) in China.

This genus was studied in some detail by Ridsdale (*Blumea* 24: 337–342. 1979; *Blumea* 34: 177–275. 1989). The unusual, usually quite elaborately developed calyx lobes are distinctive of the genus in general, and their form is distinctive for individual species; care must be taken to look for the caducous apical part of the calyx lobes and to not confuse the persistent tubular calyx limb base with the entire calyx limb. Ridsdale (loc. cit. 1989) developed a very detailed terminology, but did not suggest a function, for the calyx lobe morphology of this genus. He also noted that *Neonauclea* has secondary pollen presentation. Ridsdale (loc. cit. 1989) and Zou (J. Arnold Arbor. 69: 73–76. 1988) noted that some *Neonauclea* species are large trees that produce very good lumber.

- 1a. Leaves sessile or subsessile, with petioles to 5 mm; leaf base obtuse to rounded, truncate, or cordulate.
  - 2a. Leaf blade elliptic-oblong to elliptic or suborbicular, with 6–9 pairs of secondary veins, with domatia in abaxial axils of secondary, tertiary, and often quaternary veins; corolla tube 5–6 mm ..... 2. *N. sessilifolia*
  - 2b. Leaf blade obovate, broadly obovate, broadly elliptic, or elliptic-oblong, with 7–9 pairs of secondary veins, abaxially with domatia only in axils of secondary veins; corolla tube 8–10 mm ..... 3. *N. truncata*
- 1b. Leaves petiolate with petioles 8–40 mm; leaf base acute to cuneate or broadly obtuse, sometimes decurrent.
  - 3a. Petioles 8–20 mm; leaf base acute to cuneate and sometimes decurrent; domatia glabrous; calyx lobes densely pilosulous on middle and lower portion and glabrous at apex, with apical portion fusiform ..... 1. *N. griffithii*
  - 3b. Petioles 15–40 mm; leaf base broadly obtuse to cuneate; domatia tomentulose or glabrous; calyx lobes puberulent throughout except glabrous adaxially in basal portion, with apical portion spatulate to cucullate ..... 4. *N. tsaiiana*

**1. *Neonauclea griffithii*** (J. D. Hooker) Merrill, J. Wash. Acad. Sci. 5: 540. 1915.

新乌檀 xin wu tan

*Adina griffithii* J. D. Hooker, Fl. Brit. India 3: 24. 1880; *Cephalanthus navillei* H. Léveillé; *Nauclea griffithii* (J. D. Hooker) Haviland; *Neonauclea navillei* (H. Léveillé) Rehder.

Trees, evergreen, to 20 m tall; trunk often buttressed at base, sometimes with aerial roots; bark greenish gray, fissured and cracked, sometimes warty, with inner bark yellow, pale brown to pink; branchlets quadrangular becoming terete, grayish brown, rugose or striate, white lenticellate, glabrescent. Petiole 8–20 mm, stout, glabrous; leaf blade drying thickly papery to subleathery, obovate to elliptic, 8–22 × 4–15 cm, both surfaces glabrous, base acute to cuneate and frequently decurrent, apex rounded then abruptly cuspidate or acute; secondary veins 5–7 pairs, in abaxial axils with glabrous domatia; stipules obovate to obovate-oblong, 5–10 × 3–8 mm, weakly keeled, glabrous, apex obtuse. Inflorescences puberulent to glabrescent; peduncles 1 or 3, 2–6 cm; flowering heads solitary, 8–12 mm in diam. across calyces, 25–30 mm in diam. across corollas; involucre bracts not seen; bracteoles 0.5–1 mm. Calyx with ovary portion obconic, 1–1.5 mm, glabrous in lower 2/3, pilosulous in upper 1/3; limb partially lobed, with basal tubular portion ca. 1 mm; lobes with shaft clavate, 3.5–4.5 mm, densely pilosulous, with apical portion fusiform, deciduous before corollas open, pilosulous on lower portions, glabrous at apex. Corolla red (*Henry 12676*, MO!), narrowly funnelform to salverform, outside glabrous; tube 7–8 mm, inside glabrous to sparsely pubescent; lobes elliptic-oblong, 2–3 mm, acute. Stigmas subglobose, ca. 1 mm, exserted for 5–6 mm. Fruiting heads ca. 20 mm in diam. Capsules obconic, 5–6 mm, pilosulous at least at apex; seeds not seen.

Dense forests in valleys or on humid slopes; 800–1300 m. Guangxi, Guizhou, Yunnan [Bhutan, N India, Myanmar].

**2. *Neonauclea sessilifolia*** (Roxburgh) Merrill, J. Wash. Acad. Sci. 5: 542. 1915.

无柄新乌檀 wu bing xin wu tan

*Nauclea sessilifolia* Roxburgh, Fl. Ind. 2: 124. 1824; *Adina sessilifolia* (Roxburgh) J. D. Hooker ex Brandis; *N. sericea* Wallich ex G. Don.

Trees, leaf persistence unknown, 7–30 m tall; bark dark gray, transversely fissured and cracked, with inner bark brown, sometimes mottled; branches flattened to angled, glabrous. Leaves sessile or subsessile; petiole to 5 mm, stout, glabrous; blade drying papery to thinly leathery, elliptic to elliptic-oblong or suborbicular, 5–30 × 3–15 cm, both surfaces glabrous, base rounded to truncate or cordulate, apex obtuse; secondary veins 6–9 pairs, with small, glabrous to pilosulous, foveolate domatia in abaxial axils of lateral, tertiary, and often quaternary veins; stipules broadly elliptic to obovate, 10–30 × 5–10 mm, glabrous, keeled in lower portion, apex obtuse to broadly rounded. Inflorescences glabrescent; peduncles 1 (or 3), 1–3 (–8) cm; flowering heads solitary, 20–25 mm in diam. across calyces, 35–45 mm in diam. across corollas; involucre bracts not seen; bracteoles linear, 1–2 (–3) mm. Calyx with ovary portion obconic,

1–1.5 mm, glabrous or apically tomentulose; limb partially lobed, with basal tubular portion 0.5–0.8 mm; lobes densely pilosulous, with shaft clavate, 5–7 mm, with apical portion pyramidal, deciduous before corollas open. Corolla color unknown; tube 5–6 mm, inside glabrescent; lobes deltoid to elliptic, 2–3 mm, outside densely strigillose to sericeous, acute. Stigma subglobose, ca. 0.8 mm, exserted for 5–6 mm. Fruiting heads (15–) 25–35 mm in diam. Capsules obconic, 8–10 mm, glabrous except densely pilosulous at apex; seeds ca. 2 mm. Fl. Oct.

Thickets or broad-leaved forests on hills; 500–800 m. Taiwan, Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

This is the first report of this species in Taiwan.

**3. *Neonauclea truncata*** (Hayata) Yamamoto, J. Soc. Trop. Agric. 7: 149. 1935.

台湾新乌檀 tai wan xin wu tan

*Nauclea truncata* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 140. 1911.

Trees, evergreen, large, height not noted; branches flattened to angled, gray, glabrous. Leaves sessile or subsessile; petiole to 2 mm, glabrous; blade drying leathery, obovate, broadly obovate, broadly elliptic, or elliptic-oblong, 13.5–26 × 9.9–19.8 cm, glabrous, base rounded to truncate, obtuse, or cordulate, apex obtuse to acute or shortly acuminate; secondary veins 7–9 pairs, in abaxial axils with pilosulous or foveolate domatia; stipules elliptic-oblong to elliptic, 12–25 × 8–15 mm, glabrous, smooth to weakly keeled, rounded to obtuse. Inflorescences densely strigillose to glabrescent; peduncles 1–3 (–5), 2.2–3.5 cm, stout; flowering heads solitary on peduncles, 12–25 mm in diam. across calyces, 34–45 mm in diam. across corollas; bracteoles reportedly sparse, not seen. Calyx with ovary portion 0.8–1.5 mm, glabrous; limb partially lobed, with basal tubular portion 1–1.5 mm, pilosulous at least on apical portion; lobes deciduous before corollas open, with shaft linear, 1.5–2.5 mm, glabrous below and densely pilosulous in upper part, with apical portion obconic to thickly fusiform, 2–2.5 mm, pilosulous to glabrescent. Corolla white, funnelform; tube 8–10 mm, glabrous; lobes ligulate to lanceolate, 2–3 mm, puberulent, obtuse to acute. Stigma subglobose to fusiform, ca. 1 mm, exserted for 8–10 mm. Fruiting heads 30–35 mm in diam. Capsules obconic, 8–10 mm, glabrescent. Fl. Jul.

Forests, on coral rocks. Taiwan [Philippines].

This species was reported from Taiwan by Chun (Fl. Taiwan 4: 313. 1978) and later by Liu et al. (Fl. Taiwan, ed. 2, 4: 304–306. 1998) under the name *Neonauclea reticulata* (Haviland) Merrill, with the name *N. truncata* placed in synonymy there. However, Yamamoto (loc. cit.) had already noted the differences that separate *N. truncata* and *N. reticulata* and concluded that the name *N. reticulata* had been incorrectly applied to the Taiwanese plants. Ridsdale (Blumea 34: 213–217. 1989) later recognized these as two distinct species and reported an extended range for *N. truncata*, in N Philippines.

**4. *Neonauclea tsaiiana*** S. Q. Zou, J. Arnold Arbor. 69: 73. 1988.

滇南新乌檀 dian nan xin wu tan

Trees, to 30–40 m tall and 1 m d.b.h.; trunk cylindrical,

with buttresses; bark rough, with inner bark fibrous, yellow or sometimes with pink; branches flattened to angled, densely lenticellate, glabrescent. Petiole 12–40 mm, stout, glabrous; leaf blade drying leathery, elliptic or ovate-elliptic, 12–22 × 6–13 cm, adaxially glabrous and rather shiny, abaxially glabrous and matte, base broadly obtuse to cuneate, apex acute to shortly acuminate; secondary veins 6 or 8 pairs, with tomentulose to glabrous foveolate domatia in abaxial axils; stipules ovate, 12–24 × 8–14 mm, glabrous, weakly keeled in basal portion, apex obtuse. Inflorescences glabrous; peduncles 1–3, 2–4.5 cm; flowering heads 1–7(or 9), solitary on peduncles or 3–7 in branched cymes, 10–18 mm in diam. across calyces, 25–30 mm in diam. across corollas; involucre bracts not seen; bracteoles conical, 0.7–1 mm. Calyx with ovary portion obconic, 1–1.5 mm, glabrous except puberulent at apex; limb partially lobed, with basal tubular portion 0.8–1 mm; lobes deciduous before

corollas open, with shaft clavate, 3–4 mm, densely puberulent except adaxially glabrous in basal portion, apical portion rounded to cucullate, densely puberulent. Corolla pale yellow, funnelform, glabrous; tube 5–6.5 mm; lobes elliptic-oblong, ca. 2.5 × 1.2 mm, apex acute. Stigmas subglobose, ca. 1 mm, exserted for 5–6 mm. Fruiting heads 15–20 mm in diam. Capsules clavate, somewhat flattened, 6–7 mm, glabrous in basal portion, puberulent or pilosulous at apex; seeds unknown. Fl. Sep–Oct, fr. May–Jun.

• Tropical rain forests at streamsides or in bottom of valleys; 500–1100 m. Yunnan.

This species was described almost simultaneously with the publication of Ridsdale's revision of the genus (*Blumea* 34: 177–275. 1989) and was not mentioned by him presumably because he was unaware of it.

#### 64. *NERTERA* Banks ex Gaertner, *Fruct. Sem. Pl.* 1: 124. 1788, nom. cons.

薄柱草属 *bao zhu cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Erythrodanum* Thouars; *Gomozia* Mutis ex Linnaeus f.

Herbs, perennial, unarmed, sometimes fetid when bruised, often creeping and rooting at nodes. Raphides present. Leaves opposite, without domatia, marginally usually thickened and sometimes crisped; stipules persistent, interpetiolar and fused to petioles, triangular or bidentate. Inflorescences terminal and/or pseudoaxillary, 1-flowered, sessile or shortly pedunculate, ebracteate or sometimes with small involucre of bracts fused in pairs (i.e., calyculate) or of reduced stipules and leaves. Flowers bisexual, homostylous. Calyx limb truncate, 4-lobed, or reduced. Corolla greenish white, white, or pink, funnelform, glabrous inside; lobes 5, valvate in bud. Stamens 4, inserted near base of corolla tube, exserted; filaments developed; anthers basifixed. Ovary 2- or 4-celled, ovules 1 in each cell on axile placentas; stigmas 2 or 4, linear, exserted. Fruit orange, red, or black, drupaceous, ovoid or globose, fleshy, with calyx limb persistent; pyrenes 2 or 4, 1-celled, each with 1 seed, plano-convex, cartilaginous; seeds medium-sized, ellipsoid to plano-convex; testa membranous; endosperm scanty; cotyledons leaflike; hypocotyl hypogenous.

About six species: Antilles, Australia, Central, North, and South America, China, Indonesia, Malaysia, Pacific islands, Papua New Guinea, Philippines, Subantarctic islands (Tristan da Cunha), Vietnam; three species (one endemic) in China.

Phylogeography of the most widespread species *Nertera granadensis* (as *N. depressa*) was studied by Jakubowksy et al. (Evolution of *Nertera*. Poster presented at XVII IBC. 2005) using molecular data; they concluded that this species originated in New Zealand, where *Nertera* has its center of diversity, and dispersed independently to Australia, the Philippines, then SE Asia and Hawaii, and then Central and South America and eastward. They also suggested that *N. nigricarpa* may be better included within the circumscription *N. granadensis*, although species identity and circumscription were not the primary focus of their work so their sampling many not be adequate to address this. *Nertera nigricarpa* is distinguished primarily by its black rather than red mature fruit and was synonymized with *N. granadensis* by Liu and Yang (*Fl. Taiwan*, ed. 2, 4: 306. 1998), without comment; however, these species were separated by W. C. Ko in *FRPS* (71(2): 162–165. 1999). If these populations are treated as conspecific, this represents the only example known in *Nertera* of such fruit color dimorphism, which is known but uncommon in Rubiaceae. *Nertera nigricarpa* is provisionally separated here pending further study.

Liu and Yang (loc. cit.) and W. C. Ko (loc. cit.) described the flowers as bisexual or unisexual, but other authors reported the flowers of *Nertera* to be bisexual (e.g., Fosberg, *Acta Phytotax. Geobot.* 33: 73–83. 1982; Andersson, *Fl. Ecuador* 47: 11–12. 1993).

- 1a. Leaf blade oblong-lanceolate to elliptic, cuneate to acute at base and apex, abaxially with surface uneven due to swollen cells, on dry specimens appearing scurfy; fruit with 4 pyrenes ..... 3. *N. sinensis*
- 1b. Leaf blade ovate, broadly ovate, ovate-triangular, or ovate-reniform, acute to obtuse or broadly rounded at apex, abaxially generally smooth; fruit with 2 pyrenes.
  - 2a. Leaves acute to obtuse at apex; fruit red ..... 1. *N. granadensis*
  - 2b. Leaves obtuse to broadly rounded at apex; fruit black ..... 2. *N. nigricarpa*

1. *Nertera granadensis* (Mutis ex Linnaeus f.) Druce, *Rep. Bot. Soc. Exch. Club Brit. Isles* 1916: 637. 1917.

129. 1782; *Nertera depressa* Banks & Solander ex Gaertner; *N. taiwaniana* Masamune.

红果薄柱草 *hong guo bao zhu cao*

Creeping herbs; stems angled, glabrescent. Petiole slender, 2–4 mm, glabrescent; leaf blade drying papery and often pale abaxially, ovate or ovate-triangular, 0.3–1 × 0.2–0.8 cm, gla-

*Gomozia granadensis* Mutis ex Linnaeus f., *Suppl. Pl.*

brescent, generally smooth abaxially, base obtuse to shallowly cordate, apex acute to obtuse; secondary veins 2 or 3 pairs; stipules ovate-triangular, 0.5–1 mm, glabrescent, apex acute and often glandular. Flowers sessile or subsessile. Calyx glabrous; ovary portion ellipsoid, ca. 1 mm; limb reduced. Corolla white to pale green, glabrous; tube 0.5–1 mm; lobes ca. 1 mm. Drupes red, subglobose, 3–5 mm in diam.; pyrenes 2.

Hillsides at middle elevations. Taiwan [Indonesia, Malaysia, Papua New Guinea, Philippines; Australia, Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama), North America (Mexico), Pacific islands (Hawaii, New Zealand), South America (Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, Venezuela), Subantarctic islands (Tristan da Cunha)].

See comments under the genus regarding the distinction of this species from *Nertera nigricarpa*. No specimens have been seen from China during the preparation of this treatment that correspond to *N. granadensis*, separately from *N. nigricarpa*; thus, its presence in China remains to be confirmed and the placement of the name *N. taiwaniana* remains to be confirmed. Puff et al. (Rubiaceae of Thailand, 210. 2005) reported that *N. granadensis* has been recorded for Thailand, but they found no specimens nor the source of that report.

This species has often been called *Nertera depressa*, the type of the genus; however, *Gomozia granadensis* is an older name for this species and thus has priority over the epithet "*depressa*," so the correct name is *N. granadensis*.

**2. *Nertera nigricarpa*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 115. 1908.

黑果薄柱草 *hei guo bao zhu cao*

Creeping herbs; stems quadrate, glabrous. Petiole 1–8 mm, glabrous; leaf blade drying papery, broadly ovate or ovate-reniform, 0.25–1 × 0.3–1.1 cm, glabrous, generally smooth abaxially, base rounded to truncate or cordulate then abruptly

attenuate, apex obtuse to broadly rounded; secondary veins 2 or 3; stipules broadly triangular, 1–1.3 mm, glabrous, acute and often glandular. Flowers sessile. Calyx glabrous; ovary portion ovoid, ca. 1 mm; limb truncate to denticulate, 0.1–0.2 mm. Corolla probably pale green, urceolate-funnelform, glabrous; tube ca. 1 mm; lobes triangular, ca. 0.4 mm. Drupes black, ellipsoid to subglobose, 4–4.5 in diam., glabrous; pyrenes 2. Fl. Feb–Jul, fr. Mar–Jan.

Sparse forests, open fields; 900–2500 m. Fujian, Taiwan [Vietnam (*Averyanov et al. VH 427, MO!*)].

See comments under the genus description regarding the relationship of this species to *Nertera granadensis*. This is apparently the first report of this species from Vietnam.

**3. *Nertera sinensis*** Hemsley, J. Linn. Soc., Bot. 23: 391. 1888.

薄柱草 *bao zhu cao*

Low herbs, with main stems creeping and reproductive stems erect, to 10 cm tall; stems angled, glabrous. Petiole 1–3 mm, glabrous; leaf blade drying papery, oblong-lanceolate to elliptic, 0.7–1.6 × 0.35–0.5 cm, glabrous or sparsely hispidulous on both surfaces, abaxially rough due to enlarged thin-walled cells that dry with scurfy appearance, base cuneate to acute, margins hispidulous, apex acute to cuneate; secondary veins not visible; stipules narrowly triangular, 0.8–1 mm, obtuse to acute or aristate and usually glandular. Flowers sessile. Calyx glabrous; ovary portion 1–1.5 mm; limb truncate, 0.1–0.2 mm. Corolla pale green, funnelform, glabrous; tube ca. 1 mm; lobes triangular, ca. 0.5 mm, acute to obtuse. Drupes dark blue to black, subglobose, 2–6 mm in diam.; pyrenes 4. Fl. Jul–Aug, fr. Jul–Nov.

• Mountain slopes, roadsides, ditch sides, rocks at riversides; 500–1300 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan.

## 65. OPHIORRHIZA Linnaeus, Sp. Pl. 1: 150. 1753.

蛇根草属 *she gen cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Hayataella* Masamune; *Mitreola* Boehmer; *Mungos* Adanson.

Annual or perennial herbs or rarely subshrubs, unarmed, often fleshy or rather succulent, sometimes creeping. Raphides present. Leaves opposite, decussate, sometimes anisophyllous, without domatia; margins sometimes undulate to denticulate; stipules persistent or caducous, interpetiolar, entire or bifid to fimbriate, sometimes glandular. Inflorescences terminal and/or pseudoaxillary or rarely axillary (*Ophiorrhiza oppositifolia*), cymose to capitate, fasciculate, or paniculiform with axes often helicoid, few to many flowered, sessile to pedunculate, bracteate or bracts absent; bracts caducous to persistent, sometimes involucrel. Flowers pedicellate to sessile, bisexual and distylous or monomorphic or occasionally cleistogamous. Calyx with ovary portion turbinate to obconical, usually strongly compressed, longitudinally often 5- or 10-ribbed; limb reduced or 5(or 6)-lobed, lobed essentially to base or rarely subtruncate (*O. repandicalyx*). Corolla white, yellow, orange, pink, purple, or brown, sometimes drying with markedly different color, usually notably clavate in bud, at anthesis salverform, tubular, or funnelform with tube often swollen to gibbous at base, outside often longitudinally ridged or winged, inside glabrous to variously pubescent; lobes 5(or 6), valvate in bud, smooth or occasionally ridged, winged, and/or with hornlike appendages near apex, apex sometimes adaxially rostrate. Stamens 5(or 6), inserted near throat to below middle of corolla tube, included or exserted; filaments reduced to well developed; anthers dorsifixed near middle or base. Ovary 2-celled, ovules numerous in each cell on axile placentas attached from middle to base of septum; stigmas 2, linear to subcapitate, included or exserted. Fruit capsular, obovoid to oblate, mitriform, or obcordate, strongly laterally compressed perpendicular to septum, sometimes with apical portion prolonged into a beak, loculicidally dehiscent across top and sometimes along sides, papery, with calyx limb persistent; seeds numerous, small, angled to rhomboid, areolate to alveolate.

About 200–300 species: tropical and subtropical Asia, Australia, New Guinea, Pacific islands; 70 species (49 endemic, one of unconfirmed occurrence) in China.

*Ophiorrhiza* is a notably species-rich, taxonomically complicated genus found in wet tropical forests of SE Asia (Darwin, *Lyonia* 1(2): 47–102. 1976); it has been little studied and is particularly poorly known in SE Asia (I. Schanzer, pers. comm.). *Ophiorrhiza* was studied for China by H. S. Lo (Bull. Bot. Res., Harbin 10(2): 1–82. 1990), who variously described 44 of the 68 *Ophiorrhiza* species recognized by Lo in FRPS (71(1): 110–174. 1999). The genus was studied in India by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 1–148. 1997), who recognized 47 species there. Darwin (loc. cit.) reported that the plants are notably variable in many vegetative features, many of which were shown by him not to be informative to separate species. H. S. Lo (loc. cit. 1999: 111) reported that the calyx and corolla lobes are occasionally 6, but this has not been noted by other authors nor seen on specimens studied; this may be an occasional variation found in one or two flowers on unusual plants, as in many Rubiaceae species. H. S. Lo also described the placentas as ascending from the septum base; however, Darwin (loc. cit.: 56) reported that in the Pacific *Ophiorrhiza* species the placenta is inserted in the middle of the septum in the flower and then often becomes displaced to near the base of the septum in fruit, whereas Puff et al. (Rubiaceae of Thailand, 190. 2005) gave the insertion of the placenta as being in the lower half of the septum. Puff et al. reported that the fruit function as splash cups for seed dispersal and observed that, regardless of the orientation of the flowers, the fruit become erect with enlarged and strengthened pedicels. Tan and Rao (Biotropica 13: 232–233. 1981) reported vivipary in a species of *Ophiorrhiza* growing in Singapore, with the seeds germinating within the capsules, pushing their cotyledons out through the suture where the valves open normally, and extending roots through the capsule locules and tissues; a similar condition may be found in Chinese *Ophiorrhiza*.

Darwin (loc. cit.: 47–102) noted that the presence of distyly in *Ophiorrhiza* has been controversial because the arrangement of the stigmas and anthers in the first dimorphic species found here differs from that of classic distyly, with strictly reciprocal sizes and positions. However, since then the recognition of distyly in Rubiaceae has expanded to include species that are at least a bit dimorphic and have intra-morph incompatibility, and *Ophiorrhiza* clearly belongs in this group and has been considered distylous by subsequent authors (Deb & Mondal, loc. cit.; Kudoh et al., J. Trop. Ecol. 17: 719–728. 2001; Schanzer, Thai Forest Bull. 33: 140–166. 2004). Also, some species with markedly dimorphic distylous flowers have subsequently been discovered (e.g., *O. aureolina* and *O. rufopunctata*). Deb and Mondal (loc. cit.: 15, f. 7) illustrated some of the variation in stamen and stigma position and internal corolla pubescence in distylous species of this genus. Homostyly has also been confirmed in the genus (Nakamura et al., J. Jap. Bot. 81: 113–120. 2006; J. Plant Res. 120: 501–509. 2007) and some species also appear to be autogamous (Nakamura et al., loc. cit. 2006). Schanzer (loc. cit.) noted that some species appear to vary in floral biology across their range, to include both homostylous and distylous populations; this situation has been found elsewhere in some distylous Rubiaceae, which have variation in expression of distyly (e.g., Faivre & McDade, Amer. J. Bot. 88: 841–853. 2001), though in those cases, the flowers resemble one of the distylous forms while Schanzer described a distinct floral form in the monomorphic plants. Schanzer also noted that some of these floral forms may be aberrant and cleistogamous rather than distylous. Nakamura et al. (loc. cit. 2007) studied two supposedly conspecific varieties of *O. japonica* in Japan, one homostylous and the other distylous, and concluded that the self-compatible homostylous plants differed in ploidy level, comprised a distinct lineage according to cpDNA sequences, and are better considered a separate species. They also noted that floral biology is not correlated with ploidy in general in *Ophiorrhiza*. Observations and documentation of the floral biology of Chinese *Ophiorrhiza* species are so far limited. Kudoh et al. (loc. cit.) presented a detailed analysis of the floral forms and possible genetic controls of these in *O. napoensis* in Guangxi, China. Also notable in the floral morphology of this genus is the apparent wide variation in corolla pubescence within a species, sometimes with the long-styled and short-styled flowers reportedly different (e.g., *O. oppositiflora*, floral forms similar but corolla pubescence variable, Deb & Mondal, loc. cit.: 88, f. 39; *O. austroyunnanensis*, pubescence apparently correlated with floral form, H. S. Lo, loc. cit. 1990: 31, f. 8).

Deb and Mondal (loc. cit.: 1) noted that the genus name alludes to the presumed healing properties of the root of these plants for snakebite and that *Ophiorrhiza mungos* and *O. japonica* are used for such in the Indian subcontinent. They also noted that species of this genus are used as medicine (for snakebites, stomach ulcers, skin eruptions, rheumatism, heart diseases), dye (red, for wool and hair), and food (the fruit), and list several references detailing their ethnobotany and medical chemistry.

The monotypic genus *Hayataella*, endemic to Taiwan, was recognized by several authors (particularly Taiwanese authors) as distinct from *Ophiorrhiza*, though it was synonymized by H. S. Lo (Bull. Bot. Res., Harbin 18: 276–277. 1998). Its morphology and molecular systematics were studied by Nakamura et al. (J. Plant Res. 119: 657–661. 2006), who concluded based on molecular data that the species belongs to a relatively derived clade of *Ophiorrhiza* and formally transferred the species, eliminating another of Taiwan's few endemic genera.

No infrageneric classification has been recognized by recent authors (Darwin, loc. cit.: 47–102; Deb & Mondal, loc. cit.: 1–148).

H. S. Lo (loc. cit. 1990: 1–82) presented the definitive work on this genus in China. Most recently, *Ophiorrhiza* has been studied in China by Duan and Lin (Acta Phytotax. Sin. 45: 870–879. 2007), who synonymized several of Lo's species. Their species circumscription is relatively broad compared to that of Lo, and a few of the species they synonymized are provisionally recognized here pending further study and a broader, consistent review of *Ophiorrhiza* in China.

Overall, the treatment of *Ophiorrhiza* here is primarily an organization of the published information, rather than a revisionary work. A few other species are keyed here even though their descriptions are incomplete; their placement is based in part on the key of H. S. Lo in FRPS (loc. cit. 1999: 112–117). In the FRPS treatment, H. S. Lo described in some detail the arrangement and degree of surface development and visibility of the tertiary venation on the abaxial leaf surface of many *Ophiorrhiza* species; however, this is incompletely described for the Chinese species, is variable within species, and was not used by Lo to distinguish species nor by other authors and, therefore, is not detailed here. Details of the anthers and stigmas are also incompletely described for Chinese *Ophiorrhiza* and mostly not used to separate species; the details available are summarized in the comments following the species description.

Among the names published in *Ophiorrhiza* by H. S. Lo (loc. cit. 1990), eight lacked an acceptable indication of type and were therefore not validly published under Art. 37 of the *Vienna Code*. In one case (*O. chingii*), two gatherings were cited but neither was indicated as the type, and in the other seven cases only one gathering was cited, which under Art. 37.3 is acceptable as indication of the type, but under Art. 37.6, on or after 1 January

1990, indication of the type must also include the word “typus” or “holotypus” or an equivalent in a modern language, and Lo did not include such words. All but one of the eight names were validated by S. Y. Jin and Y. L. Chen (Cat. Type Spec. Herb. China (Suppl.), 189–191, 1999) in each case by reference to Lo’s Latin description and by indication of a single gathering as the type (as “T.”). The one remaining name, *O. longicornis*, is validated here.

- 1a. Calyx lobes relatively well developed, longest ones 3.5 mm or longer (do not confuse bracts with calyx lobes).
  - 2a. Calyx lobes strongly unequal, more than 50% different in length, longer ones 3–6 mm and shorter ones 0.8–3 mm ..... 52. *O. pingbienensis*
  - 2b. Calyx lobes subequal, at most 50% different in length, 3.5–8 mm.
    - 3a. Corolla purple, tube 26–29 mm; stipules 1.5–2 mm ..... 64. *O. sichuanensis*
    - 3b. Corolla white or yellow, tube 13–19 mm (mature corolla unknown in *O. hunanica*); stipules 3–10 mm.
      - 4a. Stems glabrescent; calyx lobes linear; corolla externally with ciliate wings ..... 27. *O. hunanica*
      - 4b. Stems pilosulous or villous at least when young; calyx lobes linear, spatulate, or ovate; corolla externally smooth to ridged or with narrow, glabrous to pubescent wings.
        - 5a. Stipules ca. 10 mm, 2- or 3-lobed, lobes linear; bracts 10–20 mm; calyx lobes linear ..... 41. *O. medogensis*
        - 5b. Stipules 3–9 mm, triangular or 2-lobed; bracts 5–7 mm; calyx lobes ligulate, narrowly spatulate, ovate, or lanceolate.
          - 6a. Corolla with tube 13–14 mm and externally ridged or ribbed, lobes 2–2.5 mm; leaves in subequal pairs ..... 15. *O. ensiformis*
          - 6b. Corolla with tube 18–19 mm and externally ridged to winged, lobes ca. 4.5 mm; leaves in unequal pairs ..... 60. *O. rufipilis*
  - 1b. Calyx lobes none (i.e., limb truncate) or longest lobes 3.4 mm or shorter (calyx lobe length unknown in *O. rarior*).
    - 7a. Inflorescences axillary, paired at nodes below apex ..... 49. *O. oppositiflora*
    - 7b. Inflorescences terminal and/or pseudoaxillary, solitary at each node.
      - 8a. Stems densely lenticellate and moderately brown villous or -hirsute with multicellular trichomes when young ..... 56. *O. rarior*
      - 8b. Stems sparsely lenticellate to smooth, glabrous to densely pubescent with trichomes of various colors and forms when dry.
        - 9a. Corollas relatively small, tube 5.5 mm or shorter (corollas unknown in *O. salicifolia*).
          - 10a. Leaves lanceolate-linear, 6 or more  $\times$  as long as wide ..... 63. *O. salicifolia*
          - 10b. Leaves variously shaped, 3  $\times$  as long as wide or broader.
            - 11a. Corolla lobes with well-developed dorsal horns or appendages, these 1.5–2 mm.
              - 12a. Inflorescences congested-cymose, branched to 1 or 2 orders; corolla pubescent in throat but glabrous below inside tube, pubescent externally ..... 6. *O. cana*
              - 12b. Inflorescences cymose to corymbose, branched to 3 or 4 orders; corolla pubescent below middle inside tube, glabrous externally ..... 35. *O. longicornis*
            - 11b. Corolla lobes dorsally smooth, ribbed, winged, or with thickenings or short hornlike protuberances, these up to 0.8 mm.
              - 13a. Bracts and bracteoles well developed, lanceolate to spatulate or elliptic, 1–3 mm wide, partially to fully enclosing buds and flowers.
                - 14a. Stipules ovate ..... 4. *O. austroyunnanensis*
                - 14b. Stipules triangular at base, quickly narrowed to a linear apex or linear lobes ..... 38. *O. lurida*
              - 13b. Bracts and bracteoles reduced or linear to triangular, 0.1–0.8 mm wide, not enclosing buds or flowers.
                - 15a. Plants creeping or at least relatively small, at most 30 cm tall and most plants much shorter.
                  - 16a. Stipules 1–3 mm, caducous and often not visible; fruit 5–7 mm wide ..... 53. *O. pumila*
                  - 16b. Stipules 4–10 mm, usually persisting on uppermost nodes; fruit 4–5 mm wide.
                    - 17a. Leaves strigillose to glabrous adaxially ..... 24. *O. hispidula*
                    - 17b. Leaves sparsely hispidulous adaxially ..... 62. *O. rugosa*
                - 15b. Plants mostly weakly ascending to erect, generally rather robust, most plants 30 cm tall or taller.
                  - 18a. Plants when dry covered with golden yellow pubescence, including on corollas ..... 3. *O. aureolina*
                  - 18b. Plants glabrous or with pubescence drying white to brown, reddened, or clear.
                    - 19a. Plants to 80–100 cm tall, with leaves 15–22  $\times$  6–10 cm, with 11–19 pairs of secondary veins; calyx limb undulate to shallowly to moderately lobed.
                      - 20a. Stipules deciduous after uppermost nodes, 4–8 mm; corolla tube 2.5–4 mm ..... 43. *O. mungos*
                      - 20b. Stipules caducous, unknown; corolla tube ca. 5.5 mm ..... 57. *O. repandicalyx*
                    - 19b. Plants to 70 cm tall, with leaves 2–15  $\times$  1–6 cm, with (4 or) 5–11(–19) pairs of secondary veins; calyx limb shallowly to deeply lobed.
                      - 21a. Stipules 3–8 mm, deciduous after uppermost nodes; Taiwan ..... 29. *O. kuroiwa*

- 21b. Stipules caducous and unknown, or persistent on uppermost nodes and 2–11 mm; mainland (including Hainan).
- 22a. Inflorescences well developed, cymose to paniculate; secondary leaf veins 7–19 pairs.
- 23a. Stipules caducous; corollas 3.5–5 mm ..... 43. *O. mungos*
- 23b. Stipules mostly persistent; corollas 6–6.5 mm ..... 49. *O. oppositiflora*
- 22b. Inflorescences somewhat reduced, congested-cymose to subcapitate; secondary leaf veins (4 or) 5–7(–11) pairs.
- 24a. Corolla with pubescent ring inside tube, with lobes 1/4–1/3 as long as tube and spreading at anthesis ..... 62. *O. rugosa*
- 24b. Corolla pubescent in throat and on upper part of tube but glabrous through most of tube, with lobes 1/3–1/2 as long as tube and spreading to strongly reflexed at anthesis.
- 25a. Stipules triangular, 2–4 mm; corolla tube 2.5–4.5 mm, lobes spreading at anthesis ..... 38. *O. lurida*
- 25b. Stipules subfiliform, ca. 6 mm; corolla tube 4.5–5 mm, lobes strongly reflexed at anthesis ..... 70. *O. wui*
- 9b. Corollas larger, tubes more than 5.5 mm (corollas unknown in *O. hainanensis* and *O. salicifolia*).
- 26a. Leaves relatively narrow, more than 3 × as long as wide, often falcate, 4.5–11 × 0.6–2 cm.
- 27a. Stems with 2 discrete lines of pubescence; bracteoles 1.5–3 mm ..... 34. *O. lignosa*
- 27b. Stems glabrescent; bracteoles 4–5 mm ..... 63. *O. salicifolia*
- 26b. Leaves rather narrow to relatively broad, less than 3 × as long as wide, 0.5–25 × 0.3–10 cm.
- 28a. Corolla lobes dorsally with well-developed hornlike appendages 0.8–2 mm.
- 29a. Plants robust, to 2.5 m tall, leaves 10–20 × 4–7.5 cm, with 15 or 16 pairs of secondary veins ..... 44. *O. mycetiifolia*
- 29b. Plants smaller to somewhat robust, to 1 m tall, leaves 2–17 × 2–4.5 cm, with 6–13 pairs of secondary veins.
- 30a. Corolla tube 22–24 mm ..... 25. *O. howii*
- 30b. Corolla tube 10.5–12 mm.
- 31a. Leaves with secondary veins 8–12 pairs; calyx lobes 0.4–0.5 mm ..... 19. *O. gracilis*
- 31b. Leaves with secondary veins 6 or 7 pairs; calyx lobes ca. 1.5 mm ..... 55. *O. purpureonervis*
- 28b. Corolla lobes dorsally smooth, ridged, winged, and/or with dorsal thickenings on lobes, these sometimes hornlike but 0.7 mm or shorter.
- 32a. Plants creeping to procumbent, with most internodes prostrate and/or most nodes rooting.
- 33a. Corolla with tube 15–20 mm, lobes 5–6.5 mm.
- 34a. Corolla externally with 5 pubescent lines ..... 42. *O. mitchelloides*
- 34b. Corolla externally glabrous or uniformly pubescent ..... 33. *O. liangkwanensis*
- 33b. Corolla with tube 7–12 mm, lobes 2–5 mm.
- 35a. Corolla lobes ca. 2 mm; stems glabrescent or pilosulous in lines ..... 30. *O. kwangsiensis*
- 35b. Corolla lobes 2.2–5 mm; stems generally uniformly villous, hirtellous, or pilosulous.
- 36a. Bracts well developed, 3.5–6 mm; leaf base regularly cordate ..... 11. *O. cordata*
- 36b. Bracts reduced, 1–2 mm; leaf base obtuse, truncate, or sometimes cordulate.
- 37a. Corolla lobes 2.5–3 mm ..... 14. *O. dulongensis*
- 37b. Corolla lobes 4–5 mm ..... 26. *O. huanjiangensis*
- 32b. Plants erect to weak, with most internodes ascending and most nodes not rooting.
- 38a. Corolla with tube 18–27 mm.
- 39a. Bracts and bracteoles well developed, enclosing buds and at least partially flowers, ligulate, lanceolate, ovate, elliptic, or elliptic-oblong, 10–18 mm.
- 40a. Stems villous; corolla funnelform at least in upper part.
- 41a. Corolla lobes not evidently veined, ca. 5 mm ..... 20. *O. grandibracteolata*
- 41b. Corolla lobes pinnately veined, 6–8 mm ..... 58. *O. rhodoneura*
- 40b. Stems glabrous; corolla salverform to funnelform.
- 42a. Corolla funnelform, tube villous inside above middle ..... 16. *O. fangdingii*
- 42b. Corolla salverform to funnelform, tube glabrous inside ..... 46. *O. napoensis*
- 39b. Bracts and bracteoles reduced to developed, not enclosing or covering buds or flowers, linear, narrowly triangular, or narrowly lanceolate, 5.5 mm or shorter.
- 43a. Stems villous, villosulous, hirsute, hispidulous, strigose, strigillose, or pilosulous.
- 44a. Calyx lobes 0.4–1.5 mm; flowers several to many.
- 45a. Peduncle 1.5–3.5 cm; corolla tube 18–20 mm, pubescent inside ..... 9. *O. chinensis*
- 45b. Peduncle 1–1.5 cm; corolla tube 23–27 mm, glabrous inside ..... 68. *O. wallichii*
- 44b. Calyx lobes 1–3 mm; flowers 1–5.

- 46a. Corolla tube 22–26 mm; leaves without gland dots abaxially ..... 54. *O. purpurascens*  
 46b. Corolla tube 18–22 mm; leaves with or without gland dots abaxially.  
 47a. Leaves without or usually with reddish gland dots abaxially; fruit 5–6 ×  
     ca. 11 mm ..... 61. *O. rufopunctata*  
 47b. Leaves without gland dots abaxially; fruit ca. 3 × 8 mm ..... 69. *O. wenshanensis*  
 43b. Stems glabrous to puberulent.  
 48a. Leaves broadly ovate to broadly elliptic, abaxially with numerous small scales ..... 12. *O. crassifolia*  
 48b. Leaves elliptic, lanceolate, ovate, ovate-oblong, or elliptic-oblong, glabrous to  
     variously pubescent but without scales.  
 49a. Stipules generally persistent at least on uppermost nodes, 6–8 mm ..... 39. *O. macrantha*  
 49b. Stipules generally caducous, unknown or perhaps reduced.  
 50a. Calyx lobes unequal, 0.7–2 mm ..... 45. *O. nandanica*  
 50b. Calyx lobes subequal, 0.4–1.5 mm.  
 51a. Fruit 14–15 mm wide ..... 68. *O. wallichii*  
 51b. Fruit 8–11 mm wide.  
 52a. Leaves 3.5–15 cm, with 9 or 10 pairs of secondary veins; corolla white to pale  
     purple-red; widespread ..... 9. *O. chinensis*  
 52b. Leaves 9–15 cm, with 10–14 pairs of secondary veins; corolla red to purplish  
     red; Xizang, Yunnan ..... 67. *O. umbricola*  
 38b. Corolla with tube less than 18 mm (corolla unknown in *O. hainanensis*).  
 53a. Stipules generally well developed, 3–16 mm, and persistent at least on uppermost nodes  
     of flowering stems.  
 54a. Calyx lobes rather well developed, 1.5–2.5 mm with at least some longer than 1.5 mm.  
 55a. Leaves larger, 6.5–22 × 2.5–10 cm; bracts 7–9 mm ..... 40. *O. macrodonta*  
 55b. Leaves smaller, 1–4 × 0.6–2.5 cm; bracts reduced, to ca. 1 mm ..... 14. *O. dulongensis*  
 54b. Calyx lobes smaller, 0.5–1.5 mm with at least some shorter than 1.5 mm.  
 56a. Bracts and bracteoles reduced, to 3 mm, mostly or all deciduous before anthesis.  
 57a. Leaves smaller, 2–11 × 1–5 cm; corollas pubescent inside, glabrous to pubescent  
     outside ..... 62. *O. rugosa*  
 57b. Leaves larger, 6.5–25 × 2–10 cm; corollas glabrous inside and puberulent to glabrous  
     outside.  
 58a. Corollas yellow to pale yellow; peduncles in flower 3–10 cm (these later elongating  
     in fruit) ..... 48. *O. ochroleuca*  
 58b. Corollas purplish red; peduncles in flower 2.5–5 cm (these later elongating in fruit) ..... 59. *O. rosea*  
 56b. Bracts and bracteoles generally well developed, 3–12 mm, generally persistent at  
     least through anthesis.  
 59a. Leaves in markedly unequal pairs, larger ones 1.5–3 × as long as shorter.  
 60a. Corolla pink or purplish red, tube ca. 11 mm, lobes ca. 1.5 mm and dorsally  
     with short hornlike appendage ..... 5. *O. brevidentata*  
 60b. Corolla white, tube ca. 9 mm, lobes 2–3 mm and dorsally narrowly winged ..... 47. *O. nutans*  
 59b. Leaves in subequal pairs.  
 61a. Leaves larger, at least some 10–16 × 4–6.5 cm; peduncles in flower 1–8 cm.  
 62a. Peduncle in flower 1.5–2 cm; bracts 3–4 mm; corolla pubescent inside ..... 23. *O. hispida*  
 62b. Peduncle in flower 1–8 cm; bracts 6–12 mm; corolla glabrous inside.  
 63a. Calyx with hypanthium portion 1–1.5 mm, lobes 1–1.2 mm ..... 17. *O. fasciculata*  
 63b. Calyx with hypanthium portion ca. 3 mm, lobes ca. 0.5 mm ..... 48. *O. ochroleuca*  
 61b. Leaves smaller, 0.8–13 × 0.5–4 cm; peduncles in flower 0.5–6 cm.  
 64a. Peduncle in flower 1–3 cm; bracts 3–6.5 mm; leaves obtuse at apex ..... 50. *O. pauciflora*  
 64b. Peduncle in flower 0.5–6 cm; bracts 5–10 mm; leaves acute to cuspidate or  
     acuminate at apex.  
 65a. Plants viscid puberulent, trichomes unicellular and not drying particularly  
     dark; leaves with secondary veins 15–17 pairs; Hainan ..... 21. *O. hainanensis*  
 65b. Plants villous, trichomes multicellular, drying reddish brown, not glandular;  
     leaves with secondary veins 9–15 pairs; mainland ..... 47. *O. nutans*  
 53b. Stipules caducous and not seen, or 3 mm or shorter.  
 66a. Calyx and fruit densely tuberculate with peglike, flat- to round-topped protuberances;  
     Taiwan ..... 22. *O. hayatana*  
 66b. Calyx and fruit smooth, glabrous to pubescent with slender trichomes.  
 67a. Plants drying purple throughout (on live plants, see old and dying tissues).

- 68a. Corolla with tube 9–14 mm; leaves 4–11 × 0.7–3.5 cm; bracts 1–6 mm ..... 28. *O. japonica*  
 68b. Corolla with tube 7–10 mm; leaves 5–20 × 2.5–8 cm, at least some longer than measurements in alternate lead; bracts 6–9 mm ..... 66. *O. succirubra*  
 67b. Plants drying green, brown, yellowed, gray, blackened, or with parts flushed purple.  
 69a. Stems (but not necessarily inflorescences) villous to hispid with well-developed spreading trichomes.  
 70a. Calyx lobes ca. 0.5 mm; corolla pale purple or white, with tube 10–12 mm and lobes ca. 1 mm ..... 23. *O. hispida*  
 70b. Calyx lobes 1–1.3 mm; corolla yellowish white or tinged with purple, with tube ca. 16 mm and lobes 5–5.5 mm ..... 36. *O. longipes*  
 69b. Stems glabrous or strigillose, puberulent, hispidulous, and/or villosulous with short, appressed to spreading trichomes.  
 71a. Leaves relatively broad, less than 2 × as long as wide, 11–16 × 5.5–10 cm ..... 8. *O. carnosicaulis*  
 71b. Leaves moderately broad to rather narrow, 2 or more × as long as wide, 1.5–20 × 0.7–7 cm.  
 72a. Leaves with secondary veins 13–23 pairs, at least some leaves with more than 13 pairs.  
 73a. Calyx puberulent; corolla lobes 1.8–4 mm, dorsally winged ..... 7. *O. cantonensis*  
 73b. Calyx hispidulous; corolla lobes ca. 1.5 mm, with short hornlike appendage ..... 13. *O. densa*  
 72b. Leaves with secondary veins 4–15 pairs, at least some leaves with fewer than 13 pairs.  
 74a. Bracteoles well developed, 7–12 mm ..... 2. *O. alatiflora*  
 74b. Bracteoles none, reduced, or moderately well developed, 6 mm or shorter.  
 75a. Bracts and bracteoles reduced or caducous, not or hardly visible.  
 76a. Leaves in unequal pairs, with secondary veins prominent adaxially ..... 37. *O. luchuanensis*  
 76b. Leaves in subequal pairs, with secondary veins flat to impressed adaxially.  
 77a. Leaves with 5 or 6 pairs of secondary veins; stems puberulent to glabrescent ..... 31. *O. laevifolia*  
 77b. Leaves with 7–15 pairs of secondary veins; stems glabrous, puberulent, or hispidulous.  
 78a. Leaves rounded-obtuse at apex ..... 65. *O. subrubescens*  
 78b. Leaves acute or acuminate at apex.  
 79a. Stems hispidulous ..... 49. *O. oppositiflora*  
 79b. Stems glabrous or puberulent.  
 80a. Corolla tube ca. 12 mm ..... 1. *O. alata*  
 80b. Corolla tube 4–8 mm ..... 49. *O. oppositiflora*  
 75b. Bracts and bracteoles developed, evident, persisting at least with flowers, bracteoles 1–6 mm.  
 81a. Leaves mostly or all in markedly unequal pairs, longer ones 2–3 or more × as long as shorter.  
 82a. Leaf pairs with longer ones 3 or more × as long as shorter; inflorescences pilosulous or puberulent with slender trichomes ..... 10. *O. chingii*  
 82b. Leaf pairs with longer ones 2–2.5 × as long as shorter; inflorescences mealy puberulent ..... 32. *O. laoshanica*  
 81b. Leaves in subequal pairs or some in unequal pairs, longer ones at most 1.5 × as long as shorter.  
 83a. Stems and leaves abaxially mealy puberulent; corolla lobes dorsally with short hornlike appendages ..... 18. *O. filibracteolata*  
 83b. Stems and leaves abaxially glabrous to variously pubescent with slender trichomes; corolla lobes dorsally smooth to winged and/or with short hornlike appendages.  
 84a. Leaves elliptic to elliptic-oblong, 6–20 × 1.5–7 cm, at least some leaves longer than measurements in alternate lead, with 9–15 pairs of secondary veins, generally becoming yellowed or brownish yellow when dry ..... 7. *O. cantonensis*  
 84b. Leaves elliptic to lanceolate or ovate, 1–11 × 0.7–4 cm, at least some leaves smaller than measurements in alternate lead, with 4–13 pairs of secondary veins, generally drying with green, gray, blackish, or purplish cast.

- 85a. Stigmas ovate to elliptic or lanceolate; widespread, common ..... 28. *O. japonica*  
 85b. Stigmas linear; known only from Yunnan, rare ..... 51. *O. petrophila*

**1. *Ophiorrhiza alata* Craib, Pl. Siam. Enum. 2: 61. 1932.**

有翅蛇根草 you chi she gen cao

Herbs, ascending, to 1 m tall; stems drying compressed, glabrous or puberulent. Leaves in subequal pairs; petiole 1–3 cm, subglabrous; blade drying submembranous, grayish green adaxially, pale abaxially, ovate, elliptic, or lanceolate-ovate, 7–13 × 3–5.5 cm, glabrous on both surfaces, base subcuneate and sometimes shortly decurrent, margins undulate, apex subacuminate; secondary veins 8–10 pairs; stipules caducous, not seen. Inflorescence many flowered, pubescent; peduncle 1.5–5 cm; axes helicoid, usually shorter than 1 cm; bracts reduced or absent. Flowers distylous, with pedicels ca. 2.5 mm. Calyx pubescent; hypanthium portion turbinate-campanulate, ca. 1.8 mm, 5-ribbed; lobes subtriangular, ca. 0.7 mm. Corolla white, tubular with swollen base, subglabrous outside; tube ca. 12 mm, with white villous ring in throat; lobes triangular to broadly ovate, ca. 1.5 mm, dorsally winged and with short horn at apex. Capsules ca. 2.5 × 6 mm. Fl. Apr–May.

Dense forests; 500–700 m. Yunnan [Thailand].

H. S. Lo (in FRPS 71(1): 173. 1999) described this species as distylous but described only an apparently short-styled flower.

**2. *Ophiorrhiza alatiflora* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 62. 1990.**

延翅蛇根草 yan chi she gen cao

Herbs or subshrubs, suberect; stems stout, terete to slightly compressed. Leaves in subequal pairs; petiole 1–1.5(–4) cm, pilosulous; blade drying papery to thickly papery, black adaxially, pale brown abaxially, ovate or oblong-ovate, 5–13 × 2–7 cm, glabrous on both surfaces or hirtellous along principal veins abaxially, base cuneate, rather inequilateral, margins subentire, apex shortly acuminate or subacute; secondary veins 7–12 pairs; stipules caducous, not seen. Inflorescence congested-cymose, many flowered, densely pubescent; peduncle 1–4 cm; axes 0.5–4 cm, helicoid; bracteoles narrowly lanceolate, 7–12 mm, acute, glabrous or sparsely ciliate. Flowers distylous, subsessile. Calyx densely pilosulous to puberulent; hypanthium turbinate, ca. 1.5 mm, 5-ribbed; lobes subtriangular or triangular, 0.5–0.7 mm, with 1 globose gland in each sinus. Corolla white striped with purple, subtubular or slightly swollen at base, outside glabrous and winged along entire length, inside with a ring of pubescence just below throat and/or in throat and onto lobes; tube 12–15 mm; lobes subovate, 2–3 mm, dorsally with wing 0.8–1 mm wide, apex rostrate. Capsules mitriform, ca. 3 × 10 mm, pilosulous.

• Forests. Yunnan.

The protologue described both of the floral forms in detail, noting explicitly that the corollas are similar and the anthers and stigmas reciprocally placed, near the middle of the corolla tube and at or just below the throat, respectively. However, the protologue figure shows partially different patterns of internal corolla pubescence in the two floral forms, with the pubescence restricted to a narrow ring well below the throat in the long-styled flowers but located in the throat of the short-styled flowers.

The varieties treated by H. S. Lo in FRPS (71(1): 160. 1999) are treated here for reference. The protologue figure was not fully labeled but apparently illustrated only var. *alatiflora*; these same figures were reproduced in FRPS (p. 161, t. 41, f. 1–8) where they were explicitly labeled as var. *alatiflora*.

- 1a. Leaf blade drying with thinner texture, glabrous on both surfaces ..... 2a. var. *alatiflora*  
 1b. Leaf blade drying with thicker texture, crisped pubescent along principal veins abaxially ..... 2b. var. *trichoneura*

**2a. *Ophiorrhiza alatiflora* var. *alatiflora***

延翅蛇根草(原变种) yan chi she gen cao (yuan bian zhong)

Leaf blade drying with thinner texture, glabrous on both surfaces.

• Forests. Yunnan.

**2b. *Ophiorrhiza alatiflora* var. *trichoneura* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 63. 1990.**

毛脉蛇根草 mao mai she gen cao

Leaf blade drying with thicker texture, crisped pubescent along principal veins abaxially.

• Forests. Yunnan.

**3. *Ophiorrhiza aureolina* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 34. 1990.**

金黄蛇根草 jin huang she gen cao

Herbs, ascending or sometimes weak at base, to 30(–45) cm tall; stems terete to compressed, usually striate, densely golden yellow pubescent. Leaves in subequal pairs; petiole 0.5–1.5 cm, densely golden yellow pubescent; blade drying papery, yellow or grayish yellow, ovate, lanceolate, or elliptic-oblong, 1.5–6 × 0.8–2 cm, adaxially sparsely strigose or glabrescent to pubescent, abaxially golden yellow pubescent to glabrescent at least on principal veins, base cuneate to acute, apex acute or shortly acuminate; secondary veins 7–10 pairs; stipules persistent on upper nodes, deeply 2-parted, lobes triangular, 3–8 mm, filiform or acuminate at apex. Inflorescences cymose to somewhat congested-cymose, many flowered, golden yellow pubescent; peduncle 5–15 mm; axes short to well developed, helicoid; bracts none or reduced and caducous. Flowers distylous, subsessile. Calyx densely golden yellow hispidulous or -pilosulous; hypanthium turbinate, 1.2–1.5 mm, 5-ribbed; lobes subtriangular, 0.5–0.7 mm. Corolla pale yellow, white, or sometimes reddish, tubular to often somewhat inflated, hispidulous outside; tube 3–4 mm, inside with a white villous ring in upper half; lobes subovate, 1–1.3 mm, apex incurved-rostrate, dorsally smooth. Capsules obcordate, ca. 2 × 4–5.5 mm, hirtellous to pilosulous. Fl. Jul.

• Forests; ca. 1800 m. Yunnan (Xishuangbanna).

H. S. Lo (loc. cit.: 34–37) recognized two forms of this species, f. *aureolina* and f. *qiongyaensis* H. S. Lo; the latter form was formally synonymized with *Ophiorrhiza pumila* by Duan and Lin (Acta Phyto-

tax. Sin. 45: 878. 2007), who are followed here. Lo described the long-styled and short-styled forms as similar in their corollas but differing in the anthers (situated below the middle of the corolla tube in the long-styled form vs. in the throat in the short-styled form); the stigmas appear to be reciprocal in position with the anthers.

**4. *Ophiorrhiza austroyunnanensis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 30. 1990 [*"astroyunnanensis"*].

滇南蛇根草 dian nan she gen cao

Herbs, generally procumbent; stems pilosulous or tomentose. Leaves in equal to somewhat unequal pairs; petiole 0.5–1.5 cm, densely pilosulous or tomentose; blade drying thinly papery, usually grayish with veins brown abaxially, ovate, elliptic, elliptic-oblong, or lanceolate, 2–5(–7) × 0.8–2.2 cm, adaxially sparsely pilose, multicellular pilose along principal veins abaxially, base cuneate to subrounded, margins sometimes undulate, apex obtuse; secondary veins 7–9 pairs; stipules persistent, ovate, 5–7 mm, glabrescent, ciliate, long acuminate. Inflorescences congested-cymose to subcapitate, several flowered, glabrescent; peduncles 2–3 cm; bracts elliptic-oblong, 5–6 × 1.5–2 mm, obtuse. Flowers distylous, subsessile. Calyx glabrous; hypanthium subturbinate, 0.8–1 mm, 5-ribbed; lobes triangular, ca. 0.4 mm. Corolla tubular-salverform, outside glabrous; tube ca. 2.6 mm, with white villous ring in throat; lobes subtriangular, ca. 1.3 mm, dorsally smooth, obtuse. Inflorescences with axes expanded, lax. Capsules oblate-ellipsoid, ca. 1.5 × 3.5 mm, glabrous, shortly white striate. Fl. May.

• Thickets; ca. 1500 m. Yunnan.

The protologue figure, reprinted in FRPS (71(1): 133, t. 32, f. 1–10. 1999), shows a remarkable dimorphism in the shape and internal pubescence of the corollas (salverform and densely barbate in the throat in the long-styled form vs. funnellform and glabrous internally in the short-styled form), but the protologue description said only that the corollas of both forms are similar; thus, this figure may deserve re-checking.

**5. *Ophiorrhiza brevidentata*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 32. 1990.

短齿蛇根草 duan chi she gen cao

Herbs, ascending; stems drying purplish red or purplish brown, slender, terete, densely hirtellous. Leaves in markedly unequal pairs; petiole ca. 1 cm, pilosulous; blade drying papery, ovate, larger ones 2–6 cm, smaller ones 1/3–1/2 as large, strigose adaxially, villous abaxially at least along principal veins, base rounded to obtuse, apex cuspidate; secondary veins 9–11(–15) pairs; stipules lanceolate, 5–6 mm, villous, acuminate. Inflorescences congested-cymose to subcapitate, few to many flowered, densely pilosulous; peduncle 1.5–4.5 cm; axes helicoid; bracts oblong-lanceolate or elliptic-oblong, 5–7 mm, ciliate. Flowers with biology unknown. Calyx pilosulous; hypanthium ca. 1.2 mm; lobes subtriangular, 0.7–0.9 mm. Corolla pink or purplish red, tubular, outside glabrous or in bud puberulent at apex; tube ca. 11 mm, inside villous above middle and in throat; lobes ca. 1.5 mm, dorsally with very short horn. Capsule ca. 2 × 6 mm, puberulent. Fl. Apr–May, fr. Jun.

• Streamsides in forests. Yunnan.

The flowers described in the protologue resemble the short-styled form of distylous species, with the anthers shortly exerted in the throat

and the stigmas positioned near the base of the corolla tube.

**6. *Ophiorrhiza cana*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 20. 1990.

灰叶蛇根草 hui ye she gen cao

Herbs, creeping; stems drying compressed, striate or shallowly sulcate, pilosulous. Leaves in subequal pairs; petiole 1–1.5 cm, pilosulous; blade drying thinly papery or membranous-papery, leaden gray or sometimes green adaxially, pale and punctulate abaxially, ovate, elliptic-oblong, or lanceolate, 3.5–11 × 1.8–4.5 cm, adaxially subglabrous or sparsely puberulent, abaxially pilosulous along principal veins, base cuneate to rarely subrounded, margins flat or undulate, apex acute or obtuse then acuminate; secondary veins 10–15 pairs; stipules persistent, broadly triangular then abruptly contracted, 4–5 mm, caudate-acuminate. Inflorescences congested-cymose, many flowered, densely pilosulous, branched to 1 order; peduncle shorter than 1 cm; axes very short, helicoid; bracteoles quickly caducous, ca. 0.3 mm. Flowers distylous, subsessile or with pedicels to 1 mm. Calyx with hypanthium subglobose to subturbinate, ca. 1.1 × 1.5 mm, 5-ribbed, hispidulous; lobes linear, 1.4–1.6 mm, with line of stiff hairs. Corolla drying orange-yellow, tubular-funnel-form, hirtellous outside; tube ca. 5 mm, with villous ring in throat; lobes subovate, ca. 2 mm, acute, dorsally with horn ca. 1.5 mm. Capsules obcordate, ca. 2 × 5 mm, hispidulous.

• SE Yunnan.

The protologue described both the long-styled and short-styled forms in detail, noting that the forms have similar calyces and corollas but differ in their stamen and stigma position (i.e., stamens inserted in the corolla tube ca. 0.5 mm from the base and stigmas positioned in the throat in the long-styled form vs. stamens inserted in the throat and stigmas positioned just below the throat in the short-styled flowers). The protologue also noted that this species is known only from the type, which lacks locality or date.

**7. *Ophiorrhiza cantonensis*** Hance, Ann. Sci. Nat., Bot., sér. 4, 18: 222. 1862.

广州蛇根草 guang zhou she gen cao

*Ophiorrhiza bodinieri* H. Léveillé; *O. japonica* Blume var. *leiocarpa* Handel-Mazzetti; *O. longzhouensis* H. S. Lo; *O. paniculiformis* H. S. Lo; *O. seguinii* H. Léveillé; *O. violaceo-flammea* H. Léveillé; *O. yingtakensis* Masamune.

Herbs or subshrubs, weak to erect, to 1.2 m tall, often brown to yellowish brown when dry; stems glabrous to densely puberulent or villosulous. Leaves in subequal pairs; petiole 1–4 cm, glabrous to densely puberulent or villosulous; blade drying papery to thickly papery, grayish brown or grayish green adaxially, pale green to yellowish brown abaxially, oblong-elliptic, elliptic, ovate, ovate-oblong, or lanceolate-oblong, 6–20 × 1.5–7 cm, glabrous throughout or sometimes puberulent abaxially, base obtuse to acute, margins entire, apex acute to acuminate; secondary veins 7–15(to 18, *O. paniculiformis*) pairs; stipules broadly triangular, 0.8–1.5 mm, puberulent to glabrous, caducous. Inflorescences paniculiform to corymbose, several to many flowered, densely puberulent to pilosulous; peduncles 1.5–7 cm; axes helicoid; bracts linear, 1–6 mm. Flowers distylous, subsessile or pedicels to 2 mm. Calyx densely puberulent;

hypanthium subglobose to turbinate, 1–1.3 mm, smooth to weakly 5-ribbed; lobes triangular, 0.4–1 mm, sometimes with 1 gland in each sinus. Corolla white to pink, often drying yellow or pale red, subtubular to tubular-funnelform, slightly swollen at base, puberulent to glabrous outside, inside villous near middle of tube and scaly pubescent above middle and onto lobes; tube 9–12(–15) mm; lobes triangular, 1.8–3(–4) mm, dorsally with wing ca. 0.3 mm wide and often prolonged near apex, apex rostrate. Capsules mitriform, 3–4 × 6–9 mm, densely puberulent to subglabrous. Fl. winter and spring, fr. spring and summer.

• Ravines and watersides in forests; 100–1700 m. Guangdong, Guangxi, Guizhou, Hainan, Sichuan (Pingshan), Yunnan.

*Ophiorrhiza longzhouensis* was synonymized formally by Duan and Lin (Acta Phytotax. Sin. 45: 870. 2007) with *O. cantonensis*; H. S. Lo's separation of *O. longzhouensis* (Bull. Bot. Res., Harbin 10(2): 79. 1990) seems to have been based on its having relatively small leaves. Duan and Lin also synonymized *O. paniculiformis* with *O. cantonensis*. In FRPS (71(1): 165–166. 1999), H. S. Lo described this species as distylous with the corollas of both forms apparently similar and the reciprocally placed anthers and stigmas positioned near the middle of the corolla tube and in its throat, respectively; Lo also described the dried color of specimens of this species as ranging to reddish or red, but those specimens here belong to the more broadly circumscribed *O. succirubra*.

**8. *Ophiorrhiza carnosicaulis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 60. 1990.

肉茎蛇根草 rou jing she gen cao

Herbs, apparently ascending; stems stout, subglabrous. Leaves in subequal pairs; petiole 1.5–7 cm, subglabrous; blade drying thickly papery, brownish yellow with veins dark brown abaxially, broadly ovate or broadly elliptic, 11–16 × 5.5–10 cm, glabrous on both surfaces, base subrounded, decurrent, ± inequilateral, margins entire, apex cuspidate; secondary veins 7 or 8 pairs; stipules caducous, not seen. Inflorescence slightly sparse, many flowered, pubescent; peduncle ca. 3 cm; axes helicoid, 2–3 cm; bracteoles subulate-ensiform, 2–3 mm, costate, obtuse. Flowers distylous, subsessile. Calyx pilosulous; hypanthium turbinate, 1.5–2 mm, 10-ribbed; lobes triangular, 0.6–0.7 mm, usually with 1 gland in each sinus. Corolla pale purple, subtubular, glabrous outside; tube ca. 14 mm, pilose in basal portion inside; lobes ovate-triangular, ca. 2 mm, dorsally with very short horn, apex rostrate. Capsules dark purple, mitriform, ca. 5 × 12 mm, pilosulous. Fl. Jun–Jul.

• Wet places in forests. Yunnan (Hekou).

The protologue described the flowers as distylous but noted that long-styled flowers had not been seen; the putative short-styled flowers were described as having the anthers positioned just below the throat and the stigmas in the lower part of the corolla tube. The protologue figure was reproduced but not exactly by FRPS (71(1): 159, t. 40, f. 1–6. 1999); in particular, the protologue figure shows the calyx as pilosulous and the corollas as pilose internally in the basal portion, but the FRPS figure depicts the calyx and the corollas as glabrous.

**9. *Ophiorrhiza chinensis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 70. 1990.

中华蛇根草 zhong hua she gen cao

Herbs or subshrubs, to 40(–80) cm tall; stems drying straw-yellow or purplish black, terete, subglabrous to pilosulous. Leaves in subequal pairs; petiole 1–4 cm; blade drying papery, rather pale red, lanceolate to ovate, 3.5–12(–15) cm, usually glabrous or subglabrous on both surfaces, base cuneate, obtuse, or rarely rounded, margins entire, apex acuminate; secondary veins 9 or 10 pairs; stipules caducous, not seen. Inflorescences paniculiform to cymose, several to many flowered, densely hirtellous to pilosulous; peduncle 1.5–3.5 cm; axes 1–3.5 cm, helicoid, deflexed, later becoming erect; bracteoles absent or reduced and caducous. Flowers distylous, on pedicels 1–2 mm. Calyx mealy puberulent; hypanthium subturbinate, 1.2–1.4 mm, 5-ribbed; lobes subtriangular, 0.4–0.5 mm. Corolla white or pale purplish red, tubular-funnelform, subglabrous or mealy puberulent outside, inside pilosulous to scaly hairy in upper part onto lobes and with a white villous ring near middle of tube; tube 18–20 mm; lobes triangular-ovate, 2.5–3 mm, dorsally with carinate narrow wing prolonged into very short horn near apex, apex cucullate-rostrate. Inflorescence axes often becoming thickened, glabrescent, expanded, peduncle to 5 cm, axes to 6 cm, pedicels to 4 mm. Capsules obcordate-mitriform, 3–3.4 × 8–10 mm, subglabrous. Fl. winter and spring, fr. spring and summer.

• Fertile soil in broad-leaved forests; ca. 1300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan.

The protologue detailed the long-styled and short-styled flowers, which are said to be similar in corolla size and to differ reciprocally in anther and stigma position, with one structure held in the middle of the corolla tube and the other exerted from the throat, respectively.

**10. *Ophiorrhiza chingii*** H. S. Lo in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 189. 1999.

秦氏蛇根草 qin shi she gen cao

Herbs, weak; stems elongated, drying brownish red, glabrous or puberulent. Leaves in markedly unequal pairs; petiole 0.5–3 cm, puberulent; blade drying thinly papery, straw-yellow except usually purple on midrib, lanceolate-oblong to elliptic, larger ones 3.5–9.5 × 1.3–2.7 cm, smaller ones 1.5–6.5 × 0.7–1.8 cm, subglabrous on both surfaces or sparsely strigose or pilose adaxially and puberulent along principal veins abaxially, base cuneate, margins subentire, apex caudate-acuminate; secondary veins 8 or 9 pairs; stipules caducous, not seen. Inflorescence congested-cymose, few flowered, puberulent to pilosulous; peduncle 1–1.5 cm; axes reduced or 2 or 3, helicoid, ca. 1 cm; bracteoles linear, 3.5–4 mm, obtuse. Flowers distylous, subsessile. Calyx puberulent or pilosulous to glabrescent; hypanthium turbinate, ca. 1.2 mm, 5-ribbed; lobes subovate or sublanceolate, ca. 0.5 mm. Corolla white, tubular-funnelform, subglabrous outside, inside with white villous ring near middle and sometimes scaly villosulous in upper part and onto lobes; tube ca. 9 mm; lobes elliptic-oblong, ca. 3 mm, dorsally with wing ca. 0.5 mm wide, apex subrostrate. Capsules not seen. Fl. Apr.

• Wet places in forests. Yunnan (Yangbi).

Although the original description (H. S. Lo, Bull. Bot. Res., Harbin 10(2): 65. 1990, not validly published) reported that the long-styled flowers were not found, the figure in FRPS (72(1): 161, t. 41, f. 9–13.

1999) illustrated these. That figure shows the corollas as similar in size between the two forms but with the internal pubescence restricted to the upper middle part of the tube in the short-styled form and from the middle of the tube through the top of the lobes in the long-styled form; also, the anthers and stigmas are reciprocally positioned near or just below the middle of the corolla tube and in the throat, respectively.

**11. *Ophiorrhiza cordata*** W. L. Sha ex S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 189. 1999.

心叶蛇根草 *xin ye she gen cao*

Herbs, procumbent to creeping; stems densely brown villous with multicellular trichomes. Leaves in subequal pairs; petiole 0.8–1.7 cm, densely brownish red villous; blade drying papery, adaxially grayish black, abaxially brownish, broadly ovate to suborbicular, 3.5–6 × 2.3–4 cm, subglabrous or sparsely pilose adaxially, villous abaxially along principal veins, base cordate, margins sparsely ciliate, apex obtuse then abruptly shortly acute; secondary veins 5–7 pairs; stipules caducous, not seen. Inflorescence congested-cymose, 4–8-flowered, brownish red villous; peduncle ca. 1 cm; axes reduced; bracts elliptic-oblong, 3.5–6 mm, ciliate. Flowers with breeding biology unknown, subsessile. Calyx subglabrous; hypanthium turbinate, ca. 2 mm, 10-ribbed; lobes triangular, ca. 0.5 mm, obtuse or perhaps acute. Corolla white, tubular-funnelform, glabrous outside; tube 11–12 mm, inside glabrous except with villous ring at middle; lobes triangular, ca. 2.2 mm, dorsally narrowly winged and with very short horn, apex rostrate. Capsules unknown. Fl. Apr.

• Forests. Guangxi (Napo).

Neither the original description (H. S. Lo, Bull. Bot. Res., Harbin 10(2): 55. 1990, not validly published) nor FRPS (71(1): 154–156. 1999) described the floral biology of this species; the flowers described resemble the long-styled form of distylous species, with the anthers positioned near the middle of the corolla tube and the stigmas in the corolla throat.

**12. *Ophiorrhiza crassifolia*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 47. 1990.

厚叶蛇根草 *hou ye she gen cao*

Herbs, perhaps ascending, notably fleshy, to 30 cm tall; stems flattened to terete, drying brown, puberulent to glabrous. Petiole 0.5–3.5 cm; leaf blade drying thickly papery, purplish red or yellowish brown abaxially, broadly ovate or broadly elliptic, 5–12 × 3.5–7 cm, glabrous on both surfaces, abaxially densely minutely orbicular scaly, base obtuse, subrounded, or subcordate, usually oblique, margins entire, apex obtuse to shortly cuspidate; secondary veins 5 or 6 pairs; stipules caducous, not seen. Inflorescences cymose or congested-cymose, many flowered, puberulent; peduncle 2.5–5.5 cm; axes short, helicoid; bracteoles narrowly spatulate, 5–5.5 mm, obtuse. Flowers with biology unknown, with pedicels 2–3 mm. Calyx puberulent; hypanthium turbinate, ca. 2 mm, 10-ribbed; lobes subtriangular, ca. 0.6 mm, in sinus with 1 gland. Corolla purplish red, salverform-funnelform, glabrous outside; tube 24–25 mm, pilose inside; lobes ovate-triangular, ca. 2.2 mm, dorsally ridged with very short horn. Capsules rhomboid, ca. 5 × 15 mm, glabrous or subglabrous. Fl. Oct.

• Rocks in forests. Guangxi (Longzhou).

**13. *Ophiorrhiza densa*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 57. 1990.

密脉蛇根草 *mi mai she gen cao*

Herbs or subshrubs, ascending, to 1 m tall; stems terete, drying brownish purple, brown pilosulous to glabrescent. Leaves in subequal pairs; petiole 1–3 cm or longer, densely pilosulous or tomentose; blade drying thinly papery, adaxially black, abaxially pale purple, ovate or lanceolate-ovate, usually inequilateral, (5–)8–15(–18) × 1.5–4 cm, sparsely pilosulous adaxially, crisped tomentose along veins abaxially, base sub-cuneate, margins entire, apex caudate; secondary veins 13–18(–23) pairs; stipules caducous, not seen. Inflorescence 4–8 cm, many flowered, brown tomentose; axes helicoid; bracteoles linear, ca. 3 mm. Flowers distylous, sessile to subsessile. Calyx hispidulous; hypanthium turbinate to subglobose, ca. 1.2 mm, 5-ribbed; lobes narrowly triangular, ca. 1 mm. Corolla pale purple, subtubular to inflated, densely pilosulous outside, inside pilosulous near middle of tube and sometimes onto lobes, and/or densely glandular-pilose on lobes; tube ca. 10 mm; lobes subdeltoid, ca. 1.5 mm, dorsally with very short horn, apex rostrate. Capsules unknown. Fl. Nov.

• Dense forests; 1400–1600 m. Yunnan (Malipo).

In the protologue and FRPS (71(1): 158. 1999), H. S. Lo described the floral forms as having similar corollas and reciprocally placed anthers and stigmas near the middle of the corolla tube and shortly exerted, respectively. However, the protologue figure showed differences between the floral forms in the internal pubescence of the corollas, with the pubescence confined to the general area of the middle of the tube in the short-styled flowers but distributed from the middle of the tube to the tops of the lobes in the long-styled form; this internal corolla pubescence was not described in the protologue text. The insides of the corolla lobes were described as “*glanduloso-piloso*” in the protologue text, which is unusual and also not shown in one of the protologue figures of the corolla interior.

**14. *Ophiorrhiza dulongensis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 27. 1990.

独龙蛇根草 *du long she gen cao*

Herbs, weak to procumbent; stems drying purplish brown, pilosulous. Petiole 0.3–1 cm, densely pilosulous or villosulous; leaf blade drying membranous to papery, often green with veins purplish brown abaxially, broadly ovate or ovate, 1–4 × 0.6–2.5 cm, scattered scabrous-strigillose adaxially, abaxially moderately pilose along principal veins, base obtuse to rounded, apex acute; secondary veins 4–6 pairs; stipules persistent, subulate, 4–6 mm, glabrous. Inflorescence fasciculate, 3- or 4-flowered, glabrescent; peduncle ca. 1 cm or slightly longer; bracts linear, ca. 1 mm. Flowers distylous. Calyx puberulent to glabrescent; hypanthium 1–1.5 mm, 5-ribbed; lobes narrowly lanceolate or lanceolate, 1.5–2 mm. Corolla white, funnelform, subglabrous outside; tube 7–7.5 mm, densely villous in throat; lobes triangular-ovate, 2.5–3 mm, dorsally ribbed at least in bud. Capsules unknown. Fl. Jul.

• Evergreen broad-leaved forests; 2300–2400 m. NW Yunnan.

In the protologue and FRPS (71(1): 127. 1999), H. S. Lo detailed the floral forms, noting that their corollas are similar in size and the an-

thers and stigmas are reciprocally placed near the middle of the corolla tube and in its throat, respectively.

**15. *Ophiorrhiza ensiformis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 22. 1990.

剑齿蛇根草 *jian chi she gen cao*

Herbs, ascending; stems pilosulous at least when young. Leaves in subequal pairs; petiole 1–3 cm, pilose; blade drying submembranous, brown or dark brown, elliptic, ovate, or elliptic-oblong, 5–12 × 2.5–5.5 cm, adaxially sparsely ferruginous pilosulous, abaxially glabrous or subglabrous, base obtuse then narrowed to decurrent, margins entire, apex acute to rather abruptly acuminate; secondary veins 10–12 pairs; stipules generally persistent, broadly triangular then abruptly narrowed, 3–5 mm, glabrescent, ciliate, long acuminate. Inflorescences congested-cymose, several to many flowered, ferruginous pilosulous; peduncle ca. 1.5 cm; axes rather short, helicoid; bracts linear-ensiform to narrowly spatulate, 5–7 mm, glabrescent, pinnately veined, ciliate, acute. Flowers with biology unknown, with short pedicels. Calyx with hypanthium subturbinate, ca. 1.5 × 2.5 mm, 5-ribbed, with dense ferruginous long trichomes mixed with unicellular trichomes; lobes linear-ensiform to spatulate, 5–7.5 mm, pinnately veined, glabrescent except ciliate, acute. Corolla white, tubular-funnelform, outside 5-ribbed or 5-ridged in upper portion, glabrous or sparsely hispidulous along ribs; tube 13–14 mm, inside with white villous ring in throat; lobes triangular, 2–2.5 mm, dorsally narrowly winged, obtuse, rostrate. Capsules rhomboid-pyramidal, ca. 4 × 8 mm, pilosulous. Fl. Jan.

• Streamsides; ca. 2000 m. Yunnan (Longling).

**16. *Ophiorrhiza fangdingii*** H. S. Lo in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 190. 1999.

方鼎蛇根草 *fang ding she gen cao*

Herbs, weak at base, ascending above, to 40 cm tall; stems subterete, drying brown, subglabrous. Leaves in unequal pairs; petiole 0.5–2 cm, glabrous; blade drying papery, adaxially leaden gray, abaxially pale with veins brown, oblong-ovate or oblong-lanceolate, larger ones 5–7.5 cm, smaller ones 2–5 cm, glabrous on both surfaces, base subcuneate and somewhat inequilateral, margins subentire, apex obtuse then acuminate; secondary veins 5–10 pairs; stipules caducous, not seen. Inflorescences 4- or 5-flowered; peduncle ca. 1 cm; axes short, helicoid; bracteoles linear or narrowly lanceolate, 10–18 × 1.5–4 mm, obtuse, costate. Flowers reportedly distylous, with short pedicels. Calyx glabrous; hypanthium turbinate, ca. 1.2 mm, 5-ribbed; lobes linear-lanceolate, ± unequal, 2–3 mm, obtuse. Corolla white, funnelform, glabrous outside; tube ca. 23 mm, white villous above middle inside; lobes dorsally narrowly winged, wing extending into very short horn. Capsules not seen. Fl. Jan.

• Wet places in forests on limestone; ca. 1200 m. Guangxi (Napo).

In the original description (Bull. Bot. Res., Harbin 10(2): 40, 42. 1990, not validly published) and FRPS (71(1): 144. 1999), H. S. Lo described this species as distylous but described only the putative long-styled flowers; these resemble the long-styled form of distylous species

in having the stigmas exerted and the anthers positioned below them in the upper part of the corolla tube.

**17. *Ophiorrhiza fasciculata*** D. Don, Prodr. Fl. Nepal. 136. 1825.

簇花蛇根草 *cu hua she gen cao*

Herbs or subshrubs, erect, to 0.5(–2) m tall; stems pilosulous or puberulent to glabrescent. Leaves in subequal pairs; petiole 1–1.5[–5] cm, puberulent; blade drying papery, sometimes darkened adaxially, pale abaxially, elliptic to lanceolate-elliptic, 8–12[–16] × 3–6 cm, glabrous or sparsely strigillose adaxially, abaxially puberulent on veins, base obtuse to cuneate then attenuate, apex acute to caudate-acuminate; secondary veins 10–13 pairs; stipules narrowly triangular, 4–10 mm, puberulent to glabrescent. Inflorescences congested-cymose to subfasciculate, several flowered, densely pilosulous; peduncle 1–8 cm; branched portion 1–2 cm; bracts ligulate-lanceolate, 6–12 mm, persistent. Flowers with biology unknown, subsessile. Calyx densely puberulent to hirtellous; hypanthium compressed cylindrical, 1–1.5 mm; lobes ovate to deltoid, 1–1.2 mm. Corolla white sometimes flushed with pink, drying yellowed, tubular-funnelform, outside puberulent; tube 10–15 mm, inside glabrous; lobes ovate-oblong, 1.5–2.5 mm. Capsules compressed rhombic, 1.5–4.5 × 4–10.5 mm, puberulent or hirtellous. Fr. Aug.

Broad-leaved forests; ca. 1700 m. Xizang (Mêdog) [Bhutan, India, Myanmar, Nepal].

Measurements in brackets are taken from the description of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 44–47. 1997) and may be expected in Chinese plants.

**18. *Ophiorrhiza filibracteolata*** H. S. Lo in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 190. 1999.

大桥蛇根草 *da qiao she gen cao*

Herbs, apparently ascending, to 30 cm tall; stems mealy puberulent. Leaves in subequal pairs; petiole 1–5 cm; blade drying papery, dark brown, ovate to broadly ovate, 2.5–5.5 × 1.5–3.3 cm, glabrous, base obtuse or subrounded, margins entire, apex acute; secondary veins 7 or 8 pairs; stipules caducous, not seen. Inflorescence somewhat congested-cymose, many flowered; peduncle ca. 3 cm; axes up to 1 cm, helicoid; bracteoles filiform, fleshy, 2.5–3 mm. Flowers distylous, subsessile or pedicels to 2 mm. Calyx pilosulous; hypanthium subturbinate, ca. 1.4 mm, shallowly 5-ribbed; lobes triangular to narrowly lanceolate, ca. 0.7 mm, with 1 gland in each sinus. Corolla white, tubular-funnelform, outside pilosulous, inside with white villous ring at middle and scaly pilose from middle onto lobes; tubes 11–12 mm; lobes ovate-triangular, ca. 3 mm, dorsally narrowly winged and with very short horn. Capsules not seen. Fl. Apr.

• Forests. Guangdong (Ruyuan).

The original description (H. S. Lo, Bull. Bot. Res., Harbin 10(2): 52–53. 1990, not validly published) described the flowers as distylous with the short-styled flowers as unknown; the putative long-styled flowers were described as having the anthers positioned just below the middle of the corolla tube and the stigmas in the throat. In FRPS (71(1): 153. 1999), H. S. Lo gave the plant height as 20 cm, but the original

description said 30 cm. Much of the information on pubescence details here is taken from the figure in the original description.

**19. *Ophiorrhiza gracilis*** Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 311. 1872.

纤弱蛇根草 xian ruo she gen cao

Herbs, weak at base, suberect above, to 30 cm tall; stems glabrous. Petiole glabrous; leaf blade drying membranous-papery, grayish on both surfaces, paler abaxially, lanceolate or subovate, 6–12(–17) × 2–4.5 cm, glabrous on both surfaces, base cuneate to attenuate and usually oblique, apex caudate to long acuminate; secondary veins 8–12 pairs; stipules caducous, not seen. Inflorescences many flowered, puberulent; peduncle 2–3 cm; bracteoles subulate, 0.5–1.2 mm, early caducous. Flowers distylous, subsessile. Calyx with hypanthium turbinate, ca. 1.3 mm, 5-ribbed; lobes ovate-triangular, 0.4–0.5 mm. Corolla white or reddish at apex, tubular; tube ca. 10.5 mm, white villous in throat and at middle inside; lobes triangular-ovate, 1.2–1.3 mm, dorsally with horn 0.8–1 mm. Capsules not seen. Fl. spring.

Dense forests. Yunnan [Myanmar].

H. S. Lo (in FRPS 71(1): 171. 1999) described the anthers as situated near the base of the corolla tube and the stigmas positioned just below the throat in the long-styled form vs. the anthers situated above the middle of the corolla tube and the stigmas near the base in the short-styled form.

**20. *Ophiorrhiza grandibracteolata*** F. C. How ex H. S. Lo, Bull. Bot. Res., Harbin 10(2): 43. 1990.

大苞蛇根草 da bao she gen cao

Herbs or subshrubs, weak at base, ascending above, to 70 cm tall; stems subterete, densely villous with trichomes multicellular or sometimes also unicellular. Leaves in unequal pairs; petiole 0.5–2(–3) cm, stout, densely multicellular villous; blade drying thinly papery, gray-black adaxially, reddish or pale abaxially, ovate, broadly ovate, or lanceolate-ovate, larger ones 4–12(–15) × 2–4.5(–6) cm, smaller ones 2–4(–6) × 1.2–2.5 cm, both surfaces glabrescent or multicellular villous on principal veins, base obtuse to cuneate and sometimes shortly decurrent, apex acute; secondary veins 7–10 pairs; stipules caducous, not seen. Inflorescence congested-umbelliform-cymose to subcapitate, 5- to many flowered or rarely 1-flowered, densely multicellular villous; peduncle ca. 0.8 cm; axes reduced; bracts and bracteoles ovate to lanceolate, 10–15 mm, pinnately veined, glabrescent except multicellular ciliate along margin and on dorsal costa. Flowers distylous, subsessile or on stout pedicels to 2 mm. Calyx multicellular villous; hypanthium broadly turbinate, 2–2.3 mm; lobes triangular, 1–1.2 mm. Corolla white or reddened, drying purplish red, funnelform, outside with 5 strigose lines from middle of tube to apices of lobes; tube 22–25 mm, inside with white villous ring above middle; lobes subovate, ca. 5 mm, sometimes weakly reticulate-veined, dorsally narrowly winged. Capsules rhomboid, 4–4.5 × ca. 11 mm, villous. Fl. Nov.

• Wet places in forests; 1200–1500 m. Guangxi (Napo), Yunnan.

The protologue and H. S. Lo in FRPS (71(1): 146. 1999) described this species as distylous, with the anthers borne well above the

middle of the corolla tube and the stigmas positioned in the throat in one floral form vs. the anthers positioned near the middle of the corolla tube and the stigmas well exerted in the other.

**21. *Ophiorrhiza hainanensis*** Y. C. Tseng, Fl. Hainan. 3: 582. 1974.

海南蛇根草 hai nan she gen cao

Herbs, weak to erect, to 50 cm tall; stems viscous puberulent with unicellular trichomes, to glabrescent. Leaves in subequal pairs; petiole 1–2.5 cm, puberulent; blade drying thinly papery, green on both surfaces, elliptic to ovate, 6–13 × 2.5–5 cm, adaxially glabrous, abaxially pilosulous along principal veins, base obtuse to acute, margins entire, apex shortly acuminate; secondary veins 15–17 pairs; stipules deciduous, triangular, 3–5 mm, aristate-acuminate. Inflorescence congested-cymose, several flowered, viscous puberulent; peduncles 0.5–1 mm, stout; bracts elliptic-oblong, 5–6 mm, viscid ciliate. Flowers with biology unknown. Calyx in bud sparsely puberulent; hypanthium to 2 mm; lobes triangular, to ca. 1 mm. Corolla in bud tubular. Capsules turbinate, ca. 4 × 9 mm, sparsely puberulent. Fl. (bud) and fr. Dec.

• Dense forests, uncommon. Hainan (Baoting, Qiongzong).

*Ophiorrhiza hainanensis* was synonymized with *O. nutans* by Duan and Lin (Acta Phytotax. Sin. 45: 877. 2007). However, this species is here recognized provisionally, based on the distinctions given in the key to species.

**22. *Ophiorrhiza hayatana*** Ohwi, Repert. Spec. Nov. Regni Veg. 36: 57. 1934.

瘤果蛇根草 liu guo she gen cao

*Ophiorrhiza stenophylla* Hayata, Icon. Pl. Formosan. 2: 91. Oct 1912, not Valetton (Feb 1912).

Herbs, erect, to 50 cm tall; stems subterete or weakly 4-angled, glabrous to puberulent or strigillose. Leaves in subequal pairs; petiole 0.3–1.5(–2) cm, glabrous to puberulent; blade drying papery, discolorous, narrowly elliptic-oblong, elliptic, or lanceolate, 2–10(–15) × 0.8–2.5(–3) cm, glabrous on both surfaces or often hispidulous near margins adaxially, base acute to attenuate, apex acute to acuminate; secondary veins 4–8 pairs; stipules deciduous, broadly triangular to rounded, 0.5–1 mm, puberulent to glabrescent and/or glandular, sometimes erose. Inflorescence several to many flowered, cymose, densely puberulent to pilosulous sometimes in lines, fasciculate or peduncle 1.5–2(–4) cm; axes subcapitate to helicoid; bracteoles linear to narrowly triangular, 0.5–4 mm, glabrous, persistent or deciduous as fruit develop. Flowers with biology unknown, subsessile or on pedicels to 1.5 mm, sometimes tuberculate. Calyx glabrous to puberulent; hypanthium suburceolate to oblate, ca. 1.2(–2) mm, densely tuberculate with peglike structures on lower part and also sometimes on sides, 5-ribbed; lobes linear to spatulate, 1–1.3 mm. Corolla white, slenderly funnelform, outside glabrous; tube (12–)13–15 mm, inside barbate in throat; lobes triangular, 2.5–3(–4) mm, ciliate, dorsally winged and with very short horn near apex. Capsules obcordate, ca. 4 × 8–10 mm, tuberculate and sometimes pilosulous.

• Broad-leaved forests; 500–900 m. Taiwan.

Some measurements given by H. S. Lo in FRPS (71(1): 129. 1999) have not been seen on specimens and are provisionally presented in parentheses. The floral biology of this species has not been described; the specimens seen appear to be monomorphic with the anthers positioned at or just below the corolla throat and the stigmas perhaps positioned at the same level.

**23. *Ophiorrhiza hispidula*** J. D. Hooker, Fl. Brit. India 3: 83. 1880.

尖叶蛇根草 jian ye she gen cao

Herbs, ascending, to 1 m tall; stems moderately villous or hispid. Leaves in subequal pairs; petiole 1.5–4(–7) cm, densely pilose or hispid; blade drying thinly papery, gray or olive-green, ovate or broadly ovate, 7–17 × 3.5–7 cm, sparsely hispid on both surfaces or moderately so abaxially, base obtuse, decurrent, often oblique, margins subentire, apex acuminate; secondary veins 9–14 pairs; stipules sublanceolate, markedly contracted above, pilose, ciliate, acuminate. Inflorescence congested-cymose, many flowered, villous; peduncle 1.5–2 cm; bracts linear, 3–4 mm, ciliate, persistent. Flowers distylous, subsessile. Calyx pilose; hypanthium subturbinate, ca. 1 mm, 5-ribbed; lobes subtriangular, ca. 0.5 mm, usually with 1 gland in each sinus. Corolla pale purple or white, slenderly tubular, sparsely pilose or hispid outside; tube 10–12 mm, inside with white villous ring near middle; lobes ovate-triangular, ca. 1 mm. Capsules ca. 2 × 5 mm, pilose or hispid.

Forests. SW Yunnan [NE India].

H. S. Lo (in FRPS 71(1): 134. 1999) noted that the corollas of the two floral forms are similar but that the flowers differ in the reciprocally placed anthers and stigmas positioned near the middle of the corolla tube or in the throat, respectively.

This species is circumscribed here following H. S. Lo (loc. cit.) and does not correspond to the circumscription of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 59–61. 1997). Deb and Mondal described *Ophiorrhiza hispidula* as having corollas with tubes 3–4 mm, leaves 2–15 × 1–4 cm, a plant stature of 35 cm or less, and calyx lobes 0.8–1 mm; the plants treated as *O. hispidula* by Lo key to *O. fasciculata* in Deb and Mondal's treatment.

**24. *Ophiorrhiza hispidula*** Wallich ex G. Don, Gen. Hist. 3: 523. 1834.

版纳蛇根草 ban na she gen cao

Herbs, procumbent at base, ascending above, to 15 cm tall; stems glabrescent to densely villosulous. Leaves in subequal pairs; petiole 0.3–1 cm, puberulent to glabrescent; blade drying thinly papery, grayish, ovate, broadly ovate, elliptic, or sublanceolate, 1.5–4.5(–7) × 1–2.5 cm, adaxially glabrescent to sparsely strigillose, abaxially glabrous except pilosulous to puberulent along principal veins, base cuneate to obtuse, margins entire, apex acute; secondary veins 5–7 pairs; stipules persistent on uppermost nodes, triangular becoming strongly narrowed, 4–10 mm, glabrescent, long acuminate to aristate. Inflorescences cymose, several flowered, puberulent to hispidulous; peduncle 1–2.5(–4) cm; axes developed, helicoid; bracts few, narrowly triangular to linear, 0.5–2 mm. Flowers subsessile. Calyx puberulent to pilosulous; hypanthium ellipsoid to subglobose, ca. 1 mm; lobes narrowly triangular, 0.8–1 mm. Corolla white, tubular, outside puberulent; tube 4–5 mm, barbate in

throat and glabrescent to puberulent inside tube; lobes triangular-ovate, ca. 1.5 mm. Capsules obcordate, 1.5–2.5 × 4–5 mm, puberulent to villosulous. Fl. May–Sep, fr. Jul–Oct.

Dense forests. Yunnan (Xishuangbanna) [Bangladesh, India (including Andaman Islands), Indonesia, Malaysia, Thailand].

*Ophiorrhiza hispidula* was synonymized by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 131–133. 1997) under *O. trichocarpa* Blume, without explanation and reportedly without having seen Blume's type; the name *O. hispidula* is provisionally used here pending further study.

**25. *Ophiorrhiza howii*** H. S. Lo, Bull. Bot. Res., Harbin 18: 277. 1998.

宽昭蛇根草 kuan zhao she gen cao

*Ophiorrhiza longiflora* F. C. How ex H. S. Lo, Bull. Bot. Res., Harbin 10(2): 70. 1990, not Blume (1826).

Herbs, ascending, to ca. 1 m tall; stems terete to somewhat flattened, rather stout, drying purplish brown to black, subglabrous. Leaves in subequal pairs; petiole 1–2 cm, densely pilosulous; blade narrowly ovate, narrowly elliptic, or ovate, 5–9 × 2–3 cm, abaxially usually pilosulous along principal veins, base cuneate, apex acuminate; secondary veins 8–13 pairs; stipules caducous, unknown. Inflorescence cymose, several to many flowered, densely pilosulous; peduncles 1.5–2 cm; axes short, helicoid; bracts absent or minute and caducous. Flowers with biology unknown, on pedicels 1–2 mm. Calyx with hypanthium portion subturbinate and slightly compressed, ca. 1.7 × 2.3 mm, 5-ribbed, mealy puberulent; lobes sublanceolate, ca. 0.5 mm, subglabrous. Corolla white, salverform, puberulent outside; tube 22–24 mm, pilose or glabrous inside; lobes broadly ovate, 3–4 mm, dorsally with horn 1.5–2 mm, apex incurved rostrate. Capsules not seen. Fl. Oct.

• Forests; 1100–1500 m. Yunnan (Maguan).

The protologue described the corolla tubes as pilose inside, but the protologue figure showed the corolla tube to be glabrous inside.

**26. *Ophiorrhiza huanjiangensis*** D. Fang & Z. M. Xie, Acta Phytotax. Sin. 40: 155. 2002.

环江蛇根草 huan jiang she gen cao

Herbs, procumbent to creeping; stems to 23 cm, densely to moderately hirtellous or pilosulous, to sometimes glabrescent. Leaves in subequal pairs; petiole 0.15–1 cm, hirtellous; blade drying papery, ovate to elliptic-ovate, 0.5–1.85 × 0.3–1.2 cm, both surfaces puberulent at least on principal veins to glabrescent, base obtuse to cordulate, apex obtuse to acute; secondary veins 3 or 4 pairs; stipules caducous, not seen. Inflorescence cymose to umbelliform, 1–3-flowered, hirtellous to glabrescent; peduncle and/or pedicel 5–10 mm; bracts linear, 1–2 mm, sparsely puberulent to glabrescent. Flowers apparently distylous, pedunculate or pedicellate. Calyx puberulent to glabrous; hypanthium turbinate, 1–1.5 mm; lobes ovate to narrowly triangular, ca. 1 mm. Corolla white, funnelform, outside glabrous; tube 10–12 mm, puberulent inside; lobes ovate, 4–5 mm. Capsules unknown. Fl. Apr.

• Dense forests in valleys; ca. 400 m. Hunan (Huitong).

The protologue described the flowers as distylous and reported that only the short-styled form has been seen.

**27. *Ophiorrhiza hunanica*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 24. 1990.

湖南蛇根草 hu nan she gen cao

Herbs, procumbent at base, to 15 cm tall; stems drying black, subglabrous. Leaves in unequal pairs; petiole 1–3 cm, subglabrous; blade drying papery, purple on veins, obovate or ovate, 6–18 × 3–6.5 cm, adaxially sparsely hirtellous-strigose, abaxially subglabrous or villous on veins, base cuneate, apex obtuse to subacute; secondary veins 10–14 pairs; stipules often persistent, ovate, 6–8 mm, ciliate, acuminate. Inflorescence cymose, many flowered, densely villous, pendulous; peduncle ca. 3 cm, arching; principal axes 2 or 3 pairs, helicoid; bracts linear, 8–15 × 1–1.4 mm, sparsely pinnately veined, sparsely ciliate. Flowers with biology unknown, subsessile. Calyx with hypanthium compressed turbinate, ca. 2 mm, 5-ribbed, densely multicellular villous; lobes linear, 6–7 mm, hispidulous along costa. Corolla in bud with color unknown, 5-winged, wings ciliate. Capsules unknown. Fl. Nov.

- Dense forests in valleys; ca. 400 m. Hunan (Huitong).

In the protologue the anthers and stigmas of the flower buds were described, but these immature structures are not reliable indicators of the size or arrangement of the mature structures.

**28. *Ophiorrhiza japonica*** Blume, Bijdr. 978. 1826–1827.

日本蛇根草 ri ben she gen cao

*Ophiorrhiza acutiloba* Hayata; *O. cavaleriei* H. Léveillé; *O. eryei* Champion; *O. dimorphantha* Hayata; *O. dimorphantha* f. *brevistigma* Hayata; *O. dimorphantha* f. *longistigma* Hayata; *O. japonica* var. *acutiloba* (Hayata) Ohwi; *O. japonica* var. *minor* J. Krause; *O. labordei* H. Léveillé; *O. monticola* Hayata; *O. monticola* f. *brevistigma* Hayata; *O. monticola* f. *longistigma* Hayata; *O. nigricans* H. S. Lo.

Herbs, weak to ascending, to 60 cm tall, often drying flushed with purple or darkened; stems subterete to slightly compressed, glabrous or with 2 hirtellous or pilosulous lines. Leaves in subequal pairs; petiole 0.3–2(–3) cm, glabrous to hirtellous or puberulent; blade drying papery, ovate, elliptic-ovate, elliptic, elliptic-oblong, lanceolate, or narrowly lanceolate, 1–11 × 0.7–3.5 cm, glabrous to strigillose or hispidulous adaxially, glabrous to puberulent, hirtellous, or villosulous abaxially, base cuneate to obtuse, margins flat to crisped, apex acute to acuminate or rarely obtuse (to rounded, *Ophiorrhiza nigricans*); secondary veins 4–8 pairs; stipules triangular, 0.8–2 mm, glabrescent, acute to bifid, caducous sometimes leaving 1 to several thickened scars to 0.3 mm. Inflorescence congested-cymose to cymose, few to many flowered, puberulent to strigillose, pilosulous, or hirtellous; peduncle 0.5–5 cm (to 6 cm, *O. nigricans*); axes congested-cymose becoming helicoid; bracts lanceolate-linear, spatulate, or linear, 1–6 mm, sometimes glabrescent, persistent. Flowers distylous, on pedicels 1–2 mm. Calyx glabrous to densely puberulent or pilosulous; hypanthium subturbinate to oblate or subglobose, 0.8–1 mm, 5-

ribbed; lobes triangular, 0.4–1.2 mm. Corolla white or pink, funnellform to tubular-funnelform, outside glabrous to puberulent or pilosulous and longitudinally winged, inside pilose near middle and pilosulous above middle through throat and sometimes onto lobes; tube 9–14 mm; lobes triangular to ovate, (1.5–1.8 mm, *O. nigricans*) 2.5–4 mm, dorsally with wing to 0.5 mm wide, apex rostrate. Capsules submitriform, 2.5–4 × 6.5–9 mm, pilosulous to glabrous. Fl. winter, fr. spring and summer.

Fertile soil of ravines in forests; 100–2400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, S Shanxi?, Sichuan, Taiwan, NE Yunnan, Zhejiang [Japan, Vietnam].

Duan and Lin (Acta Phytotax. Sin. 45: 873. 2007) synonymized *Ophiorrhiza nigricans* with *O. japonica*. They also synonymized *O. kwangsiensis* with *O. japonica*, but that species is provisionally separated here based on the characters given in the key to species pending further study. The reproductive biology of *O. japonica* was studied by Nakamura et al. (J. Plant Res. 120: 501–509. 2007), who found the Chinese plants sampled to be distylous and diploid. The corollas are apparently similar between the two floral forms, with the reciprocally placed anthers and stigmas positioned near the middle of the corolla tube vs. at or just above its throat, respectively.

**29. *Ophiorrhiza kuroi*** Makino, Bot. Mag. (Tokyo) 20: 5. 1906 [*"Kuroiwa"*].

小花蛇根草 xiao hua she gen cao

*Ophiorrhiza japonica* Blume var. *kuroi* (Makino) Ohwi; *O. kotoensis* Hatusima; *O. liukiensis* Hayata; *O. parviflora* Hayata (1912), not Reinwardt ex Korthals (1851).

Herbs, erect, to 60 cm tall; stem 4-angled, densely strigillose-tomentulose to glabrescent. Leaves in subequal pairs; petiole 0.5–2.3(–3) cm, villosulous-tomentulose to glabrescent; blade drying membranous to papery, red or pale, oblong-ovate, ovate, or elliptic-oblong, 5–12(–15) × 2–6 cm, adaxially sparsely scaberulous, abaxially puberulent at least on principal veins, base cuneate to obtuse then often narrowed and shortly attenuate, margins entire, apex acute or occasionally obtuse or shortly acuminate; secondary veins 6–11 pairs; stipules deciduous, deeply 2-parted, 3–7 mm, puberulent, lobes cuspidate or filiform. Inflorescences cymose to paniculate, several to many flowered, hirtellous- or hispidulous-tomentulose; peduncle 3.5–5 cm; axes several, elongating as buds develop, helicoid; bracts reduced, caducous. Flowers with biology unknown, subsessile or on pedicels to 2 mm. Calyx puberulent to glabrous; hypanthium subglobose, 1–1.5 mm; lobes triangular, 0.3–0.5 mm, dorsally keeled. Corolla white, tubular or inflated, outside glabrous to puberulent, inside pubescent in upper part of tube and onto lobes; tube 2.5–3.5 mm; lobes ovate-triangular, ca. 1 mm, dorsally ridged. Capsules reniform-oblate, 2–3.5 × 6–9 mm, 5-ribbed, glabrescent. Fl. Apr–Oct, fr. Sep–Feb.

Taiwan [Japan, Philippines].

**30. *Ophiorrhiza kwangsiensis*** Merrill ex H. L. Li, J. Arnold Arbor. 24: 453. 1943.

广西蛇根草 guang xi she gen cao

Herbs, creeping to weakly ascending, to 18 cm tall; stems drying yellowish brown, subglabrous or with puberulent to

strigillose lines. Leaves in subequal pairs; petiole 0.5–1.5 cm, glabrous; blade drying papery to membranous, leaden gray or olive-green adaxially, pale green or yellowed abaxially, cordiform to cordate-ovate,  $0.8-2 \times 0.7-1.5$  cm, glabrous on both surfaces or puberulent adaxially, base cordate to subtruncate, margins entire, apex acute to somewhat obtuse; secondary veins 4–6 pairs; stipules caducous, not seen. Inflorescence congested-cymose, few or several flowered, densely hirtellous to pilosulous; peduncle 0.7–1.5 cm; axes reduced or shortly helicoid; bracts linear to linear-lanceolate, 4.5–6 mm, glabrous except sparsely ciliolate. Flowers reportedly distylous, subsessile, fragrant. Calyx puberulent; hypanthium turbinate, ca. 1 mm, weakly 5-ribbed; lobes oblong-lanceolate, in bud 1–2.5 mm and equal to unequal. Corolla pale yellow or reddish, tubular-funnelform, outside subglabrous; tube 9–10 mm, inside sparsely pilose; lobes ovate-triangular, ca. 2 mm, dorsally costate and with very short horn. Capsules ?mitriform,  $2-2.5 \times 6-7$  mm, puberulent. Fl. early spring or Sep.

- Shady wet places in forests. Guangxi (Shangsi).

H. S. Lo (in FRPS 71(1): 145. 1999) reported this species as distylous but described only one floral form, similar to the short-styled flowers of distylous species. The protologue described only young flower buds with no description of anther or stigma position. The protologue described the calyx lobes as ca. 1 mm without any note about them being unequal, while H. S. Lo (loc. cit.) described these as 1.5–2.2 mm and usually unequal; both conditions are included here provisionally.

*Ophiorrhiza kwangsiensis* was synonymized with *O. japonica* by Duan and Lin (Acta Phytotax. Sin. 45: 873. 2007), but a number of characters seem to distinguish it; it is provisionally separated here pending further study.

**31. *Ophiorrhiza laevifolia* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 80. 1990.**

平滑蛇根草 ping hua she gen cao

Herbs, suberect, to 80 cm tall; stems subterete to slightly compressed, drying black on upper part, puberulent or subglabrous. Leaves in subequal pairs; petiole 0.5(–1.5) cm; blade drying papery, adaxially dark green, abaxially pale green, ovate or lanceolate,  $\pm$  inequilateral,  $4-12 \times 2-4.5$  cm, glabrous on both surfaces, base cuneate, margins undulate or flat, apex acute, acuminate, or caudate; secondary veins 5 or 6 pairs; stipules caducous, not seen. Inflorescence congested-cymose, many flowered, densely ferruginous hirtellous; peduncle reduced or up to 1 cm; axes reduced to shortly helicoid; bracts absent or minute. Flowers reportedly distylous, subsessile. Calyx glabrescent; hypanthium obovoid, ca. 2 mm, 5-ribbed; lobes narrowly lanceolate, ca. 1 mm, with 1 gland in each sinus. Corolla pink, subtubular, glabrous outside; tube ca. 13 mm, sparsely white villous above middle inside; lobes subovate, 1.8–2 mm, dorsally with short horn 0.1–0.2 mm, apex rostrate. Capsules not seen. Fl. Apr.

- Semi-evergreen forests; 800–1000 m. Xizang (Mêdog).

The protologue reported this species as distylous but described only one floral form, similar to the short-styled flowers of distylous species; this was described as having the stigmas positioned not far below the middle of the corolla tube and the anthers exerted.

**32. *Ophiorrhiza laoshanica* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 65. 1990.**

老山蛇根草 lao shan she gen cao

Herbs, suberect, to 50 cm tall; stems sulcate to subterete, drying grayish yellow, subglabrous. Leaves in markedly unequal pairs; petiole 0.3–1 cm, subglabrous; blade drying thinly papery, adaxially gray to blackened, abaxially grayish yellow, ovate, larger ones  $6-8(-11) \times 2-3$  cm, smaller ones  $1.5-5 \times 1-2$  cm, glabrous on both surfaces, base obtuse to acute then decurrent, apex shortly acuminate; secondary veins 6–9 pairs; stipules caducous, not seen. Inflorescence ferruginous mealy puberulent; peduncle 1–2 cm; axes short, helicoid; bracteoles filiform-subulate, ca. 3 mm. Flowers reportedly distylous, subsessile. Calyx mealy puberulent; hypanthium obconic-turbinate, ca. 1 mm, 5-ribbed; lobes triangular to deltoid, ca. 0.4 mm. Corolla white, tubular-funnelform, outside glabrous; tube 9–10 mm, inside near middle with villous fascicles mixed with scale-like pilose trichomes; lobes subovate, ca. 0.7 mm, dorsally with a broad semiorbicular wing. Capsules not seen. Fl. Nov–Jun of following year.

- Wet places in forests. Guangxi.

The protologue reported this species as distylous but described only one floral form, similar to the short-styled flowers of distylous species with the anthers positioned in or shortly above the corolla throat and the stigmas situated near the middle of the corolla tube.

**33. *Ophiorrhiza liangkwanensis* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 39. 1990.**

两广蛇根草 liang guang she gen cao

Herbs, procumbent to creeping, rooting at nodes, to 30 cm tall; stems densely white- or pale yellow villous. Leaves usually in unequal pairs; petiole 0.5–2(–3) cm, densely hirtellous or villosulous; blade drying thinly papery or submembranous, broadly ovate, ovate, or oblong-ovate,  $1.5-8(-11) \times 1-6$  cm, sparsely hirtellous to villous on both surfaces, base subrounded to obtuse, usually inequilateral, apex acute to obtuse; secondary veins 6–11 pairs; stipules caducous, not seen. Inflorescence congested-cymose, 2- or 3(–6)-flowered, densely villosulous to villous; peduncle 0.5–1.2 cm; bracts linear or filiform, 1.5–10 mm. Flowers distylous, subsessile or on pedicels to 3 mm. Calyx villosulous; hypanthium subglobose, ca. 1.5 mm; lobes filiform, ca. 2 mm, with 1 globose gland in each sinus. Corolla white or pale purple, drying yellow, slenderly funnelform, sparsely villous to glabrescent outside; tube 18–20 mm, sparsely pilose inside in basal 1/3; lobes ovate-triangular, ca. 6 mm, dorsally ribbed, apex rostrate. Capsules mitriform, ca.  $3 \times 7$  mm, densely villous. Fl. Jun.

- Roadsides at forest margins. Guangdong (Xinyi), Guangxi.

The protologue detailed both long-styled and short-styled flowers and noted that their calyces and corollas are similar. H. S. Lo in FRPS (71(1): 142. 1999) described this species as rarely many flowered, but this has not been noted by other authors nor seen on specimens studied.

**34. *Ophiorrhiza lignosa* Merrill, Brittonia 4: 176. 1941.**

木茎蛇根草 mu jing she gen cao

Subshrubs, erect, to 50 cm tall; stems weakly 4-angled to terete, glabrous except with 2 pilosulous to hirtellous lines. Leaves in subequal pairs; petiole 0.6–2 cm, glabrous or villosulous; blade drying papery or submembranous, adaxially olive-green, pale abaxially, lanceolate or narrowly lanceolate, 5–11 × 1–2 cm, glabrous on both surfaces or sometimes pilosulous along principal veins abaxially, base long cuneate, margins entire, apex acuminate; secondary veins 8 or 9 pairs; stipules caducous, not seen. Inflorescence cymose to somewhat congested-cymose, many flowered, 3–4.5 cm, subferruginous pilosulous; peduncle 1–2 cm; axes helicoid, up to 1 cm; bracteoles ensiform-linear or linear and acuminate, 1.5–3 mm. Flowers with biology unknown, subsessile or on pedicels to 1 mm. Calyx hispidulous; hypanthium compressed turbinate, ca. 1.3 mm, 5-ribbed; lobes ovate-triangular, 0.5–0.7 mm, usually with 1 gland in each sinus. Corolla purple, subtubular, glabrous outside, inside with white villous ring in upper part of tube and onto lobes; tube 10–11 mm; lobes broadly ovate or oblong-ovate, ca. 3 mm. Capsules unknown. Fl. Apr.

Forests; ca. 1100 m. Yunnan (Malipo) [Myanmar].

The protologue reported this species only from Myanmar, at ca. 1200 m, and did not detail the position of the anthers but did describe the style as long enough to position the stigmas in the corolla throat; H. S. Lo (in FRPS 71(1): 152–153, t. 37, f. 4. 1999) described and illustrated the anthers as positioned near the middle of the corolla tube. Thus, the flowers described resemble the long-styled flowers of distylous species; none of these authors have posited the floral biology of this species.

### 35. *Ophiorrhiza longicornis* H. S. Lo, sp. nov.

长角蛇根草 *chang jiao she gen cao*

Type: China. Guangxi: Napo, *Y. Lin* 3-5324 (holotype, GXMI).

Validating Latin description: that of "*Ophiorrhiza longicornis* Lo" (H. S. Lo, Bull. Bot. Res., Harbin 10(2): 57. 1990).

Herbs, apparently ascending; stems drying brownish red, terete, glabrous. Leaves in somewhat unequal pairs; petiole 1–2 cm, glabrous; blade drying papery or rather thickly papery, abaxially yellowish or greenish yellow with veins brown, narrowly elliptic-ovate to oblanceolate, 4–10 × 1.5–3.5 cm, glabrous on both surfaces, base cuneate, margins entire, apex obtuse then cuspidate or caudate; secondary veins 7–11 pairs; stipules caducous, not seen. Inflorescences cymose to subcorymbose, many flowered, branched to several orders, puberulent; peduncles 1.5–2.5 cm; axes spiciform to helicoid, principal ones ca. 1 cm; bracteoles turning purple when dry, linear-lanceolate, 3–5 mm, sharply acute. Flowers with biology unknown, subsessile. Calyx with hypanthium compressed subglobose-turbinate, ca. 1.5 mm, 5- or 10-ribbed, puberulent; lobes triangular, 0.7–1 mm, subglabrous, with 1 gland in each sinus. Corolla purplish red, tubular, glabrous and slenderly 5-ribbed outside; tube ca. 4.5 mm, inside with white villous ring below middle; lobes subtriangular, 0.4–0.5 mm, dorsally with horn 1.5–2 mm and drying black, apex incurved-rostrate. Capsules not seen. Fl. Apr.

• Forests. Guangxi (Napo).

This name was previously published by H. S. Lo (loc. cit.) but not validly so because the type was not indicated in accordance with Art. 37.6 of the *Vienna Code*.

### 36. *Ophiorrhiza longipes* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 49. 1990.

长梗蛇根草 *chang geng she gen cao*

Herbs, apparently ascending, to 100 cm tall; stems drying flattened, densely pilosulous. Leaves in markedly unequal pairs; petiole 0.5–1(–3) cm, pilosulous; blade drying thinly papery, adaxially grayish green, abaxially pale or purple, ovate or elliptic, larger ones 3.5–7.5 × 2–3.2 cm, smaller ones 2–5 × 1.5–3 cm, glabrous adaxially, abaxially glabrous or pilosulous along veins, base cuneate, obtuse, or subrounded, ± inequilateral, margins subentire, apex obtuse; secondary veins 6–8 pairs; stipules caducous, not seen. Inflorescence cymose, 5–9-flowered, often rather lax, hispidulous to hirsute; peduncle 2–2.5 cm; axes helicoid, ca. 1 cm; bracteoles subulate, 2–3 mm. Flowers with biology unknown, subsessile. Calyx pilosulous or hispidulous; hypanthium turbinate, ca. 2.5 mm, 5-ribbed; lobes triangular, 1–1.3 mm, with 1 gland in each sinus. Corolla yellowish white or tinged with purple, funnelform, glabrous outside; tube ca. 16 mm, with pilose or pilosulous ring above middle inside; lobes ovate-triangular, 5–5.5 mm, dorsally thinly winged, apex rostrate. Capsules drying brownish red, mitriform-rhomboid, ca. 3 × 7 mm. Fl. Apr.

• Rocks in wet and shady places in forests. Guangxi.

The figure of this species presented by H. S. Lo in FRPS (71(1): 150, t. 36, f. 1–6. 1999) seems to be redrawn based on the protologue figure but differs a bit from it; in particular, the lower right-hand leaf is shown in FRPS as acute or shortly acuminate, while in the protologue figure this was shown as obtuse and there corresponded to the textual description. Neither the protologue nor FRPS posited the floral biology of this species; the flower described in the protologue resembles the short-styled form of distylous species, with the anthers positioned in or just below the corolla throat and the stigmas positioned just below the middle of the corolla tube.

### 37. *Ophiorrhiza luchuanensis* H. S. Lo, Bull. Bot. Res., Harbin 10(2): 74. 1990.

绿春蛇根草 *lü chun she gen cao*

Herbs or subshrubs, weak to ascending, to 2 m tall; stems densely hispid. Leaves in markedly unequal pairs; petiole 0.3–2 cm, densely hispid or pilose; blade drying papery, lanceolate to narrowly elliptic, larger ones 5–15 × 2.5–4.5 cm, smaller ones 2–6(–8) × 1–2 cm, strigose adaxially, densely hirtellous or hirsute along principal veins abaxially, base acute to attenuate, apex acuminate to caudate; secondary veins 7–12 pairs, prominent adaxially; stipules caducous. Inflorescence cymose, many flowered, densely villous; peduncle 1–3 cm; axes several, helicoid; bracts absent or minute. Flowers distylous, subsessile. Calyx glabrous or ferruginous mealy puberulent; hypanthium rhombic-turbinate, ca. 1 mm, 5-ribbed; lobes subtriangular, ca. 0.4 mm. Corolla white, salverform-tubular and slightly contracted in middle, glabrous outside; tube 7–8 mm, barbate in throat; lobes triangular, 1.8–2 mm, dorsally costate to narrowly winged near apex. Capsules drying reddish brown, broadly mitriform, ca. 1.5 × 5 mm, 5-ribbed, subglabrous. Fl. Oct.

- Shady wet places in forests; ca. 2000 m. S Yunnan (Lüchun).

The protologue described the corollas of both floral forms as similar and noted that the anthers and stigmas are reciprocally placed, at or just below the throat or at the bottom of the corolla tube, respectively. The protologue figure was apparently redrawn for FRPS (71(1): 170, t. 43, f. 1–7. 1999) and differs from the first version: in particular, the stems, petioles, and inflorescence are depicted as densely hispid or pilose in the protologue figure but apparently glabrous in the redrawn figure, and the redrawn figure shows the secund-helicoid flower arrangement on the inflorescence axes as significantly more regular than in the protologue figure.

**38. *Ophiorrhiza lurida*** J. D. Hooker, Fl. Brit. India 3: 82. 1880.

黄褐蛇根草 huang he she gen cao

Herbs, procumbent to ascending, to 20 cm tall; stems puberulent to densely villosulous. Leaves in subequal pairs; petiole (0.1–)0.2–2.8 cm, densely villosulous; blade drying papery, adaxially green, abaxially pale green, ovate, ovate-lanceolate, or elliptic, 0.6–5 × 0.6–2.5 cm, adaxially sparsely hispidulous to hispid, abaxially puberulent or hispid along principal veins, base obtuse, truncate, or subrounded, margins entire, apex obtuse to acute; secondary veins 4 or 5 pairs; stipules generally persistent, triangular to ovate, 2–4 mm, glabrous to hirtellous, acuminate or aristate with 1–3 bristles 2–7 mm. Inflorescences congested-cymose to subcapitate, few to several flowered, glabrous; peduncles 0.5–4 cm; heads ca. 1 × 1 cm; bracts subulate-linear, lanceolate, elliptic-oblong, or spatulate, 3–8 mm, costate, obtuse to acute. Flowers with biology unknown, subsessile or on pedicels to 1.5 mm. Calyx glabrous; hypanthium subglobose, ca. 1.5 mm; lobes narrowly triangular, ca. 1 mm. Corolla white, drying yellow, tubular to inflated, glabrous outside, inside villous in upper part of tube and onto lobes; tube 2.5–4.5 mm; lobes triangular-ovate, 1–1.5 mm, dorsally narrowly winged, obtuse. Capsules not seen in China. Fl. Aug.

Broad-leaved forests, *Tsuga* forests; [300–]1800–2300 m. Xizang (Mêdog), NW Yunnan [India (Darjeeling, Sikkim)].

Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 67. 1997) described the capsules of Indian plants as flattened obturbinate, 1.5–3 × 5–8 mm, and glabrous to puberulent.

**39. *Ophiorrhiza macrantha*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 28. 1990.

大花蛇根草 da hua she gen cao

Herbs, weak at base, ascending to erect above, to 50 cm tall; stems drying orange, subglabrous or puberulent when young. Leaves in unequal pairs; petiole 1–4 cm, glabrous or puberulent; blade drying thinly papery or papery, adaxially grayish green, pale or yellowish green abaxially, oblong-ovate, subovate, or elliptic-oblong, 4–16 × 1.8–4.5 cm, glabrous on both surfaces or abaxially puberulent along principal veins, base obtuse to subrounded, margins usually undulate, apex caudate; secondary veins 7–9 pairs; stipules generally persistent, narrowly triangular, 6–8 mm, with globose gland at apex and at each side of base. Inflorescences cymose, many flowered, puberulent; peduncle 2–2.5 cm; axes helicoid, 0.5–2 cm; bracteoles linear-spatulate, ca. 2 mm, ciliolate. Flowers distylous, on

pedicels 1.5–3 mm. Calyx puberulent to glabrescent; hypanthium rhomboid-subglobose, ca. 2.5 × 2 mm, 10-ribbed; lobes triangular, subequal or unequal, 1.5–2 mm. Corolla reddish or pink, funnelform, glabrous outside, inside with sparsely white villous ring at middle of tube and sparsely villous above this and sometimes onto lobes; tube 22–23 mm; lobes subovate, ca. 5.5 mm, dorsally with wing ca. 0.8 mm wide with very short apical spur, apex rostrate. Immature capsules submitriform, ca. 3 × 7–7.5 mm, 10-ribbed. Fl. Mar.

- Streamsides in dense forests; ca. 3000 m. Yunnan.

In the protologue and FRPS (71(1): 129–131. 1999), H. S. Lo noted that the long-styled flowers have the anthers positioned near the middle of the corolla tube and the stigmas in its throat, while the short-styled flowers have the anthers positioned in the throat and the stigmas below them inside the upper part of the corolla tube.

**40. *Ophiorrhiza macrodonta*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 25. 1990.

大齿蛇根草 da chi she gen cao

Large herbs or subshrubs, erect, to 2.5 m tall; stems drying black to brownish red, ferruginous pilosulous to glabrescent. Leaves in subequal pairs; petiole 1–2 cm or sometimes longer; blade drying papery, adaxially grayish brown, abaxially pale, oblong-elliptic, ovate-oblong, or ovate, 6.5–17 × 2.5–5.5 cm, glabrescent on both surfaces or sparsely pilosulous adaxially and pilosulous along principal veins abaxially, base cuneate then decurrent, margins entire, apex acuminate; secondary veins 14–16 pairs; stipules ovate to lanceolate-ovate, 5–16 mm, entire or occasionally dentate, parallel-nerved, subglabrous, acuminate. Inflorescence cymose to congested-cymose, many flowered, pendulous then becoming erect, densely ferruginous hirsute or -hirtellous; peduncle ca. 1 cm; bracts sublinear, 7–9 mm, ciliolate, glabrous or sparsely pilose, persistent. Flowers reportedly distylous, on pedicels 1–1.5 mm. Calyx hispidulous; hypanthium obrhombic, ca. 1 mm, weakly 5-ribbed; lobes narrowly lanceolate, ca. 2.5 mm. Corolla greenish yellow in bud, reddish at anthesis, tubular-funnelform, glabrous outside; tube 13–14 mm, villous inside; lobes subovate, ca. 2 mm, dorsally with wing to 0.6 mm wide, apex rostrate. Capsules obcordate, 2.5–3 × 7.5–9 mm, hispidulous. Fl. Sep.

- Wet places in forests; ca. 1500 m. Yunnan.

In the protologue and FRPS (71(1): 126–127. 1999), H. S. Lo described the flowers as distylous with the long-styled flowers unknown; the putative short-styled flowers were described as having the anthers partially exerted in the throat and the stigmas situated below the middle of the corolla tube.

**41. *Ophiorrhiza medogensis*** H. Li, Acta Phytotax. Sin. 18: 116. 1980.

长萼蛇根草 chang e she gen cao

Herbs or subshrubs, ascending, to 60 cm tall; stems densely brown villous with multicellular trichomes. Leaves in unequal pairs; petiole 0.5–1.5(–3.5) cm, densely villous; blade drying thinly papery, pallid green on both surfaces or reddened abaxially, lanceolate, oblong-lanceolate, or subovate, 6–14 × 2.2–5.5 cm, adaxially glabrous or sparsely hispid, abaxially

densely villous along principal veins, base rounded or subcordate, usually inequilateral, margins subentire or undulate, ciliate, apex abruptly acuminate; secondary veins 8–16 pairs; stipules generally persistent, with 2 or 3 subulate to filiform lobes ca. 1 cm, ciliate. Inflorescences congested-cymose, many flowered, densely villous; peduncles shorter than 1 cm; axes short, helicoid; bracts filiform or subulate, 1–2 cm, ciliate. Flowers with biology unknown, subsessile. Calyx densely villous; hypanthium subglobose, ca. 2 mm; lobes filiform, 7–8 mm, ciliate. Corolla white, tubular-funnelform, puberulent outside; tube ca. 18 mm, in throat notably expanded, inside villous above middle; lobes oblong-ovate, ca. 4 mm. Capsules obovate, ca. 5 × 10 mm. Fl. Sep.

• Broad-leaved forests on mountain slopes; ca. 1700 m. Xizang (Médog).

**42. *Ophiorrhiza mitchelloides*** (Masamune) H. S. Lo, Bull. Bot. Res., Harbin 18: 277. 1998 [*"michelloides"*].

东南蛇根草 dong nan she gen cao

*Hayataella mitchelloides* Masamune, Trans. Nat. Hist. Soc. Formosa 24: 206. 1934 [*"michelloides"*]; *Geophila exigua* H. L. Li; *Ophiorrhiza exigua* (H. L. Li) H. S. Lo.

Herbs, procumbent to creeping, generally rooting at most nodes; stems villous with multicellular trichomes. Leaves in subequal to unequal pairs; petiole 0.3–1.3 cm, densely villous to villosulous; blade drying papery, adaxially dark gray or nearly black, abaxially purplish red to reddish or rarely pale, broadly ovate, ovate, or suborbicular, 0.8–2.5 × 0.6–2 cm, sparsely pilose to villous along principal veins to throughout on both surfaces, base subtruncate to obtuse or rounded, apex acute to rounded-obtuse; secondary veins 3–5 pairs; stipules usually caducous, triangular to ligulate, 1–1.5 mm, glabrescent, acuminate to 2–4-lobed. Inflorescences fasciculate to cymose, 1- or 2(or 5)-flowered, villosulous; peduncles and/or pedicels 0.4–2 cm; bracts linear, 4–8 mm. Flowers distylous, pedunculate or pedicellate. Calyx with hypanthium compressed globose, ca. 1.2 mm, densely villosulous; lobes linear, ca. 1.4 mm, glabrescent or ciliate. Corolla white, funnelform or salverform, outside with 5 strigose or hispidulous lines; tube ca. 15 mm, inside with white villous ring just above middle and otherwise villous or glabrous except pubescent in throat; lobes broadly ovate, 5–6.5 mm. Capsules obcordate, ca. 3.5 × 9–10 mm, villous. Fl. Apr, fr. Jun.

• Broad-leaved forests or forest margins; 400–1500 m. Fujian, Guangdong, Hunan, Jiangxi, Taiwan.

This small plant was separated by some authors in a monotypic genus endemic to Taiwan, *Hayataella*. However, recent authors have noted a broader range for it and included it in *Ophiorrhiza* based on morphological (H. S. Lo, Bull. Bot. Res., Harbin 10(2): 1–82. 1990, and references cited therein) and molecular (Nakamura et al., J. Plant Res. 119: 657–661. 2006) characters. H. S. Lo in FRPS (71(1): 141–142. 1999) detailed both short-styled and long-styled flowers.

**43. *Ophiorrhiza mungos*** Linnaeus, Sp. Pl. 1: 150. 1753.

蛇根草 she gen cao

Herbs or subshrubs, ascending, to 100 cm tall; stems glabrescent to puberulent. Leaves in subequal pairs; petiole 1.5–5

cm, glabrous to puberulent; blade drying thinly papery, elliptic or lanceolate-elliptic, 2.5–22 × 1–9 cm, glabrous adaxially, glabrous or puberulent on principal veins abaxially, base cuneate to obtuse, apex acute to acuminate; secondary veins 10–19 pairs; stipules deciduous, narrowly triangular, 4–8 mm, sometimes 2-lobed, glabrescent. Inflorescence cymose to paniculate, several to many flowered, puberulent; peduncle 0.5–6 cm; axes helicoid; bracts reduced and caducous or none. Flowers apparently distylous, subsessile. Calyx densely puberulent; hypanthium compressed turbinate, ca. 1 mm; lobes triangular, 0.5–1 mm. Corolla white, tubular or sometimes constricted near middle, outside puberulent to glabrous; tube 2.5–4 mm, inside villosulous near middle; lobes triangular, ca. 1 mm, dorsally smooth to costate. Capsules broadly mitriform, 1.5–3 × 3–9 mm, glabrous to densely puberulent.

Expected in Yunnan [India, Myanmar, ?Philippines, Thailand to Malaysia, ?Vietnam].

This species was not included for China by H. S. Lo (Bull. Bot. Res., Harbin 10(2): 1–82. 1990; FRPS 71(1): 110–174. 1999) but has been reported from the surrounding regions (Deb & Mondal, Bull. Bot. Surv. India 39(1–4): 67–73. 1997), and some specimens from China have been identified with this name by Chinese botanists (in herb.). The description here is presented at least for reference and is based on that of Deb and Mondal (excluding *Ophiorrhiza mungos* var. *nemorosa* (Thwaites) J. D. Hooker). Deb and Mondal (loc. cit.) reported *O. mungos* to flower and fruit throughout the year and did not describe its floral biology or individual floral forms but illustrated both short-styled and long-styled flowers.

**44. *Ophiorrhiza mycetiifolia*** H. S. Lo, Guihaia 11: 103. 1991.

腺木叶蛇根草 xian mu ye she gen cao

Herbs or subshrubs, erect, to 2.5 m tall; stems puberulent to villosulous. Leaves in generally equal pairs; petiole 2–4 cm, densely villosulous; blade drying thinly papery, olive-green, elliptic-ovate or elliptic, 10–20 × 4–7.5 cm, sometimes weakly bullate, adaxially glabrous or sparsely strigillose to puberulent, abaxially glabrous to densely villosulous, base obtuse to rounded then shortly decurrent, margins entire, apex acute to shortly cuspidate; secondary veins 15 or 16 pairs; stipules caducous, unknown. Inflorescence congested-cymose, many flowered, 5–6 cm wide, densely villosulous-tomentulose; peduncle ca. 2.5 cm; axes several, dichasial at lower axes then helicoid above; bracts linear-lanceolate, 5–10 mm, acuminate. Flowers with biology unknown, subsessile or on pedicels to 2 mm. Calyx densely hirtellous; hypanthium subglobose, ca. 1.5 mm, 5-ribbed with ribs glabrescent; lobes triangular, 0.8–1 mm. Corolla white, tubular, outside glabrous to pilosulous, pubescent throughout inside; tubes 10–11 mm; lobes subtriangular, ca. 2 mm, reflexed, dorsally with horn 1.5–2 mm near apex. Capsules not seen. Fl. Dec.

• Sparse forests in valleys; ca. 600 m. Guangxi (Longzhou).

**45. *Ophiorrhiza nandanica*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 63. 1990.

南丹蛇根草 nan dan she gen cao

Herbs, suberect, to 40 cm tall; stems drying black to brownish yellow, terete, glabrous. Petiole 1–2.5 cm, glabrous;

leaf blade drying papery, dark gray or blackish gray adaxially, pale yellow or greenish yellow with veins brown abaxially, ovate to lanceolate, 4–11 × 1.5–4.5 cm, glabrous, base obtuse, apex acuminate; secondary veins 5–9 pairs; stipules caducous, not seen. Inflorescences congested, several flowered, pubescence in 2 pilose longitudinal lines; peduncle 1–2 cm; axes helicoid; bracts linear-lanceolate, 3–5 mm, weakly pinnately veined. Flowers distylous, sessile or subsessile. Calyx with hypanthium submitriform, ca. 1.5 mm, 5-ribbed; lobes triangular or narrowly triangular, markedly unequal, 1 or 2 larger ones 1–2 mm, 3 or 4 smaller ones ca. 0.7 mm, both lobes and sinuses glandular. Corolla pale yellow, subsalverform, glabrous outside; tube ca. 18 mm, glabrous inside; lobes long narrowly triangular, ca. 1.5 mm, dorsally with wing ca. 1 mm wide with very short horn at top, apex rostrate. Capsules not seen. Fl. Oct.

- Shady places in forests in limestone regions. Guangxi (Nandan).

In the protologue and FRPS (71(1): 162. 1999), H. S. Lo detailed both long-styled and short-styled flowers, with similar corollas but differing in anther and stigma positions (in the middle of the corolla tube vs. the throat, respectively and correspondingly).

**46. *Ophiorrhiza napoensis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 48. 1990.

那坡蛇根草 na po she gen cao

Herbs, ascending, to 30 cm or taller; stems glabrous. Leaves in unequal pairs; petiole 0.3–1.4 cm, glabrous; blade drying papery, grayish adaxially, pale yellow abaxially, narrowly lanceolate to subovate, 5–12 × 1.5–3.5 cm, glabrous on both surfaces or pilosulous along midrib abaxially, base cuneate to obtuse, margins entire, apex acute to acuminate; secondary veins 7–12 pairs; stipules caducous, triangular, 0.5–1 mm, entire or glandular. Inflorescences congested-cymose, several flowered, ferruginous- to golden yellow tomentulose or -pilosulous; peduncle 0.8–1 cm; axes short, helicoid; bracts lanceolate-linear, 10–14 mm, weakly costate, glabrous. Flowers with biology unknown, subsessile or on pedicels to 1.5 mm. Calyx with hypanthium turbinate-rhombic, 1.5–2 × 2.3–2.5 mm, 5-ribbed, densely pilosulous; lobes narrowly triangular, unequal, largest ones 1.8–2 mm, smallest ones 1.3–1.5 mm, glabrous, sinus sometimes with 2 or 3 globose glands. Corolla white, drying orange-yellow, salverform to funnelform, glabrous outside; tube 20–22 mm, glabrous inside; lobes ligulate to ovate, 2.5–5 mm, dorsally ribbed and with very short horn. Immature fruit obovate. Fl. Oct.

- Forests on hill slopes. Guangxi (Napo), Yunnan (Maguan).

**47. *Ophiorrhiza nutans*** C. B. Clarke ex J. D. Hooker, Fl. Brit. India 3: 84. 1880.

垂花蛇根草 chui hua she gen cao

Herbs, weak to erect, to 70 cm tall; stems densely reddish brown villous with multicellular trichomes. Leaves in subequal to unequal pairs; petiole 0.5–2 cm, densely pubescent; blade drying papery, ovate, lanceolate, elliptic, or elliptic-oblong, 3–8(–13) × 1.5–4 cm, sparsely pilose or strigose adaxially, glabrescent except pubescent along principal veins abaxially, base obtuse to subrounded then attenuate, margins ciliolate, entire or undulate, apex acute to cuspidate; secondary veins 9–13[–15]

pairs; stipules persistent, lanceolate or subovate, 8–10 mm, acuminate to 2-lobed. Inflorescence congested-cymose to corymbiform, many flowered, densely hirtellous; peduncle 1–3[–6] cm; bracts linear-oblong or lanceolate, 5–10 mm, ciliate, sometimes fimbriate and/or with a linear lobe at each side. Flowers distylous, subsessile. Calyx densely hispidulous to glabrescent; hypanthium subtrubinate, ca. 1.5 mm; lobes sublanceolate, ca. 1.2 mm. Corolla white, tubular-funnelform, glabrous or sparsely hispid outside; tube [6.5–]9[–19] mm, inside sparsely pilosulous near middle and barbate in throat; lobes subtriangular or subovate, 2–3 mm, dorsally narrowly winged. Capsules mitriform, ca. 2.5 × 6–7 mm, hispidulous to subglabrous.

Moist forests; 700–2400 m. Xizang (Mêdog), Yunnan [NE India, Myanmar, Nepal].

Measurements in brackets are taken from the description of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 82. 1997) and may be expected in Chinese plants. H. S. Lo (in FRPS 71(1): 131. 1999) and Deb and Mondal noted that this species is distylous, with the corollas similar in size in both floral forms and the stigmas and anthers reciprocally placed in the corolla throat and near the base of the corolla tube, respectively. H. S. Lo described the corolla tubes as ca. 9 mm; the Fl. Bhutan (2(2): 779. 1999) described them as 6.5–8.5 mm; and Deb and Mondal described them as 13–19 mm.

*Ophiorrhiza hainanensis* was synonymized with *O. nutans* by Duan and Lin (Acta Phytotax. Sin. 45: 877. 2007). However, several distinctions between these were cited by H. S. Lo (Bull. Bot. Res., Harbin 10(2): 30. 1990), and these species are provisionally separated here pending further study.

**48. *Ophiorrhiza ochroleuca*** J. D. Hooker, Fl. Brit. India 3: 78. 1880.

黄花蛇根草 huang hua she gen cao

Herbs, annual or perennial, or subshrubs, erect, to 40[–100] cm tall; stems [glabrous to] pubescent. Leaves in subequal pairs; petiole 1–4.5 cm, subglabrous; blade drying thinly papery, adaxially pale green, abaxially paler, elliptic to lanceolate, [3.5–]13–15[–22.5] × [1.5–]4.5–6[–10] cm, subglabrous except pilosulous abaxially along principal veins, base cuneate to obtuse, margins entire, apex shortly acuminate to subacute; secondary veins [8–]10–12[–15] pairs; stipules deciduous, subovate or triangular, [4–]5[–15] mm, at apex with 1 gland. Inflorescence cymose, many flowered, branched to several orders, pilosulous; peduncle ca. 3[–10] cm; axes helicoid, 1–3[–10] cm; bracts minute, caducous. Flowers subsessile or on pedicels to 3 mm. Calyx puberulent to pilosulous; hypanthium subtrubinate, ca. 3 mm, 5-ribbed; lobes triangular, ca. 0.5 mm. Corolla yellow to pale yellow, tubular, outside glabrous and 5-ribbed in upper part; tube 5.5–6.5[–12] mm, glabrous inside; lobes ca. 1 mm. Capsules mitriform, ca. 3 × [5–]7.5 mm, puberulent to glabrescent.

Wet places in forests; 300–2000 m. Yunnan [Bhutan, NE India, Myanmar].

Measurements included in brackets are from the description of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 84–86. 1997). Their description conflicts with that of the Fl. Bhutan (2(2): 777. 1999), which distinguished this species by its leaves glabrous below while Deb and Mondal considered the pubescent lower leaf veins distinctive.

**49. *Ophiorrhiza oppositiflora*** J. D. Hooker, Fl. Brit. India 3: 80. 1880.

对生蛇根草 *dui sheng she gen cao*

Herbs, weak to ascending, to 70 cm tall; stems generally terete, hispidulous to glabrescent. Leaves in subequal pairs; petiole 1–2 cm, subglabrous or puberulent; blade drying papery, brown, narrowly elliptic, ovate, or lanceolate, [3–]8–15 × [1–]3.5–6 cm, subglabrous or sparsely strigillose adaxially, pilose along principal veins abaxially, base cuneate then narrowed and shortly decurrent, apex shortly acuminate; secondary veins 9–11(–15) pairs; stipules caducous or persistent on upper nodes, linear or bifid, 2–11 mm, puberulent. Inflorescence terminal and/or paired in upper stem nodes, cymose to paniculate, many flowered, ferruginous puberulent; peduncle 2–4 cm; axes helicoid; bracts minute, caducous. Flowers with biology unknown, subsessile. Calyx pubescent; hypanthium ellipsoid, ca. 1 mm; lobes triangular, ca. 0.3 mm. Corolla white, tubular-funnelform, outside glabrous; tube ca. 4[–8] mm, inside glabrous or densely barbate in throat; lobes oblong-triangular, ca. 2 mm, dorsally ridged, apex rostrate. Capsules drying yellow, mitri-form-obcordate, ca. 2 × 6–7 mm, subglabrous. Fl. winter and spring.

Wet places in forests; [below 100–1500 m in Myanmar]. Hainan, Yunnan [NE India, Myanmar].

Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 86–87. 1997) described this species as annual and the flowers as variously glabrous inside or densely barbate in the throat. Measurements in brackets above are taken from their description and may be expected in Chinese plants.

**50. *Ophiorrhiza pauciflora*** J. D. Hooker, Fl. Brit. India 3: 84. 1880.

少花蛇根草 *shao hua she gen cao*

Herbs, weak to erect, to 30 cm tall; stems pilosulous to villousulous. Leaves in subequal pairs; petiole 0.5–2 cm, hirtellous; blade drying thinly papery, adaxially dark purple, abaxially purple or grayish, ovate to elliptic-ovate, 1.5–5.5 × 0.8–2.5 cm, adaxially strigose or sericeous, abaxially pubescent on principal veins, base obtuse to subrounded or sometimes shortly decurrent, apex obtuse; secondary veins 5–9 pairs; stipules persistent, narrowly triangular or usually 2-lobed, 3–6 mm, lobes narrowly triangular to linear, glabrescent. Inflorescence congested-cymose, several flowered, pubescent; peduncle 1–3 cm; bracts linear, 3–6.5 mm, persistent. Flowers distylous, subsessile. Calyx puberulent to pilosulous or glabrescent; hypanthium obovoid, ca. 1.5 mm; lobes sublanceolate, 0.8–1 mm. Corolla white, tubular, outside hispid to glabrescent; tube 8–9 mm, barbate in throat and upper part; lobes ovate, ca. 1 mm. Capsules obcordate, ca. 2 × 4.5 mm, puberulent to hirtellous or glabrescent. Fl. and fr. May–Oct.

Dense forests; 600–1600 m. Yunnan (Xishuangbanna) [NE India].

Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 89–93. 1997) recognized two varieties, the pubescent var. *pauciflora* with corollas 6–9 mm and the glabrous var. *glabra* Deb and Mondal with corollas 10–12 mm; the plants treated as *Ophiorrhiza pauciflora* by H. S. Lo (in FRPS 71(1): 127. 1999) generally fall within var. *pauciflora* but have corollas that are intermediate in size and thus cannot be conclusively included in either of the Indian varieties (suggesting that the Indian varieties may not ultimately be separable).

**51. *Ophiorrhiza petrophila*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 66. 1990.

法斗蛇根草 *fa dou she gen cao*

Herbs, ascending, to 100 cm tall; stems drying dark brown or purplish black and shiny, slightly compressed to subterete, glabrous. Leaves in subequal pairs; petiole 0.5–1 cm, glabrous; blade drying papery, grayish green adaxially, pale abaxially, ovate or narrowly ovate, 2–7(–9) × 1.5–3(–3.5) cm, glabrous, base cuneate to obtuse, margins entire, apex cuspidate to shortly caudate; secondary veins 7–9 pairs; stipules caducous, not seen. Inflorescence 3–5 cm, many flowered, pilosulous to glabrescent; bracts filiform to subulate, 4–5 mm, obtuse, persistent. Flowers reportedly distylous, subsessile or on pedicels to 1.5 mm. Calyx glabrous; hypanthium turbinate, ca. 1.5 mm, 5-ribbed; lobes triangular, 0.7–1 mm, with 1 gland in each sinus. Corolla reddened, tubular-funnelform, outside glabrous; tube 10–11 mm, sparsely villous to scabrous throughout inside; lobes ovate-triangular, 1.5–1.8 mm, dorsally with broad lunate wing. Capsules purple, ca. 2.5 × 8 mm. Fl. May.

• Dense forests in limestone regions. Yunnan.

The protologue described this species as distylous but noted that long-styled flowers had not been seen; the putative short-styled flowers were said to have the anthers positioned in or shortly above the corolla throat and the stigmas situated near the middle of the corolla tube.

**52. *Ophiorrhiza pingbienensis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 20. 1990.

屏边蛇根草 *ping bian she gen cao*

Herbs, ascending; stems drying reddish brown and usually angled, densely reddish brown pilosulous at least when young. Leaves in subequal pairs; petiole 0.5–2.5 cm, densely pilosulous; blade drying thinly papery, oblong-ovate, elliptic, oblong-lanceolate, or ovate, 2–7.5 × 1–3 cm, adaxially sparsely puberulent, abaxially glabrescent to usually densely puberulent on principal veins, base cuneate, margins entire, apex acute to obtuse; secondary veins 5–7 pairs; stipules persistent to deciduous, lanceolate to subovate, ca. 4 mm, entire or sparsely dentate, at base usually with 2 glands, acuminate and sometimes with small globose gland at apex. Inflorescence congested-cymose, several flowered, densely reddish brown pilosulous; peduncles 1–1.5 cm; axes relatively short, helicoid; bracts linear-lanceolate, spatulate, or lanceolate, 5–7 mm, often pinnately veined, subglabrous or ciliate, obtuse to subacute. Flowers with biology unknown, subsessile or on pedicels 1.5–3 mm. Calyx with hypanthium turbinate, ca. 1.5 mm, 5-ribbed, densely pilosulous; lobes lanceolate, subovate, or spatulate, unequal, largest ones 3–6 mm, smallest ones 0.8–3 mm, pinnately veined, ciliate or subglabrous. Corolla dark red, tubular-funnelform, outside 5-winged in upper part in bud and glabrescent; tube 15–17.5 mm, inside with 5 small villous fascicles below throat and just above anthers; lobes subovate to ligulate, 2.5–3 mm, inside densely shortly scaly pubescent, dorsally with broad lunate wing, apex rostrate. Immature capsule obcordate, ca. 2 × 5.5 mm, ferruginous pilosulous. Fl. Jul.

• Streamsides; ca. 1400 m. Yunnan (Pingbian).

This species was keyed by H. S. Lo (loc. cit.: 8, as "*qinbienensis*") based in part on its persistent, usually discernible stipule, although the accompanying figure there shows no stipules, which suggests these may be deciduous at least sometimes. As shown in the figure in the protologue, the pedicels described there could be considered inflorescence axes producing sessile flowers by others.

**53. *Ophiorrhiza pumila*** Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 4: 169. 1852.

短小蛇根草 duan xiao she gen cao

*Ophiorrhiza aureolina* H. S. Lo f. *qiongyaensis* H. S. Lo; *O. humilis* Y. C. Tseng; *O. inflata* Maximowicz; *O. pumila* var. *inflata* (Maximowicz) Masamune.

Herbs, weak to ascending, to 20(–30) cm tall; stems drying gray or grayish yellow, weakly rugose, densely tomentulose-villosulous. Leaves in subequal pairs; petiole 0.1–1.5 cm, densely tomentulose; blade drying papery, adaxially green, grayish green, or dark grayish brown, abaxially pale to red, ovate, lanceolate, elliptic, or elliptic-oblong, (0.5–)2–5.5(–9) × (0.4–)1–2.5 cm, adaxially subglabrous to sparsely strigillose or hispidulous, abaxially densely puberulent to tomentulose or sometimes glabrescent, base cuneate and generally decurrent, margins entire to somewhat undulate, apex acute to obtuse, subacuminate, or rounded; secondary veins 5–8 pairs; stipules caducous, linear, 1–3 mm, puberulent. Inflorescences congested-cymose, several to many flowered, densely tomentulose-puberulent; peduncle 0.3–1.2 cm; branched portion 5–10 × 10–12 mm; axes becoming helicoid; bracts few, narrowly triangular to linear, 0.3–2 mm. Flowers homostylous, subsessile or on pedicels to 1.5 mm. Calyx with hypanthium subglobose, 0.8–1.2 mm, 5-ribbed, densely hispidulous except ribs glabrescent; lobes subtriangular to linear, 0.3–0.6 mm, glabrescent. Corolla white, tubular to inflated, outside puberulent to hispidulous; tube 2.5–2.8 mm, with villous ring in throat to villosulous throughout inside; lobes ovate-triangular, 1.2–1.5 mm, dorsally weakly ribbed, acute to obtuse. Capsules drying brownish yellow, mitriform or somewhat obcordate, 2–2.5 × 5–7 mm, hispidulous. Fl. Apr–Sep, fr. Jun–Oct.

Shady places on wet lands, streamsides or riversides in forests; 200–700 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, Yunnan [Japan, N Vietnam].

The floral biology of this species was studied by Nakamura et al. (J. Jap. Bot. 81: 113–120. 2006), who found the plants studied in the Ryukyu Islands and Taiwan to be long-styled-monomorphic, not distylous as previously reported. They also observed very low pollination rates in wild plants and concluded that probably at least much of the reproduction in this species is through autogamy.

This species was reviewed recently by Duan and Lin (Acta Phytotax. Sin. 45: 878–879. 2007), who newly synonymized several names under *Ophiorrhiza pumila* but separated relatively smaller plants in *O. humilis*. However, these smaller plants were included within the circumscription of *O. pumila* by H. S. Lo (in FRPS 71(1): 171. 1999), who is followed here.

**54. *Ophiorrhiza purpurascens*** H. S. Lo in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 191. 1999.

紫脉蛇根草 zi mai she gen cao

Herbs, often procumbent at base, ascending above; stems

densely brown villous or -hirsute with multicellular trichomes. Leaves in subequal pairs; petiole ca. 0.5 cm; blade drying papery, with veins purple, ovate, 1–3 × 0.5–1.7 cm, both surfaces brown villous with pubescence denser along veins abaxially, base rounded to obtuse and slightly oblique, margins entire, apex acute to subobtuse; secondary veins 5–8 pairs; stipules caducous, not seen. Inflorescences 1-flowered or fasciculate and few flowered, densely pubescent; peduncles or pedicels 3–10 mm; bracts filiform, ca. 5 mm. Flowers with biology unknown, pedicellate or pedunculate. Calyx with hypanthium ca. 1.5 mm; lobes filiform, 2.5–3 mm. Corolla white, slenderly subfunneliform, puberulent outside; tube 22–23 mm, with white villous ring at middle inside; lobes ovate-triangular, 3–4 mm, obtuse, puberulent marginally, dorsally narrowly winged. Capsules not seen. Fl. Sep.

• Shady places in ravines; ca. 1000 m. Sichuan (Xuyong).

**55. *Ophiorrhiza purpureonervis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 42. 1990.

苍梧蛇根草 cang wu she gen cao

Herbs, apparently ascending, to 30 cm tall; stems glabrous. Petiole 0.3–0.5(–1) cm, glabrous; leaf blade drying papery, adaxially leaden gray, abaxially straw-yellow with veins purple, ovate, lanceolate, or broadly ovate, 2–7.5 × 1–4 cm, glabrous on both surfaces, base rounded or obtuse, margins entire, apex obtuse; secondary veins 6 or 7 pairs; stipules caducous, not seen. Inflorescences many flowered, densely ferruginous villosulous; peduncle 1.5–2.5 cm; axes stout, helicoid; bracts filiform, 2.5–3 mm, ciliate or sparsely hispidulous. Flowers reportedly distylous, subsessile or on pedicels to 1 mm. Calyx with hypanthium obovoid, ca. 1.5 mm, 5-ribbed, densely pubescent; lobes lanceolate, ca. 1.5 mm, ciliate. Corolla white or pale yellow, slenderly funneliform, glabrous outside; tube ca. 10 mm, inside with white villous ring at middle and puberulent above; lobes sublanceolate, ca. 4 mm, dorsally with horn ca. 1 mm near apex. Immature capsules obcordate, ca. 1.5 × 4 mm, pubescent. Fl. Jul.

• Dense forests; 200–500 m. Guangxi (Cangwu).

In the protologue and FRPS (71(1): 145. 1999), H. S. Lo noted that this species is distylous but described only long-styled flowers, with the stigmas borne near the corolla throat and the anthers positioned below the middle of the corolla tube.

**56. *Ophiorrhiza rarior*** H. S. Lo in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 191. 1999.

毛果蛇根草 mao guo she gen cao

Herbs, apparently ascending; stems moderately brown villous or -hirsute with multicellular trichomes to glabrescent, densely lenticellate when young. Petiole 4–6 cm, sparsely villous; leaf blade drying membranous-papery, adaxially olive-green, abaxially pale, narrowly elliptic-oblong, 13–21 × 4.5–5 cm, sparsely strigose adaxially, abaxially glabrescent except sparsely hirsute along veins, base acute, margins subentire, ciliate, apex acuminate or acute; secondary veins 14–18 pairs; stipules caducous, not seen. Inflorescences and flowers not seen. Infructescences branched to several orders, villous; peduncle ca. 8.5 cm, 4-angled; axes 4–5.5 cm, helicoid; bracts

lanceolate to linear-subulate, 4–8 mm, ciliate, persistent. Capsules mitriform, ca.  $4 \times 10$ –11 mm, crisped villous. Fl. Jun.

- Wet places in forests. Guangxi (Longzhou).

**57. *Ophiorrhiza repandicalyx*** H. S. Lo in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 191. 1999.

大叶蛇根草 da ye she gen cao

Herbs, erect, to 100 cm tall; stems drying dark brown, rather stout, glabrous. Leaves in subequal pairs; petiole 0.8–1.5 cm, glabrous; blade drying papery, adaxially grayish green, abaxially pale green, broadly ovate, ovate, or elliptic, 15–22  $\times$  6–10 cm, glabrous on both surfaces, base obtuse then abruptly narrowed, apex cuspidate; secondary veins 11–16 pairs; stipules caducous, not seen. Inflorescences congested-cymose to subcapitate, many flowered, ca. 3 cm in diam., mealy pubescent; peduncle ca. 1.5 cm; axes helicoid; bracts absent. Flowers reportedly distylous. Calyx mealy pubescent; hypanthium broadly turbinate, ca. 2.1 mm; limb tubular, ca. 1.5 mm, undulate to shallowly 5-lobed. Corolla green, rather stoutly tubular, mealy puberulent outside; tube ca. 5.5 mm, white villous above middle inside; lobes triangular-ovate, ca. 1.5 mm, dorsally broadly winged and with horn ca. 0.5 mm near apex. Capsules unknown. Fl. Nov.

- Forests in ravines; ca. 1100 m. Yunnan (Jinghong).

The original description (H. S. Lo, Bull. Bot. Res., Harbin 10(2): 79–80. 1990, not validly published) noted that the flowers are distylous but described only a presumed long-styled form, with the anthers positioned near the middle of the corolla tube and the stigmas positioned at or just above the corolla throat.

**58. *Ophiorrhiza rhodoneura*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 45. 1990.

红脉蛇根草 hong mai she gen cao

Herbs, ascending, to 50 cm tall; stems subterete, rather stout, densely ferruginous villous with multicellular trichomes. Leaves in somewhat unequal pairs; petiole 1–4 cm, densely villous; blade drying subleathery-papery, with veins ferruginous-red abaxially, ovate or elliptic, 5.5–12  $\times$  2.5–6 cm, glabrous adaxially, villous on principal veins abaxially, base subrounded, apex acute; secondary veins 9–13 pairs; stipules caducous, not seen. Inflorescence congested-cymose and rather umbelliform to subcapitate, many flowered, densely villous; peduncles 3–3.5 cm; axes short, helicoid; bracts linear-spatulate, 10–13(–15) mm. Flowers reportedly distylous, subsessile. Calyx densely villosulous; hypanthium compressed turbinate; limb reduced, denticulate. Corolla funnelform, outside  $\pm$  pubescent; tube 24–27 mm, inside villous below middle; lobes subovate, 6–8 mm, pinnately veined, dorsally with narrow ciliate wing, apex rostrate. Capsules obcordate-mitriform, ca. 4.5  $\times$  8–10 mm, villosulous. Fl. Sep, fr. Nov.

- Broad-leaved forests; ca. 1300 m. Guangxi (Napo).

In the protologue and FRPS (71(1): 148. 1999), H. S. Lo noted that this species is distylous but described only putative short-styled flowers, with the stigmas borne near the base of the corolla tube and the anthers positioned just below the corolla throat.

**59. *Ophiorrhiza rosea*** J. D. Hooker, Fl. Brit. India 3: 78. 1880.

美丽蛇根草 mei li she gen cao

Herbs or shrubs, to 100[–150] cm tall; stems drying rugose, grayish yellow, pilosulous becoming glabrescent. Leaves in subequal pairs; petiole 1–3(–5) cm, hirtellous; blade drying thinly papery, ovate, elliptic, or broadly ovate, [6.5–]10–22[–25]  $\times$  [2–]5–10 cm, glabrous adaxially, densely hispidulous along principal veins abaxially, base cuneate, obtuse, or subcordate, apex abruptly acute to acuminate; secondary veins 8–13(–16) pairs; stipules deciduous, 2-lobed nearly to base, 5–7 mm, lobes subulate, glabrescent. Inflorescence cymose to paniculate, many flowered, puberulent; peduncle 2.8–5 cm; axes helicoid; bracts reduced, caducous. Flowers with biology unknown, subsessile. Calyx densely mealy puberulent; hypanthium compressed turbinate, ca. 1.5 mm, 5-ribbed; lobes subtriangular, ca. 0.5 mm. Corolla purplish red, tubular-funnel-form, outside puberulent to glabrous, sometimes 5-ridged in bud; tube 8–9 mm, inside glabrous; lobes subovate, ca. 1 mm. Capsules broadly mitriform, ca. 3  $\times$  8 mm, subglabrous or mealy pubescent. Fl. Oct–Dec.

Broad-leaved forests; 1300–2100 m. Xizang (Médog), Yunnan [Bhutan, NE India, Myanmar, Thailand].

Measurements in brackets are taken from the description of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 103–105. 1997) and may be expected in Chinese plants.

**60. *Ophiorrhiza rufipilis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 17. 1990.

红毛蛇根草 hong mao she gen cao

Herbs, suberect to procumbent and rooting along lower portion; stems drying striate, densely reddish brown villous with multicellular moniliform trichomes. Leaves in markedly unequal pairs; petiole 1–5 cm, densely villous; blade drying papery, pallid green, oblong-lanceolate, lanceolate, elliptic, or subovate, larger ones 3–10  $\times$  1–4 cm, smaller ones 1–6  $\times$  0.5–2.5 cm, adaxially sparsely strigose-villous, abaxially densely pubescent on principal veins, base obtuse, subrounded, or occasionally subcordate, margins ciliate, apex acuminate or obtuse and abruptly acuminate; secondary veins in larger leaves 10–16 pairs, in smaller leaves 5–8 pairs; stipules generally persistent, lanceolate-triangular or usually 2-lobed, 7–9 mm, sparsely ciliate, long acuminate. Inflorescence cymose, several to many flowered, densely reddish brown villous; peduncle shorter than 1 cm; axes rather short, helicoid; bracts linear, ca. 5 mm, ciliate. Flowers with biology unknown, subsessile or on pedicels to 1.5 mm. Calyx with hypanthium turbinate-subglobose, ca. 1.5  $\times$  1.5 mm, densely villous; lobes subovate or lanceolate, 3.5–4 mm, glabrescent, pinnately veined, hispid along margin and midrib, acute to shortly rounded. Corolla white or pale yellow, funnel-form, outside glabrescent with 5 hispid or villous lines on ridges; tube 18–19 mm, sparsely scaly pubescent inside; lobes lanceolate to ovate, ca. 4.5 mm, dorsally with broad ciliate wings, apex rostrate. Immature capsules subobcordate, ca. 3.5  $\times$  7 mm, 5-ribbed, villosulous. Fl. Feb.

- Dense forests; ca. 1200 m. SE Yunnan.

**61. *Ophiorrhiza rufopunctata*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 15. 1990.

红腺蛇根草 hong xian she gen cao

Herbs, weak at base, ascending above, to 15 cm tall; stems brownish hispidulous or -strigose. Leaves in somewhat unequal pairs; petiole 0.3–1.5 cm, pilosulous or hirsutulous; blade drying papery, oblong-ovate, ovate, or broadly ovate, 3–8(–10) × 2–3.5 cm, adaxially glabrescent and usually with scattered reddened gland dots, abaxially with red gland dots and glabrous or hispidulous to strigose on veins, base obtuse to subrounded or subcordate, often oblique, margins undulate, apex obtuse, subrounded, or acute; secondary veins 4 or 5 pairs; stipules persistent at least on upper nodes, subtriangular to ovate, 2–3 mm, obtuse and glandular at apex. Inflorescence 1-flowered or usually cymose and 2–5-flowered, densely brown hispidulous; peduncle ca. 1 cm; bracteoles linear-subulate, ca. 3 mm, usually hirtellous and/or with reddish gland dots. Flowers distylous, on short pedicels. Calyx hispidulous and/or with red gland dots; hypanthium turbinate to ellipsoid, ca. 3 mm, 5-ribbed; lobes linear, ca. 3 mm, each sinus with 1 gland. Corolla pale purple, funnelform; tube 18–22 mm, white villous or pilosulous above middle and densely pilosulous at middle inside; lobes ovate, 4–5 mm, dorsally ridged and with very small horn. Capsules 5–6 × ca. 11 mm, hispidulous. Fl. Nov.

- Wet places in forests. Sichuan.

In the protologue and FRPS (71(1): 118. 1999), H. S. Lo noted that the short-styled flowers have the anthers situated in the upper part of the corolla tube and the stigmas situated near its middle, while the long-styled flowers have the anthers situated near the middle of the corolla tube and the stigmas in its throat.

**62. *Ophiorrhiza rugosa*** Wallich in Roxburgh, Fl. Ind. 2: 547. 1824.

匍地蛇根草 pu di she gen cao

*Ophiorrhiza harrisiana* Heyne ex G. Don var. *rugosa* (Wallich) J. D. Hooker; *O. prostrata* D. Don; *O. prostrata* var. *rugosa* (Wallich) Panigrahi & S. K. Kar.

Herbs, sometimes annual, weak to erect, to 60 cm tall; stems pilosulous to tomentulose. Leaves in subequal pairs; petiole 0.5–1.5(–3) cm, puberulent to tomentulose; blade drying thinly papery, ovate-lanceolate, lanceolate, or elliptic, 2–6(–11) × 1–3(–5) cm, adaxially glabrous to sparsely strigillose or hispidulous, abaxially pilosulous or hispidulous along principal veins, base cuneate to obtuse, apex caudate-acuminate, obtuse, acute, or weakly acuminate; secondary veins 5–7(–11) pairs; stipules generally persistent on uppermost nodes, triangular then contracted to linear, 4–10 mm, puberulent to glabrescent. Inflorescence cymose to congested-cymose, several to many flowered, pilosulous to glabrescent; peduncles 1.5–3 cm; axes short to developed, becoming helicoid; bracts few, deciduous, linear, 2–3 mm. Flowers with biology unknown, subsessile. Calyx puberulent; hypanthium ellipsoid, ca. 0.8 mm; lobes 0.2–1.5 mm. Corolla pink to white, tubular-funnelform, outside puberulent to glabrous; tube 3–6 mm, inside with pubescent ring near or above middle; lobes triangular, 1–2 mm, dorsally smooth to ridged. Capsules obconic, 2–2.5 × 4–5 mm, puberulent to glabrescent.

Evergreen forests; 1700–3400 m. Xizang, Yunnan (Gongshan) [Bhutan, NE India, Nepal, Sri Lanka].

The description here is based mostly on the description by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 107–118. 1997); the elevational range is taken from Fl. Bhutan (2(2): 778. 1999). This species was treated by Deb and Mondal as a widespread, morphologically rather variable species; Fl. Bhutan noted that this species is variable and not well circumscribed.

**63. *Ophiorrhiza salicifolia*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 50. 1990.

柳叶蛇根草 liu ye she gen cao

Subshrubs, apparently ascending, to 1 m tall; stems flattened to terete, subglabrous. Leaves in subequal pairs; petiole 0.5–1.5 cm, subglabrous; blade drying papery, red, lanceolate-linear, ± falcate, 4.5–11 × 0.6–1.5 cm, subglabrous on both surfaces, base cuneate, apex subobtuse; secondary veins 9–11 pairs; stipules caducous, not seen. Inflorescences and flowers not seen. Infructescences cymose-paniculate, 10–12 × ca. 8 cm, branched to several orders, pubescent; peduncles 4–6.5 cm; axes dichotomous to helicoid; bracteoles linear, 4–5 mm, subglabrous, persistent; pedicels 2–3 mm. Capsules mitriform, 2.5–3 × 7–8 mm, puberulent. Fr. May.

- Wet fertile soil. Guangxi (Shangsi).

**64. *Ophiorrhiza sichuanensis*** H. S. Lo, Guihaia 11: 104. 1991.

四川蛇根草 si chuan she gen cao

Herbs, procumbent in lower portion, ascending above; stems drying black, subglabrous or puberulent. Leaves in subequal pairs; petiole 0.8–2 cm, subglabrous; blade drying thickly papery, adaxially leaden gray, abaxially dark brown, broadly elliptic, 1.5–5 × 1.2–3.2 cm, glabrous on both surfaces, base rounded to obtuse, margin irregularly dentate or rarely entire, apex obtuse or acute; secondary veins 4–6 pairs; stipules generally persistent, subulate, 1.5–2 mm, acuminate. Inflorescences 1- or 2-flowered; bracts linear, 4–6 mm. Flowers with biology unknown, on pedicels 6–8 mm. Calyx with hypanthium broadly turbinate, ca. 2.5 mm, 5-ribbed; lobes linear, 3.5–4 mm, slightly obtuse. Corolla purple, funnelform, outside glabrous; tube 26–29 mm, white villous inside; lobes ovate-triangular, ca. 6 mm, apex rostrate. Capsules not seen. Fl. Apr.

- On rocks; ca. 1200 m. Sichuan (Leibo).

**65. *Ophiorrhiza subrubescens*** Drake, J. Bot. (Morot) 9: 215. 1895.

变红蛇根草 bian hong she gen cao

Herbs, weak to suberect, to 60 cm tall; stems glabrous to pubescent. Leaves in subequal pairs; petiole 0.5–2(–4) cm, densely pilose; blade drying thinly papery, red on both surfaces or grayish green adaxially, lanceolate to ovate, 3–11 × 1–4 cm, glabrous or sparsely strigose adaxially, ?pilose along principal veins abaxially, base cuneate, margins entire or undulate, apex rounded-obtuse to acuminate or acute; secondary veins 7–13 pairs; stipules sometimes caducous, broadly triangular then strongly narrowed, 2–3 mm. Inflorescence congested-cymose, many flowered, densely pubescent; peduncle 1–6 cm; axes heli-

coid, up to 1 cm, elongating as fruit develop; bracts absent, minute, or caducous. Flowers reportedly distylous, subsessile. Calyx densely pubescent; hypanthium subobcordate, ca. 1 mm, 5-ribbed; lobes subtriangular, ca. 0.5 mm. Corolla slenderly tubular, 6–8(–12) mm, outside pubescent and 5-ribbed at least in bud, inside with white villous ring at middle and scaly pubescent in throat and onto lobes; lobes triangular to subovate, dorsally narrowly winged and with very short horn. Capsules drying purplish red, obcordate, ca. 3 × 7–8 mm, pubescent. Fl. Apr–Jul.

Shady and wet places in forests. Guangxi, Hainan, Yunnan [N Vietnam].

The circumscription of this species here follows that of H. S. Lo in FRPS (71(1): 139. 1999), which partly differs from that of other authors and also conflicts with the protologue in some details. The protologue described the plants as glabrous with filiform stipules and bracts that fall before the fruit mature, while H. S. Lo said they are pubescent with narrowly triangular stipules and lacking bracts. Lo described the flowers as distylous with the corollas apparently similar in both floral forms but unusual in anther position: the forms were described as differing in style length, ca. 2 mm vs. ca. 6 mm, and anther size, ca. 2 mm vs. ca. 3 mm, but with the anthers in both forms positioned near the base of the corolla, at ± the same height as the short-styled stigmas but well below the long-styled stigmas. However, the figure in FRPS (p. 140, t. 33, f. 1–8) differs from Lo's description in its depiction of well-developed bracts that persist with the flowers, deeply bilobed stipules, corollas with only 1 ring of internal pubescence, glabrous fruit, and flower forms with the anthers of the short-styled flowers exerted on well-developed filaments.

**66. *Ophiorrhiza succirubra*** King ex J. D. Hooker, Fl. Brit. India 3: 82. 1880.

高原蛇根草 gao yuan she gen cao

Herbs to subshrubs, weak to erect, to 60[–75] cm tall, usually drying partly to wholly red; stems glabrous or with pilosulous lines. Leaves in subequal pairs; petiole 0.5–2 cm, glabrous or subglabrous; blade drying thinly papery, lanceolate-elliptic, ovate-elliptic, or elliptic-oblong, 5–11(–20) × 2.5–4(–8) cm, glabrous on both surfaces or sparsely pubescent adaxially, base cuneate to obtuse, margins entire or undulate, apex acuminate to caudate; secondary veins 7–10 pairs; stipules caducous, not seen. Inflorescence congested-cymose, many flowered, often pendulous later becoming erect, glabrescent or axes sometimes puberulent to pilosulous in lines; peduncle 1–1.5[–3] cm; axes short; bracts linear-lanceolate, 6–9 mm. Flowers perhaps homostylous, on pedicels 1–1.5 mm. Calyx glabrous to puberulent or densely pilosulous; hypanthium submitriform, ca. 1.5 mm, 5(or 10)-ribbed; lobes ovate-triangular to lanceolate-triangular, usually slightly unequal, 1.4–1.8 mm, with 1 gland in each sinus. Corolla pink or white, tubular-funnelform and swollen at base, outside glabrous; tube 7–7.5[–10] mm, inside glabrous or villous; lobes ovate, ca. 2.5 mm, dorsally narrowly keeled. Capsules mitriform, [2–3.5 × 6–9 mm], glabrous to puberulent or pilosulous. Fl. Jul–Oct.

Broad-leaved forests; ca. 2000 m or more. Guizhou, Xizang (Mêdog), Yunnan [Bhutan, NE India, Myanmar, Nepal].

This species has apparently been distinguished based primarily on its distinctive purple-red drying color; it is characterized further in the key to species here.

Measurements in brackets are taken from the description of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1–4): 120–122. 1997), where this species is reported to flower throughout the year and grow from middle elevations up to 2400 m. H. S. Lo (in FRPS 71(1): 145–146. 1999) did not posit the floral biology but described the flowers similarly to Deb and Mondal as essentially homostylous, with the anthers and stigmas both positioned near the middle of the corolla tube.

**67. *Ophiorrhiza umbricola*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 12: 217. 1920.

阴地蛇根草 yin di she gen cao

Herbs, sometimes weak at base, ascending above, to 45(–100) cm tall; stems obtusely 4-angled, drying purple, glabrous or subglabrous. Petiole 1–4 cm, subglabrous; leaf blade drying membranous or thinly papery, adaxially dark green, abaxially pale green or red, ovate, elliptic, or lanceolate, 9–15 × 3–6.5 cm, glabrous on both surfaces or sparsely strigillose adaxially, base cuneate to obtuse, apex long acuminate or cuspidate; secondary veins 10–14 pairs; stipules caducous, not seen. Inflorescences congested-cymose, many flowered, glabrous or reddish brown hirtellous; peduncle 1.5–3 cm; axes helicoid. Flowers reportedly distylous, subsessile or on pedicels to 1 mm. Calyx glabrous; hypanthium submitriform, 1.5–2 mm; lobes with 1 gland in each sinus. Corolla red or purplish red, sububular, glabrous outside; tube 22–24 mm, white hirsute above middle inside; lobes ovate-triangular, 3(–6) mm. Capsules drying red, mitriform, 10–11 mm wide. Fl. Jun.

Dense forests; 2000–3000 m. Xizang (Mêdog), Yunnan [Myanmar].

H. S. Lo (in FRPS 71(1): 151. 1999) described this species as distylous but described only putatively long-styled flowers, with the anthers positioned just above the middle of the corolla tube and the stigmas apparently positioned just above them.

**68. *Ophiorrhiza wallichii*** J. D. Hooker, Fl. Brit. India 3: 79. 1880.

大果蛇根草 da guo she gen cao

Herbs, weak at base, ascending above, to 20[–60] cm tall; stems pilosulous [to glabrous]. Leaves in unequal [to subequal] pairs; petiole [0.5–]1–3 cm or longer, glabrous; blade drying thickly papery [or leathery], adaxially grayish green, abaxially greenish yellow, ovate, sub lanceolate, or elliptic-oblong, 3–14[–15] × 2–4.5[–6] cm, subglabrous on both surfaces, base obtuse and often shortly decurrent, distinctly inequilateral [or symmetrical], margins entire or undulate, apex acuminate or cuspidate; secondary veins 7 or 8(or 9) pairs; stipules caducous, reduced, subulate. Inflorescences corymbose to congested-cymose, several to many flowered, puberulent to subglabrous; peduncle 1–1.5 cm; axes short or 0.5–1 cm, helicoid; bracts linear, 2–3 mm, caducous. Flowers with biology unknown, on pedicels 1–2 mm. Calyx densely puberulent; hypanthium broadly compressed turbinate, ca. 1 mm, 5-ribbed; lobes triangular, ca. 0.4[–1.5] mm, each sinus with 1 gland. Corolla pale red, drying yellow, salverform, glabrous outside; tube 23–25[–27] mm, glabrous inside; lobes ovate-triangular, [2–]5 mm, dorsally narrowly winged, apex rostrate. Capsules mitriform, 5–6 × 14–15 mm, puberulent. Fl. Apr–Jun.

Shady and wet places in forests. Yunnan [NE India, Myanmar].

Measurements in brackets are taken from the description of this species by Deb and Mondal (Bull. Bot. Surv. India 39(1-4): 135-137, 1997) and may be expected in Chinese plants.

**69. *Ophiorrhiza wenshanensis*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 17, 1990.

文山蛇根草 wen shan she gen cao

Herbs, weak in lower part, ascending above, to 20 cm tall; stems densely pilosulous to hispidulous. Petiole 0.5-1 cm, hispidulous; leaf blade drying papery, adaxially grayish green, pallid abaxially, ovate to lanceolate, 1.5-3.5(-7) × 0.8-2(-3) cm, subglabrous to sparsely hispidulous adaxially, subglabrous except pilosulous on veins abaxially, base cuneate to obtuse, apex obtuse; secondary veins 5 or 6 pairs; stipules glabrous, 2-parted almost to base, 2.5-3 mm, lobes subulate-triangular, with globose gland at apex and sometimes also stipitate glands at base. Inflorescences 1- or 2-flowered, glabrous; pedicels 3-5 mm; bracts 2, fused to hypanthium base, linear-subulate, ca. 5 mm. Flowers reportedly distylous, pedicellate or pedunculate. Calyx glabrous; hypanthium turbinate, ca. 1.5 mm, 6-8-ribbed; lobes 5-7, lanceolate-linear, sometimes unequal, 1-3 mm. Corolla white, funnelform with throat markedly expanded, outside glabrous; tube 18-20 mm, densely white villous inside through throat; lobes 6 or 7, subovate, 3-4 mm, dorsally with very short horn, apex rostrate. Capsules subobcordate, ca. 3 × 8 mm, with persistent bracteoles. Fl. May.

● Streamsides in forests. Yunnan (Wenshan).

In the protologue and FRPS (71(1): 120, 1999), H. S. Lo described the flowers as probably distylous, but only the putative short-styled form has been documented.

**70. *Ophiorrhiza wui*** H. S. Lo, Bull. Bot. Res., Harbin 10(2): 33, 1990.

吴氏蛇根草 wu shi she gen cao

Herbs, procumbent at base, ascending above, to 30 cm tall; stems drying reddish brown, subterete to striate-grooved, puberulent to densely pilosulous. Leaves in subequal pairs; petiole 1-2.5 cm, pilosulous; blade drying thinly papery, ovate or lanceolate-ovate, 5-11 × 1.8-4 cm, adaxially glabrous or sparsely strigillose, abaxially villosulous or hirtellous along veins, base cuneate then shortly decurrent, apex obtuse then abruptly acuminate; secondary veins 5-7 pairs; stipules subfiliform, ca. 6 mm. Inflorescences cymose, several flowered, branched to several orders, on peduncles and axes with 2 pilosulous or strigillose lines; peduncle 1-2.5 cm; axes helicoid; bracts absent or reduced. Flowers with biology unknown, subsessile. Calyx with hypanthium ca. 1.5 mm; lobes ca. 0.4 mm. Corolla white or reddish, tubular, glabrous outside; tube 4.5-5 mm, densely pubescent in throat; lobes oblong-triangular, ca. 2 mm, dorsally winged, markedly reflexed in anthesis. Capsules unknown. Fl. Apr.

● On wet limestone; ca. 1100 m. Yunnan (Luxi).

**66. *PAEDERIA*** Linnaeus, Syst. Nat., ed. 12, 2: 135, 189; Mant. Pl. 1: 7, 52, 1767, nom. cons.

鸡矢藤属 ji shi teng shu

Chen Tao (陈涛); Charlotte M. Taylor

*Daun-contu* Adanson.

Shrubs, subshrubs, or vines, unarmed, usually extensively twining, usually with fetid odor when bruised. Raphides present. Leaves opposite or infrequently in whorls of 3 or 4, without or sometimes with (*Paederia foetida*, *P. spectatissima*) pubescent domatia; stipules caducous or persistent, interpetiolar, triangular to bilobed. Inflorescences axillary and/or terminal on main stem or often on short lateral stems, thyriform, paniculate, cymose, or spiciform, several to many flowered, sessile to pedunculate, bracteate with bracts sometimes enlarged and stipitate [to petaloid]. Flowers sessile to pedicellate, bisexual, monomorphic. Calyx limb (4 or)5(or 6)-lobed [sometimes with calycophylls]. Corolla white, pink, or purple, funnelform to salverform usually with tube very slender then abruptly enlarged shortly above base, inside pubescent in tube and throat, sometimes fenestrate near base; lobes (4 or)5(or 6), induplicate-valvate in bud, with margins often crisped to irregular, rarely shortly trifid at apex. Stamens (4 or)5(or 6), included, inserted at various levels near middle of corolla tube, included; filaments reduced [or sometimes developed]; anthers dorsifixed. Ovary 2(or 3)-celled, ovules 1 in each cell, erect, basal, anatropous; stigmas 2, filiform, included or exerted. Fruit characteristic: dry, drupaceous becoming schizocarpous, globose or compressed globose to compressed ellipsoid, with calyx limb persistent and occasionally becoming enlarged; exocarp dry, membranous to papery, usually drying shiny, at maturity fragmenting; pyrenes ("diaspores") 2(or 3), indehiscent, membranous to leathery, hemispherical to flattened, oblong to ovate in outline, entire to winged, rarely pubescent (*P. yunnanensis*), sometimes borne on a persistent carpophore; seeds with testa thin; cotyledons broadly cordate; radicle short, hypogeous.

Thirty species: tropical and subtropical Africa, Asia, Madagascar, North America (Mexico), and South America; nine species (three endemic) in China.

*Paederia* was studied in detail by Puff and collaborators (in Puff, Opera Bot. Belg. 3: 1-376, 1991). They recognized three subgenera based on corolla morphology and size, anther position, style length, the presence of petaloid bracts, and fruit morphology. Two of their subgenera are found in China: *P.* subg. *Paederia*, which is restricted to SE Asia and includes *P. cavaleriei*, *P. foetida*, *P. pertomentosa*, and *P. stenobotrya*; and *P.* subg. *Alatopaederia* Puff, which is found worldwide except continental Africa and includes the remaining Chinese species. Puff (loc. cit.: 207-292) presented a species-level taxonomy of Asian *Paederia* that differed significantly from that of other authors, including W. C. Ko (in FRPS 71(2): 110-119, 1999). In particular, he recognized fewer species, circumscribed *P. foetida* more widely, and accordingly synonymized several names. Puff also applied the name *P. foetida* differently than previous authors, and his conclusions were not adopted in FRPS: he applied the name *P. foetida* to plants

treated by W. C. Ko (loc. cit.: 118–119) as *P. scandens*, and he included the plants treated as *P. foetida* by W. C. Ko (loc. cit.: 112–113) in *P. cruddasiana*. Puff (loc. cit.: 216–220) discussed in detail the confusion of these species and the typification of *P. foetida* and synonymized *P. scandens* under *P. foetida*. The treatment here follows Puff, which is well documented and internally consistent, and thus is distinct from traditional taxonomy of SE Asian *Paederia*.

The fruit of *Paederia* are unusual in Rubiaceae: they are drupaceous in structure but dry and tardily schizocarpous with the exocarp fragmenting to expose the two pyrenes, which are the dispersal unit or diaspores, sometimes simply enclosed in the fruit and sometimes borne on carpophores (Puff, loc. cit.: 1–376). *Paederia* species are best distinguished by fruit characters; determinations of flowering specimens are usually provisional. The corollas of most species of *Paederia* have a notable size range, sometimes varying by 100–200. *Paederia foetida* is by far the most commonly collected Asian species of the genus and one of the most commonly collected species of Rubiaceae in China. The descriptions below follow Puff (loc. cit.: 207–292) in describing primarily what he termed the “mid-stem region,” i.e., the mature stems below the apical, young region. Inflorescence morphology was used by Puff in part to distinguish species; however, these are indeterminate and in several species continue to grow. In particular, their axes continue to elongate for some time during the flowering period; thus, if inflorescences of different ages are compared these characters can be problematic to interpret. W. C. Ko (loc. cit.: 111) described the anthers as basifixed or dorsifixed, but Puff (loc. cit.) reported them as dorsifixed.

### Key to fruiting material

- 1a. Fruit globose to subglobose, 4–7 mm in diam.; pyrenes hemispherical to concavo-convex or plano-convex.
  - 2a. Inflorescences paniculate, thyrsiform, corymbiform, or cymose, usually branched to several orders and with flowers in open cymose groups, dichotomous or frequently with higher order axes scorpioid; stipules 1.5–6 mm ..... 3. *P. foetida*
  - 2b. Inflorescences narrowly paniculate, racemiform, or spiciform, branched to 1 or several orders and with flowers in congested groups to small heads, axes when developed usually dichotomously branched; stipules 2–12 mm.
    - 3a. Stipules 2–3.5 mm; calyx lobes 0.6–1 mm ..... 5. *P. pertomentosa*
    - 3b. Stipules 4–12 mm; calyx lobes 0.4–2 mm.
      - 4a. Calyx lobes 0.4–1 mm; leaf margins flat or often finely and extensively crisped; plants of mainland and Taiwan ..... 1. *P. cavaleriei*
      - 4b. Calyx lobes 1–2 mm; leaf margins flat; plants of mainland and Hainan ..... 8. *P. stenobotrya*
- 1b. Fruit orbicular, ovoid, or ellipsoid, rounded to strongly flattened, 5–15.5 × 4.5–11 mm; pyrenes flattened, orbicular, ovate, or elliptic in outline, sharply edged to marginally winged.
  - 5a. Stipules 1–1.5 mm; fruit 10–11 mm wide, flattened; pyrenes papery; calyx lobes 0.3–0.6 mm; inflorescence branched to several orders, becoming diffuse with well-developed axes, these usually ascending ..... 7. *P. spectatissima*
  - 5b. Stipules 2.5–25 mm; fruit 4.5–10 mm wide, rounded to flattened (if stipules less than 4 mm then fruit 4.5–8 mm wide); calyx lobes 0.5–2 mm.
    - 6a. Stipules 9–25 mm.
      - 7a. Fruit 5–7 mm; calyx lobes 0.5–0.8 mm ..... 6. *P. praetermissa*
      - 7b. Fruit 6–9 mm; calyx lobes 0.5–1.7 mm ..... 9. *P. yunnanensis*
    - 6b. Stipules 2.5–8.9 mm.
      - 8a. Stipules 2.5–6 mm ..... 2. *P. cruddasiana*
      - 8b. Stipules 4–8.9 mm.
        - 9a. Fruit 9–15 × 7–9 mm ..... 4. *P. lanuginosa*
        - 9b. Fruit 6–9 × 5–7 mm ..... 9. *P. yunnanensis*

### Key to flowering material

- 1a. Well-developed inflorescences paniculate, thyrsiform, corymbiform, or cymose, usually branched to several orders (up to 10) and with flowers borne separated in open cymose groups, with axes dichotomous or frequently higher order axes scorpioid; stipules 1–6 mm.
  - 2a. Inflorescences becoming diffuse, axes mostly dichotomously branched, well developed, and ascending; stipules 1–1.5 mm ..... 7. *P. spectatissima*
  - 2b. Inflorescences small to extensive and spreading, with axes dichotomously branched and/or often highest order axes markedly scorpioid; stipules 1.5–6 mm.
    - 3a. Flowers generally borne in small rather congested groups; calyx lobes 0.4–2 mm; corolla lobes 2–4 mm; pyrenes somewhat flattened ..... 2. *P. cruddasiana*
    - 3b. Flowers generally borne in branched cymules; calyx lobes 0.4–1 mm; corolla lobes 1–2 mm; pyrenes hemispherical ..... 3. *P. foetida*
- 1b. Well-developed inflorescences paniculate, racemiform, or spiciform, branched to 1 to several orders and with flowers usually congested in small groups or heads, with axes short and dichotomously branched or sometimes unbranched; stipules 2–25 mm.
  - 4a. Calyx limb with short tube and lobes deltoid and ± equal in length to tube; stipules 9–25 mm ..... 6. *P. praetermissa*

- 4b. Calyx limb lobed to base or with very short tube, lobes linear, ovate, suborbicular, or triangular and longer than tube; stipules 2–15 mm.
- 5a. Stipules 2–3.5 mm; leaves usually with sides generally parallel; inflorescences with secondary axes often not developed ..... 5. *P. pertomentosa*
- 5b. Stipules 4.5–15 mm; leaves generally with sides curved; inflorescences with secondary axes at least shortly developed.
- 6a. Corolla tube 15.5–17.5 mm ..... 4. *P. lanuginosa*
- 6b. Corolla tube 4–10.5 mm.
- 7a. Plants of mainland and Hainan; leaves 6–17 × 3–7 cm; corolla tube 5–6 mm; fruit usually drying orange-yellow; pyrenes plano-convex or concavo-convex ..... 8. *P. stenobotrya*
- 7b. Plants of mainland and Taiwan; leaves 6–22 × 2.5–13 cm; corolla tube 4–10.5 mm; fruit drying straw-yellow to brown, gray, or black; pyrenes plano-convex to concavo-convex or flattened.
- 8a. Leaf margins flat or often finely crisped; stems densely hirsute, hirtellous, pilosulous, and/or tomentose to glabrescent; calyx lobes 0.4–1 mm; pyrenes plano-convex to concavo-convex ..... 1. *P. cavaleriei*
- 8b. Leaf margins flat; stems densely tomentulose and/or hirtellous to glabrescent; calyx lobes 0.5–1.7 mm; pyrenes flattened ..... 9. *P. yunnanensis*

**1. *Paederia cavaleriei*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 179. 1914.

耳叶鸡矢藤 *er ye ji shi teng*

Vines, to 4 m; stems densely hirsute and/or hirtellous, pilosulous, or tomentulose to glabrescent, drying brown. Leaves opposite; petiole 2–8(–21) cm, densely hirsute or hirtellous to glabrescent; blade drying submembranous to papery, ovate, oblong-ovate, lanceolate, rhombic-ovate, or oblong, 6–18(–22) × 2.5–10(–13) cm, adaxially sparsely to densely strigillose, hirtellous, hirsute, or scabrous, abaxially sparsely to densely pilosulous to hirtellous with pubescence denser on veins, base rounded or truncate to cordate or usually cordate, margin flat or usually densely finely crisped and often appearing denticulate, apex acute to long acuminate; secondary veins 5–10 pairs; stipules generally persistent, triangular to lanceolate, 5–12 mm, acute to acuminate. Inflorescences axillary and/or terminal, paniculate to racemiform, cylindrical to narrowly pyramidal, 7–20(–30) cm, branched to 2–4 orders, densely hirtellous, pilosulous, or hirsute, pedunculate; bracts triangular to linear, 1–3 mm; pedicels to 1 mm. Flowers sessile to pedicellate in congested cymes or small heads. Calyx puberulent to glabrous; hypanthium portion ellipsoid to turbinate, 1–1.6 mm; limb lobed nearly to base; lobes triangular, 0.4–1 mm. Corolla pinkish gray, lilac gray, grayish white, or purplish green, tubular-funnelform, outside densely mealy tomentose or mealy puberulent; tube 4–10 × 2.5–4.5 mm, without slits; lobes broadly triangular to broadly ovate, 1–2 mm, obtuse to acute. Fruit globose, 4.5–5 × 4.5–5 mm, puberulent to glabrous, drying straw-yellow; pyrenes plano-convex to concavo-convex. Fl. Apr–Aug, fr. Aug–Nov.

• Thickets on mountains; 100–3000 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, ?Sichuan, Taiwan [?Laos].

**2. *Paederia cruddasiana*** Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67: 295. 1898.

臭鸡矢藤 *chou ji shi teng*

*Paederia cruddasiana* subsp. *microcarpa* (Kurz) Puff; *P. foetida* Linnaeus var. *microcarpa* Kurz.

Vines, to 10 m; stems moderately to sparsely hirtellous or

strigillose to glabrous, drying yellowish brown. Leaves opposite; petiole 1–3 cm, hirtellous or strigillose to glabrescent; blade drying membranous, ovate, lanceolate, or narrowly lanceolate, 5–16 × 2–10.5 cm, adaxially glabrous or puberulent on principal veins, abaxially sparsely hirtellous to glabrous on blade and sparsely to moderately puberulent or hirtellous along veins, base rounded to truncate or cordate, margins flat, apex acute to weakly acuminate; secondary veins 4–8 pairs; stipules generally persistent, ovate-lanceolate to broadly triangular, 2.5–6 mm, acute or bifid. Inflorescences axillary and/or terminal, paniculate, pyramidal, 6–50 cm, branched to 3–5 orders, hirtellous to glabrescent, pedunculate; bracts triangular to linear, 0.5–2 mm; pedicels to 2 mm. Flowers subsessile to pedicellate in cymes. Calyx puberulent to glabrescent; hypanthium portion ellipsoid, ca. 1 mm; limb lobed nearly to base; lobes triangular, 0.4–2 mm. Corolla purplish blue, lilac, or pink, funnelform, outside densely puberulent to tomentulose; tube 6–16 × 1.5–4.5 mm, without slits; lobes triangular, 2–4 mm. Fruit broadly ellipsoid to ovoid, somewhat laterally compressed, 6–11 × 4.5–8 mm, glabrescent, drying yellowish gray; pyrenes ovate to elliptic, somewhat flattened, marginally winged. Fl. May–Jun, fr. Nov–Dec.

Open forests; 100–1900 m. Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

This species has long been incorrectly treated by several previous authors as *Paederia foetida*, including by W. C. Ko (in FRPS 71(2): 112–113. 1999); see comments above in the genus discussion. Puff (Opera Bot. Belg. 3: 251–252. 1991) recognized two subspecies of *P. cruddasiana*, distinguished by fruit and pyrene size and form, and included some Chinese plants in subsp. *cruddasiana* and others in subsp. *microcarpa*. The distribution of these subspecies is apparently complementary (Puff, loc. cit.: 252, f. 11), with the plants in the SE range of this species falling into subsp. *microcarpa*; however, the measurements that separate these taxa are overlapping generalizations, based on study of ten collections of subsp. *cruddasiana* and four collections of subsp. *microcarpa* from China, with several collections of each subspecies apparently found in the same relatively small region (e.g., *Mengla Exped.* 34288, subsp. *microcarpa*, and *Li Y. H.* 317, subsp. *cruddasiana*, both reported as 21°30'N 101°25'E; this latter collection apparently not mapped in his f. 11). Given the large morphological variation documented within other species of *Paederia*, the few specimens studied by Puff, and the geographic overlap, these varieties are provisionally not recognized here pending further study.

**3. *Paederia foetida*** Linnaeus, Syst. Nat., ed. 12, 2: 189; Mant. Pl. 1: 52. 1767.

鸡矢藤 *ji shi teng*

*Gentiana scandens* Loureiro; *Paederia chinensis* Hance; *P. dunniana* H. Léveillé; *P. esquirolii* H. Léveillé; *P. laxiflora* Merrill ex H. L. Li; *P. mairei* H. Léveillé; *P. scandens* (Loureiro) Merrill; *P. scandens* f. *mairei* (H. Léveillé) Nakai; *P. scandens* var. *mairei* (H. Léveillé) H. Hara; *P. scandens* var. *tomentosa* (Blume) Handel-Mazzetti; *P. tomentosa* Blume; *P. tomentosa* var. *glabra* Kurz; *P. tomentosa* var. *mairei* (H. Léveillé) H. Léveillé; *P. stenophylla* Merrill.

Vines, to 5 m; stems glabrous to densely puberulent, hirtellous, or pilosulous often becoming glabrescent, drying gray to brown. Leaves opposite or rarely ternate; petiole 0.5–9 cm, glabrous to densely hirtellous or pilosulous; blade drying papery to subleathery, ovate, ovate-oblong, lanceolate, lanceolate-elliptic, or elliptic, (1–)5–9(–21) × 1–4(–9) cm, adaxially glabrous to puberulent at least on principal veins, abaxially glabrous to puberulent, hirtellous, or strigillose at least on principal veins, base cuneate, rounded, truncate, or sometimes cordulate to cordate, margins flat, apex acute or acuminate; secondary veins 4–6 pairs; stipules generally persistent, triangular to ovate, 1.5–6 mm, obtuse to acute, acuminate, or rarely bifid. Inflorescences axillary and/or terminal, paniculate, thyriform, corymbiform, or cymose, pyramidal to rounded, 5–100 cm, branched to 2–5 orders with higher order axes dichotomous or often scorpioid, hirtellous, strigillose, or glabrous, pedunculate; bracts lanceolate to triangular, 0.8–3 mm; pedicels to 1.5 mm. Flowers sessile to pedicellate in dichotomous to scorpioid, lax to somewhat congested cymes. Calyx glabrous to densely puberulent; hypanthium portion turbinate to ellipsoid, 0.8–2 mm; limb deeply lobed; lobes triangular, 0.4–1 mm. Corolla pale purple, grayish pink, lilac, or grayish white, funnelform, outside densely mealy puberulent or mealy tomentulose; tube (5–)7–10(–17) × 2–6 mm, without slits; lobes broadly triangular to ovate, 1–2 mm, acute. Fruit globose, 4–7 × 4–7 mm, glabrescent, drying gray to yellow; pyrenes concavo-convex to plano-convex. Fl. May–Oct, fr. Jul–Dec.

Forests, forest margins, thickets in ravines and on mountain slopes; 200–2000 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Jiangsu, Jiangxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, Borneo, Cambodia, India, Indonesia, Japan, N Korea, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; also occasionally cultivated, and naturalized in United States (Florida) and perhaps Sri Lanka].

*Paederia foetida* is naturalized in a few places around the world and apparently quite weedy wherever it grows; in particular, it has been reported as an adventive and sometimes a problem weed in Florida, where it is called “skunk vine.”

Puff (Opera Bot. Belg. 3: 207–292. 1991) substantially changed and clarified the application of this name; see the discussion under the genus above. *Paederia foetida* as circumscribed by Puff (and here) is widespread and morphologically widely variable but with continuous morphological variation, as documented in detail (loc. cit.: 223–224, f. 4, f. 5). W. C. Ko (in FRPS 71(2): 118–119. 1999) recognized two varieties within this species (treated as *P. scandens*), with the stems and leaves glabrous or subglabrous in var. *scandens* and subglabrous to pubescent in var. *tomentosa*; Ko reported var. *scandens* from throughout

the range of this species in China and var. *tomentosa* only from “Jiangxi, Guangdong, Hong Kong, Hainan, Guangxi, Yunnan.” Puff synonymized these based on his conclusion that pubescence varies continuously within this species and thus does not distinguish separate evolutionary lineages.

Puff synonymized *Paederia stenophylla* with *P. foetida*, and this name is provisionally listed in synonymy here. The name *P. stenophylla* seems to have been applied by W. C. Ko (loc. cit.: 115) at least in part to plants that Puff treated as *P. pertomentosa* rather than *P. foetida*, and Puff reported that he did not see the type of *P. stenophylla*; this situation may deserve re-consideration, but that work is outside the scope of this current project.

The name *Paederia dunniana* from Guizhou was apparently overlooked by Puff; this was reported by Lauener and Ferguson (Notes Roy. Bot. Gard. Edinburgh 32: 112. 1972) to be a synonym of “*P. scandens*,” which corresponds to *P. foetida* here, and this name is accordingly synonymized here provisionally.

**4. *Paederia lanuginosa*** Wallich, Pl. Asiat. Rar. 2: 52. 1831.

绒毛鸡矢藤 *rong mao ji shi teng*

*Hondbesseion lanuginosum* (Wallich) Kuntze; *Paederia macrocarpa* Wallich.

Vines, to 12 m; stems densely tomentose to glabrescent, drying dark brown. Leaves opposite; petiole 3.5–12 cm, densely tomentose; blade elliptic to oblong-elliptic, 8–20 × 4.5–15 cm, adaxially sparsely to moderately strigillose with pubescence denser on midrib, abaxially densely tomentulose, base cordate to subrounded, margins flat, apex acuminate; stipules caducous often by fragmentation, triangular, 4.5–8.5 × 2.3–5.5 mm, acute to bifid. Inflorescences axillary on main stems and/or terminal on lateral stems, paniculate, densely tomentulose, pedunculate. Flowers subsessile in small heads. Calyx densely tomentulose; hypanthium portion turbinate to subglobose, 1.6–2.5 mm; limb deeply lobed; lobes triangular to suborbicular, 1–1.4 mm. Corolla pale green, dull white, pink, reddish purple, or dark purple, funnelform, outside densely tomentulose; tube 15–17.5 × 3.5–4.5 mm, with slits at base; lobes broadly triangular, 2.7–4 mm, acuminate, marginally crisped. Fruit oblong-elliptic, laterally flattened, 9–15 × 7–9 mm, subglabrous, drying brown; pyrenes elliptic to ovate in outline, flattened, marginal wing 1–2 mm wide. Fl. Jun–Jul, fr. Aug–Feb.

Open forests or thickets, twining on other shrubs and small trees; sea level to 1900 m. Yunnan [Myanmar, Thailand].

Puff (Opera Bot. Belg. 3: 207–292. 1991) noted that this species has the largest leaves of the genus, as well as notably large flowers and fruit, and sometimes has “conspicuously fissured bark” that is also distinctive. W. C. Ko (in FRPS 71(2): 114. 1999) described the corolla lobes as 3-lobed, but this has not been mentioned by any other authors.

**5. *Paederia pertomentosa*** Merrill ex H. L. Li, J. Arnold Arbor. 24: 458. 1943.

白毛鸡矢藤 *bai mao ji shi teng*

Vines or clambering subshrubs, to 5 m; stems densely pilosulous to tomentulose, when dry dark straw-yellow. Leaves opposite; petiole 1–5 cm, densely pilosulous or hirtellous and/or tomentulose; blade drying papery, ovate-elliptic, lanceolate-oblong, or oblong-elliptic, 5–15 × 2–6 cm, adaxially moder-

ately to densely pilosulous to strigillose with pubescence denser along midrib, abaxially densely white tomentulose, base obtuse, rounded, truncate, or cordulate, margins flat, apex acute to acuminate; secondary veins 6–8 pairs; stipules generally persistent, triangular, 2–3.5 mm, acute to weakly acuminate. Inflorescences axillary and/or terminal, spiciform to paniculate, cylindrical to narrowly pyramidal, 15–50 cm, branched to 1–3 orders with ultimate axes often very short, densely pilosulous to tomentulose, pedunculate; bracts triangular, 1–4 mm. Flowers sessile or subsessile in congested cymes or small heads. Calyx densely pilosulous to tomentose; hypanthium portion turbinate to ellipsoid, ca. 1 mm; limb lobed nearly to base; lobes triangular, 0.6–1 mm. Corolla lilac, grayish pink, or grayish purple, tubular-funnelform, outside densely papillose to puberulent; tube 5–8 × 2–3 mm, without slits; lobes ovate to triangular, 1–1.5 mm, acute, margins flat to crisped. Fruit globose to subglobose, 4–7 × 4–7 mm, glabrous, drying straw-yellow; pyrenes plano-convex or concavo-convex. Fl. May–Aug, fr. Jul–Nov.

• Forests, thickets, often on limestone; 200–1400 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi.

**6. *Paederia praetermissa*** Puff, Opera Bot. Belg. 3: 273. 1991.

奇异鸡矢藤 qí yì jī shì teng

Vines, to 5 m; stems densely hirsute to hirtellous becoming glabrescent, drying brownish gray. Leaves opposite; petiole 1.5–8 cm, moderately to densely hirsute, hirtellous, or pilosulous; blade drying papery to subleathery, ovate-elliptic or lanceolate, 6–22 × 3.5–12 cm, adaxially sparsely hirtellous or hispidulous to glabrescent, abaxially densely pilose to hirtellous or tomentose, base cordulate to cordate, margins flat, apex acute to acuminate; secondary veins ca. 8 pairs; stipules caducous, triangular to lanceolate, 9–25 × 5–13 mm. Inflorescences terminal on lateral stems and/or axillary on main stems, paniculate, pyramidal to cylindrical, 8–20 cm, branched to 2–4 orders, densely hirsute to hirtellous or pilosulous, pedunculate; bracts linear to triangular. Flowers subsessile. Calyx densely pilosulous to hirtellous; hypanthium portion ellipsoid, 1–1.4 mm; limb lobed for ca. 1/2; lobes narrowly lanceolate or linear-lanceolate, 0.5–0.8 mm. Corolla grayish purple to pink, funnelform, outside densely puberulent or scabridulous; tube 4.5–9 × 1.2–1.5 mm, without slits; lobes ovate-elliptic, 1.5–2.5 mm, acute to minutely trifid, margins crisped. Fruit brown, ellipsoid to ovoid, laterally somewhat compressed, 5–7 × 5–6 mm, sparsely to moderately pilosulous to hirtellous to glabrescent; pyrenes ovate to elliptic in outline, flattened, marginal wing 0.8–1 mm wide. Fl. Jun–Jul or Oct–Nov, fr. Dec–Jan.

Sparse forests or thickets; 600–1300 m. Yunnan [Myanmar, Thailand, ?Vietnam].

**7. *Paederia spectatissima*** H. Li, Novon 9: 220. 1999.

云桂鸡矢藤 yún guì jī shì teng

Vines, twining, to 12 m; stems glabrous, drying dark red then grayish brown. Leaves opposite; petiole 1–4 cm, glabrous; blade drying leathery to papery, ovate-elliptic to elliptic, 6–12 × 3–6 cm, glabrous on both surfaces, base cuneate to obtuse, margins flat, apex acuminate with tip usually prolonged; secondary veins 6–10 pairs; stipules persistent or caducous, broadly trian-

gular, 1–1.5 mm, obtuse to shortly acuminate. Inflorescences axillary and/or terminal, paniculate, pyramidal to cylindrical, 20–100 cm, branched to 6–10 orders, papillose, puberulent, or glabrescent, pedunculate; bracts triangular, 1–2 mm. Flowers sessile or subsessile. Calyx densely puberulent; hypanthium portion ellipsoid, 1–1.5 mm; limb 0.8–1 mm, lobed for ca. 1/2; lobes triangular, 0.3–0.6 mm. Corolla greenish to purplish white, funnelform, densely papillose-puberulent to scabrid-papillose outside; tube 5–8 × 2.6–3.7 mm, with slits at base; lobes triangular, 1.7–2.4 mm, acute, margins often crisped. Fruit orbicular, flattened laterally, 10–11 × 10–11 mm, puberulent, drying dark gray; pyrenes orbicular in outline, flattened, papery, marginal wing 4–4.5 mm wide. Fl. and fr. Jun–Oct.

Open forests; 800–1000 m. Guangxi, Yunnan (Pingbian) [Vietnam].

W. C. Ko (in FRPS 71(2): 112. 1999) attributed this name to Puff (Opera Bot. Belg. 3: 285. 1991). However, Puff attributed this name to Li in unpublished work and provided no Latin diagnosis or designation of a type, so this name was not validly published by him. Li cited only three collections in her article in Novon and none were specimens cited by Puff, so the specimens cited by Puff do not actually seem to be paratypes as has been suggested.

**8. *Paederia stenobotrya*** Merrill, Lingnan Sci. J. 11: 57. 1932.

狭序鸡矢藤 xiá xù jī shì teng

Vines, to 3 m; stems densely hirtellous, hirsute-hirtellous, or glabrescent, drying dark yellow. Leaves opposite; petiole 2.5–7 cm, densely hirtellous to tomentose-hirtellous; blade drying papery, ovate, oblong-ovate, or elliptic-ovate, 6–17 × 3–11 cm, adaxially sparsely to moderately scabrid to hirtellous, abaxially hirtellous, pilosulous, or pilose with pubescence denser along veins, base cordate, cordulate, truncate, or rarely acute, margins flat, apex acute to acuminate; secondary veins 5–8 pairs; stipules generally caducous, triangular, 4–10 mm, acute. Inflorescences axillary and/or terminal, spiciform to narrowly paniculate, cylindrical to narrowly pyramidal, 7–30 cm, branched to 1–3 orders, densely hirtellous to hirtellous-tomentose, pedunculate; bracts triangular, 1–2 mm. Flowers sessile in congested cymes or small heads. Calyx densely hirtellous; hypanthium portion turbinate to ellipsoid, 1–1.5 mm; limb lobed nearly to base; lobes subulate to narrowly triangular, 1–2 mm. Corolla funnelform, outside densely hirtellous to tomentulose; tube 5–6 × 2.5–3 mm, without slits; lobes ovate, 1–2 mm. Fruit globose, 5–6 × 5–6 mm, glabrous, drying orange-yellow; pyrenes plano-convex to concavo-convex. Fl. Jun, fr. Jun–Nov.

• Broad-leaved forests on hill slopes; 400–900 m. Fujian, Guangdong, Hainan.

Puff (Opera Bot. Belg. 3: 207–292. 1991) reported this species only from Hainan, but W. C. Ko (in FRPS 71(2): 117. 1999) reported it also from Guangdong and Fl. Fujian. (5: 185. 1993) from Fujian.

**9. *Paederia yunnanensis*** (H. Léveillé) Rehder, J. Arnold Arbor. 18: 249. 1937.

云南鸡矢藤 yún nán jī shì teng

*Cynanchum yunnanense* H. Léveillé, Cat. Pl. Yun-Nan, 13. 1915; *Paederia bodinieri* H. Léveillé (1914–1915), not H.

Léveillé (1914); *P. rehderiana* Handel-Mazzetti; *P. tomentosa* Blume var. *purpureocaerulea* H. Léveillé & Vaniot.

Vines, to 7 m; stems densely tomentulose and/or hirtellous becoming glabrescent, drying brown. Leaves opposite; petiole 2–7.5 cm, densely tomentulose and/or pilosulous; blade drying submembranous to papery, ovate, lanceolate, or lanceolate-elliptic, 6–16 × 3–12 cm, adaxially densely strigillose, pilosulous, or scabrous, abaxially densely tomentose to hirtellous, base cordulate to deeply cordate or rarely obtuse, margins flat, apex acute or acuminate; secondary veins 6–8 pairs; stipules generally persistent, lanceolate-triangular to narrowly triangular, 4–15 mm, acute to acuminate or rarely bifid. Inflorescences axillary on main stems and/or terminal on lateral stems, paniculate, cylindrical to narrowly pyramidal, 6–25 cm, branched to 1–3 orders, densely tomentulose to hirtellous or pilosulous, pedunculate or sometimes apparently sessile with basal axes sub-

tended by reduced leaves (or leaflike bracts); bracts linear to narrowly triangular or deeply bilobed, 1.5–6 mm. Flowers sessile and subsessile in congested to subcapitate cymes (sometimes appearing pedicellate when axes of cymes develop later). Calyx with hypanthium portion ellipsoid, 1–1.5 mm, glabrous to puberulent; limb lobed nearly to base; lobes oblong-lanceolate to narrowly triangular, 0.5–1.7 mm, sparsely to densely puberulent, strigillose, or hirtellous. Corolla pale green, pink, reddish purple, or dark purple, tubular-funnelform, outside densely mealy puberulent; tube 5–10.5 × 2.5–5 mm, without slits; lobes broadly triangular, 1–2.5 mm, obtuse to acute, margins crisped. Fruit ovoid, laterally compressed, 6–9 × 5–7 mm, glabrescent, drying brown; pyrenes ovate in outline, flattened, papillose-puberulent, marginal wing ca. 1 mm wide. Fl. Jun–Oct, fr. Jul–Dec.

Forest margins in valleys; 300–3000 m. Guangxi, Guizhou, Sichuan, Yunnan [Vietnam].

## 67. PAVETTA Linnaeus, Sp. Pl. 1: 110. 1753.

大沙叶属 da sha ye shu

Chen Tao (陈涛); Charlotte M. Taylor

*Pavate* Adanson.

Shrubs, small trees, or infrequently subshrubs, unarmed. Raphides absent. Leaves opposite or rarely whorled, usually with bacterial nodules and/or domatia in abaxial vein axils; stipules generally persistent, shortly united around stem, triangular, often aristate, often sericeous adaxially. Inflorescences terminal on principal stems, terminal on reduced lateral stems and appearing axillary, or rarely truly axillary, cymose to corymbiform, many flowered, sessile to pedunculate, bracteate with bracts often fused in pairs. Flowers pedicellate or sessile, bisexual, monomorphic, fragrant, with secondary pollen presentation. Calyx limb truncate or 4(or 5)-lobed. Corolla white to cream [or rarely red], salverform with tube slender, inside glabrous or pubescent in throat; lobes 4, convolute in bud. Stamens 4(or 5), inserted in corolla throat, exserted or included; filaments short; anthers dorsifixed near base, sometimes becoming twisted with age. Ovary 2-celled, ovules 1(or 2) in each cell on axile placentas attached at top of septum; stigma restricted to terminal portion of thickened style, very shortly 2-lobed with lobes erect, exserted. Fruit black and often shiny or infrequently white, red, or blue, drupaceous, thinly fleshy, globose to ovoid, with calyx limb persistent or deciduous; pyrenes 2, 1-celled, each with 1 seed, plano-convex or concavo-convex, papery; seeds medium-sized, ellipsoid, discoid, or plano-convex; testa membranous; endosperm corneous; embryo dorsal, curved; cotyledons leaflike; radicle hypogeous.

About 400 species: paleotropical, widespread in Africa, tropical Asia, Australia, and Pacific islands, apparently absent from Madagascar; six species (two endemic) in China.

Secondary pollen presentation is found in *Pavetta* (De Block, Opera Bot. Belg. 9: 1–218. 1998; Rout & Deb, Bull. Bot. Surv. India 41: 1–182. 1999). Rout and Deb (loc. cit.) reported synchronous flowering in the Indian species of *Pavetta*. W. C. Ko (in FRPS 71(2): 25. 1999) described the filaments as ranging from short to prolonged, but that latter condition has not been reported by other authors in *Pavetta* or *Ixora*. Ko also described the placentas as sometimes attached to the middle of the septum, but Bremekamp (Repert. Spec. Nov. Regni Veg. 37: 2–11. 1934) said this is incorrect and an old mistake in *Pavetta*.

Bremekamp (loc. cit.; Repert. Spec. Nov. Regni Veg. 47: 12–28. 1939) recognized three subgenera of *Pavetta*; the Chinese species all belong to his *P.* subg. *Pavetta*, and the other two subgenera are restricted to Africa.

Bremekamp, in general, distinguished *Pavetta* species more narrowly than many other authors; for example, he (loc. cit. 1934; loc. cit. 1939) reported 42 species for the Indian subcontinent, while Rout and Deb (loc. cit.) recognized only 25 species with the rest of Bremekamp's names synonymized. W. C. Ko (loc. cit.: 25–30) followed Bremekamp (loc. cit. 1934) closely; in contrast, all the morphological variation found among the Chinese species falls well within Rout and Deb's (loc. cit.: 114–136) circumscription of *P. indica* Linnaeus. Bremekamp (loc. cit. 1939) noted that the E Chinese plants previously identified as *P. indica* were included by him in *P. hongkongensis*.

In particular, Bremekamp (loc. cit. 1934) considered stem characters to be informative taxonomically in *Pavetta*, particularly green vs. corky-barked stems, but Rout and Deb (loc. cit.) concluded that these represent different developmental stages rather than differences between species. Bremekamp (loc. cit. 1934) considered the arrangement of the bacterial nodules in the leaves to be taxonomically informative for distinguishing infrageneric groups and sometimes species, but Rout and Deb (loc. cit., as “bacterial leaf-galls”) found them to have no taxonomic value and concluded that the nodules vary in shape and number among different leaves on a plant as well as between plants of the same and different species. Bremekamp (loc. cit. 1934) distinguished several species based on leaf shape and size, but Rout and Deb (loc. cit.) included notable variation in leaf size and shape, from relatively very narrow to quite broad, within individual species of *Pavetta*; Bridson and Verdcourt (Fl. Trop. E. Africa, Rub. (Pt. 2), 619–686. 1988) circumscribed several species similarly to Rout and Deb. Bremekamp (loc. cit. 1934) considered several species of *Pavetta* to have

axillary inflorescences, as did Rout and Deb (loc. cit.), but Bridson and Verdcourt (loc. cit.) considered the inflorescences of the African species at least to be terminal on reduced lateral short shoots, as found in a number of Rubiaceae genera, and to appear axillary but not be truly axillary. Bremekamp (loc. cit. 1934) gave much attention to the arrangement of the inflorescence bracts in *Pavetta*; his descriptions apply to bracts but not bracteoles, so his characterizations may be misinterpreted if not observed carefully. Bremekamp noted (loc. cit. 1934) that occasional flowers with 5 calyx and corolla lobes are found in most *Pavetta* species, but the majority of flowers are always 4-merous and the genus best considered to be 4-merous; a similar situation is found in other Rubiaceae genera.

The treatment here follows that of W. C. Ko (loc. cit.), for reference. The key here has been augmented with characters from the descriptions, and the descriptions have been augmented with characters from the available specimens cited by Bremekamp.

- 1a. Flowering branches not green.
  - 2a. Leaf blade elliptic-oblong to obovate-oblong, 9–18 × 3–3.5 cm, drying membranous, adaxially glabrous, abaxially villosulous, with secondary veins 6–8 pairs ..... 1. *P. arenosa*
  - 2b. Leaf blade elliptic or elliptic-lanceolate, 8–15 × 4–9 cm, drying thickly papery, adaxially scabrous, abaxially tomentose, with secondary veins 10–12 pairs ..... 6. *P. tomentosa*
- 1b. Flowering branches green or almost green, sometimes becoming black when dry.
  - 3a. Leaf blade scabrous on both surfaces on midrib; style ca. 38 mm ..... 4. *P. scabrifolia*
  - 3b. Leaf blade smooth, glabrous, or variously pubescent but not scabrous on both surfaces; style 35 mm or shorter.
    - 4a. Flowering branches and hypanthium portion of flower glabrous; leaf blade elliptic-oblong to elliptic-obovate, adaxially glabrous, abaxially subglabrous or pubescent along midrib and in axils of veins ..... 2. *P. hongkongensis*
    - 4b. Flowering branches and hypanthium portion of flower puberulent to pilosulous or glabrescent; leaf blade narrowly obovate, lanceolate, narrowly elliptic, or oblanceolate, adaxially glabrescent, abaxially puberulent to pilosulous at least on veins.
      - 5a. Leaf blade narrowly obovate or lanceolate, 9–13 × 3.5–4.7 cm, with secondary veins 6–8 pairs ..... 3. *P. polyantha*
      - 5b. Leaf blade narrowly elliptic or oblanceolate, 10–13 × ca. 5 cm, with secondary lateral veins 6 or 7 pairs ..... 5. *P. swatowica*

**1. *Pavetta arenosa*** Loureiro, Fl. Cochinch. 1: 73. 1790, emend. Bremekamp, Repert. Spec. Nov. Regni Veg. 47: 23. 1939.

大沙叶 da sha ye

?*Pavetta sinica* Miquel.

Shrubs, 1–3 m tall; branches compressed, puberulent to glabrous. Petiole 5–20 mm, glabrous to sparsely pilosulous; leaf blade drying membranous, elliptic-oblong to obovate-oblong, 9–18 × 3–3.5 cm, usually with bacterial nodules, adaxially glabrous and somewhat shiny, abaxially sparsely to densely villosulous, base cuneate to acute, apex acuminate; secondary veins 6–8 pairs; stipules broadly ovate-triangular, 2–12 mm, pilosulous to glabrous, acute to obtuse. Inflorescence terminal, 9–11 × ca. 15 cm, pilosulous to glabrescent; peduncle 2.5–4 cm; pedicels 10–12 mm. Flowers pedicellate. Calyx with hypanthium portion ellipsoid, ca. 1 mm, densely pilosulous; limb ca. 1 mm, sparsely pilosulous to glabrescent, lobed for up to 1/2. Corolla white, outside glabrous; tube 10–18 mm, bearded in throat; lobes narrowly oblong, 3–5 mm, obtuse. Style 25–30 mm. Drupe globose, 6–7 mm in diam., glabrous, calyx limb persistent. Fl. Apr–May, fr. Oct–Nov.

Sparse forests at low elevations. Guangdong, Guangxi, Hainan [Vietnam].

Plants with calyx tube glabrous from Guangxi have been called *Pavetta arenosa* f. *glabrituba* Chun & F. C. How ex W. C. Ko (Fl. Hainan. 3: 583. 1974). This may be best synonymized here, pending further study.

In his revision of *Pavetta* Bremekamp (Repert. Spec. Nov. Regni Veg. 37: 104. 1934) described *P. hongkongensis* for the common Chinese plants and considered *P. arenosa* a dubious name that he tenta-

tively referred to *Tarenna*, but later (Bremekamp, Repert. Spec. Nov. Regni Veg. 47: 12–28. 1939) he reported that Merrill had differed with his conclusion, had examined the type of *P. arenosa*, and had sent him information that persuaded him to apply this latter name to Chinese plants. The protologue provided very limited information, which was significantly expanded by Bremekamp, thus the annotation here of this as an emended description. Bremekamp here also stated, without citing any individual specimens or contrasting the species, that both *P. arenosa* and *P. hongkongensis* are found commonly in China. W. C. Ko (in FRPS 71(2): 26. 1999) separated these based on the color of their flowering branches: green or almost green in *P. hongkongensis* vs. not green in *P. arenosa*; however, this is a character that Rout and Deb (Bull. Bot. Surv. India 41: 1–182. 1999) tested empirically and found to be variable within all Indian species of *Pavetta* and, thus, of questionable use there and elsewhere.

W. C. Ko (loc. cit.: 28) cited the name *Pavetta sinica* as a synonym of *P. arenosa*, but the source for this synonymy is unknown to us. Bremekamp specifically excluded this name from synonymy in his circumscription of *P. arenosa*, though apparently Merrill did synonymize it here (Lingnan Sci. J. 15: 17. 1936). Bremekamp treated *P. sinica* as a species distinct from *P. arenosa* and *P. hongkongensis* and considered it most closely related to *P. tomentosa*. Bremekamp saw its type and described the corolla tube as 17 mm, which does not agree with the descriptions presented by W. C. Ko (loc. cit.: 27–28) for either *P. arenosa* or *P. hongkongensis*. However, the specimens cited for *P. arenosa* by Bremekamp (loc. cit. 1939) have corolla tubes 10–18 mm, so Bremekamp's description of *P. sinica* is easily included in his circumscription of *P. arenosa*.

**2. *Pavetta hongkongensis*** Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 104. 1934.

香港大沙叶 xiang gang da sha ye

*Tarenna kwangsiensis* Handel-Mazzetti.

Shrubs or small trees, 1–4 m tall; branches compressed, glabrous, green or almost green, often drying blackened. Petiole 1–2 cm, glabrous; leaf blade drying membranous, elliptic-oblong to elliptic-oblancoate, 8–15 × 3–6.5 cm, often with bacterial nodules, adaxially glabrous, abaxially glabrous, glabrescent, or pubescent along midrib, base cuneate to acute, apex acuminate to acute; secondary veins 6 or 7 pairs; stipules broadly ovate-triangular, 1–3 mm, glabrous, acute to shortly aristate. Inflorescences terminal on lateral branches, laxly corymbose, 7–9 × 7–15 cm, many flowered, glabrous; peduncle 1–2 cm; pedicels 3–6 mm. Flowers pedicellate. Calyx with hypanthium portion ellipsoid, ca. 1 mm, glabrous; limb 0.5–1.5 mm, glabrous, shallowly lobed. Corolla white, outside glabrous; tube 12–19 mm, inside pilose at throat; lobes narrowly triangular-oblong, 5–7 mm, acute to obtuse. Style ca. 35 mm. Drupes globose, 6–7 mm, pilosulous to glabrous, calyx limb persistent. Fl. Mar–Jul, fr. Jul–Nov.

Thickets; 200–1300 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

Bremekamp noted in his description of this species that it comprises the Chinese plants previously treated as *Pavetta indica* by at least some authors.

**3. *Pavetta polyantha*** (J. D. Hooker) R. Brown ex Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 103. 1934.

多花大沙叶 duo hua da sha ye

*Pavetta indica* Linnaeus var. *polyantha* J. D. Hooker, Fl. Brit. India 3: 150. 1880.

Shrubs, 1–3 m tall; young branches compressed to subterete, glabrescent or puberulent. Petiole 10–30 mm, puberulent; leaf blade drying membranous, narrowly obovate or lanceolate, 9–13 × 3.5–4.7 cm, with several bacterial nodules, adaxially glabrescent, abaxially puberulent at least along veins, base cuneate or acute, apex acuminate; secondary veins 6–8 pairs; stipules ovate-triangular, 5–7 mm, puberulent or glabrescent, shortly aristate. Inflorescences terminal on developed branches, laxly corymbose, ca. 9 × 15 cm, many flowered, strigillose to glabrescent; peduncle 1.5–2 cm; pedicels 3–5 mm. Flowers pedicellate. Calyx with hypanthium portion ellipsoid, 1–1.2 mm, densely strigillose; limb 1–1.5 mm, sparsely strigillose, lobed for up to 1/2. Corolla white, outside glabrous; tube 19–22 mm, bearded in throat; lobes narrowly ligulate, 6–7 mm, obtuse to rounded. Style ca. 30 mm. Drupe globose, ca. 8 mm, glabrous. Fl. Apr–Jun.

Sparse forests, streamsides; 900–1200 m. Guangdong, Guangxi, Guizhou, Yunnan [Bhutan, India, Indonesia, Myanmar, Philippines].

Rout and Deb (Bull. Bot. Surv. India 41: 122–128. 1999) included *Pavetta polyantha* within their circumscription of *P. indica* var. *glabrescens* (Kurz) Deb & Rout. The name *P. polyantha* is based on a Wallich specimen from Assam.

**4. *Pavetta scabrifolia*** Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 100. 1934.

糙叶大沙叶 cao ye da sha ye

Shrubs, height not noted; branches subcompressed to angled, puberulent to pilosulous, green or almost green. Petiole

1–1.5 cm, pubescent; leaf blade drying membranous, lanceolate, 13–16 × 3.2–4.4 cm, adaxially subglabrous except scabrous along midrib, abaxially scabrous, base cuneate, apex caudate; secondary veins 5 or 6 pairs; stipules broadly triangular, cuspidate. Inflorescence terminal on branches with 1 long internode and several short internodes, laxly corymbose, pubescent. Calyx subglabrous; limb ca. 1 mm, lobed for ca. 1/2. Corolla white; tube ca. 17 mm, glabrous inside; lobes narrowly oblong-triangular, ca. 5.5 mm. Style ca. 38 mm. Drupes subglobose, ca. 5 mm in diam., glabrescent, calyx limb persistent. Fl. May–Jun.

• Sparse forests, ditch sides; 900–1300 m. Yunnan.

**5. *Pavetta swatowica*** Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 104. 1934.

汕头大沙叶 shan tou da sha ye

Shrubs, height not noted; branches compressed to terete, pilosulous, green or almost green becoming grayish or blackened when dry. Petiole 1–2 cm, pilosulous; leaf blade drying thinly papery or submembranous, narrowly elliptic or oblanceolate, 10–13 × ca. 5 cm, adaxially glabrescent, abaxially pilosulous, base cuneate, apex long acuminate; secondary veins 6 or 7 pairs; stipules ovate-triangular, ca. 5 mm, puberulent, shortly cuspidate. Inflorescence terminal on developed branches, laxly corymbose, many flowered, pubescent; peduncles 2–3 cm; pedicels 4–6 mm. Flowers pedicellate. Calyx with hypanthium subglobose, densely grayish pilosulous or sericeous; limb shallowly lobed. Corolla white, outside glabrous; tube ca. 14 mm, sparsely tomentose inside; lobes narrowly oblong or oblong-lanceolate, ca. 6 mm. Style ca. 35 mm. Drupes unknown.

• Sparse forests, streamsides. Guangdong.

This name was incorrectly spelled by W. C. Ko (in FRPS 71(2): 26–27. 1999) as “*Pavetta swatouica*.” Ko’s description, perhaps following that of Bremekamp, described the stipules as caducous, although the stipules are otherwise considered persistent in *Pavetta* by other authors, including Bremekamp.

**6. *Pavetta tomentosa*** Roxburgh ex Smith in Rees, Cycl. 26: *Pavetta* no. 2. 1814.

绒毛大沙叶 rong mao da sha ye

*Ixora tomentosa* (Roxburgh ex Smith) Roxburgh; *I. tomentosa* var. *roxburghii* Kurz; *Pavetta indica* Linnaeus var. *tomentosa* (Roxburgh ex Smith) J. D. Hooker; *P. tomentosa* var. *roxburghii* (Kurz) Bremekamp.

Shrubs or small trees, height not noted; branches tomentose. Petiole 1–3 cm, tomentose; blade drying thickly papery and blackening, elliptic or elliptic-lanceolate, 8–15 × 4–9 cm, scabrous adaxially, tomentose abaxially, base acute, apex acute or acuminate; secondary veins 10–12, with foveolate and/or pubescent domatia; stipules ovate-triangular, 6–8 mm, tomentose, aristate. Inflorescences terminal on branches with 1 or 2 internodes, laxly corymbose, 5–10 × 5–25 cm, densely tomentose, pedunculate; peduncle 0.5–1.5 cm; pedicels 4–8 mm. Flowers pedicellate. Calyx densely tomentose; hypanthium portion ellipsoid, ca. 1 mm; limb ca. 0.5 mm, denticulate to lobed. Corolla white, outside glabrous; tube (6.2–)8–12 mm, sparsely pilose inside; lobes narrowly oblong, 4.6–7 mm, acute. Style 24–33

mm. Drupes globose, ca. 5 mm, tomentulose. Fl. and fr. Jul–Sep.

Tropical rain forests; ca. 1000 m. Yunnan (Menghai) [India, Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

Rout and Deb (Bull. Bot. Surv. India 41: 128–136. 1999) treated this species as *Pavetta indica* var. *tomentosa*. Bremekamp (Repert. Spec. Nov. Regni Veg. 37: 113–114. 1934) and Rout and Deb described the corolla tubes as 8–12 mm, but W. C. Ko (in FRPS 71(2): 28. 1999) gave the minimum measurement as 6.2 mm.

## 68. *PENTAS* Benth, Bot. Mag. 70: t. 4086. 1844.

五星花属 *wu xing hua shu*

Chen Tao (陈涛); Charlotte M. Taylor

Perennial herbs or subshrubs, unarmed. Raphides present. Leaves opposite or whorled, without domatia; stipules persistent, interpetiolar and sometimes fused to petioles, triangular to truncate, multifid or setaceous, with segments often gland-tipped. Inflorescences terminal, cymose, paniculate, or corymbiform, several to many flowered, subsessile to pedunculate, bracteate. Flowers subsessile, bisexual, distylous [or rarely tristylous]. Calyx limb deeply (4 or)5-lobed; lobes sometimes slightly to strongly unequal on an individual flower [sometimes with calycophylls]. Corolla white, pink, red, purple, or yellow, salverform to narrowly tubular with tube prolonged and usually expanded at throat, inside villous in throat; lobes (4 or)5(or 6), valvate in bud. Stamens (4 or)5(or 6), inserted in corolla just below throat, included in long-styled, mid-styled, and homostylous forms or exserted in short-styled form; filaments short to well developed; anthers dorsifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas; stigmas 2, linear, included in short-styled and mid-styled forms or exserted in long-styled and monomorphic forms. Fruit capsular, subglobose to ovoid or obovoid with apex often elongated into conical beak, membranous or leathery, loculicidally dehiscent through apical portion, with calyx limb persistent; seeds numerous, small, angled to subglobose.

About 50 species: widespread in Africa and Madagascar, one species cultivated worldwide; one species (introduced) in China.

**1. *Pentas lanceolata*** (Forsskål) Deflers, Voy. Yemen, 142. 1889.

五星花 *wu xing hua*

*Ophiorrhiza lanceolata* Forsskål, Fl. Aegypt.-Arab. 42. 1775; *Pentas carnea* Benth.

Subshrubs, 30–70 cm tall; branches quadrangular, moderately to densely pilosulous to villous often becoming glabrescent with age. Leaves opposite; petiole 0.5–3 cm, pilosulous to villous; blade drying papery, oblong-lanceolate to ovate, 5–14 × 2–5.5 cm, adaxially scabrous or villous to glabrescent, abaxially densely villous or hirtellous at least along principal veins, base cuneate to obtuse, apex acute or shortly acuminate; secondary veins 8–10 pairs; stipules truncate to broadly rounded, 1.5–2 mm, villous, bristles 1–5, 1–4 mm. Inflorescence densely pilosulous to villous; peduncle 3–12 mm; branched portion congested-cymose often becoming lax, 1.5–4 × 1.5–4 cm; bracts narrowly triangular to linear, 0.5–1.5 mm. Flowers sessile or

subsessile, distylous. Calyx densely hirtellous or villous; ovary portion subglobose to obovoid, ca. 1 mm; limb deeply lobed; lobes narrowly oblanceolate to elliptic or narrowly spatulate, 2–8 mm, usually unequal on an individual flower with nearly this entire size range found on some flowers, acute. Corolla pale purple to pink, red, white, or yellow, salverform, sparsely hirtellous to glabrescent outside; tube slender except rather abruptly swollen in throat in long-styled form (around stamens), 17–20 mm, densely barbate in throat; lobes elliptic or oblong-lanceolate, 3–4 mm, acute to obtuse. Capsules obovoid, 4–6 × 4–6 mm, stiffly papery to woody, with beak 1–2 mm tall; seeds 0.5–1 mm. Fl. Jul–Sep.

Cultivated in gardens in S China; sea level to 1500 m. Fujian, Guangdong [native to Africa (Democratic Republic of Congo, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda); commonly cultivated worldwide].

Cultivated plants of *Pentas lanceolata* are usually all long-styled and usually do not set fruit. They are variable in flower color, and new varieties and colors continue to be developed.

## 69. *PERTUSADINA* Ridsdale, Blumea 24: 353. 1979.

槽裂木属 *cao lie mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Trees or shrubs, unarmed; trunk often fluted or latticed. Raphides absent. Leaves opposite, usually with domatia; stipules caducous, triangular, entire or shortly bifid. Inflorescences axillary or terminal, capitate with 1–5 globose heads in fascicles or cymes, pedunculate, bracteate; bracteoles spatulate to linear-spatulate. Flowers sessile, bisexual, monomorphic. Calyx lobes 5, spatulate, obtuse. Corolla yellow, salverform to slenderly funnelform, inside glabrous; lobes 5, valvate or with apices subimbricate in bud. Stamens 5, inserted in upper part of corolla tube, exserted; filaments short; anthers basifixed. Ovary 2-celled, ovules 4–10 in each cell, pendulous on axile placentas attached to upper third of septum; stigma globose to obovoidal, exserted. Fruiting heads globose. Fruit capsular, obconic, septically then loculicidally dehiscent into 2 or 4 valves from base to apex with valves separating also from persistent or tardily deciduous septum, cartilaginous to ligneous, with calyx limb persistent on septum; seeds several, small, ovoid-triangular, bilaterally compressed, winged at both ends.

Four species: China, Malay Peninsula, Moluccas, New Guinea, Philippines, Thailand; one species in China.

**1. *Pertusadina metcalfii*** (Merrill ex H. L. Li) Y. F. Deng & C. M. Hu, *Blumea* 51: 559. 2006.

海南槽裂木 *hai nan cao lie mu*

*Adina metcalfii* Merrill ex H. L. Li, *J. Arnold Arbor.* 24: 454. 1943; *A. affinis* F. C. How; *A. hainanensis* F. C. How; *A. polycephala* Benth. var. *glabra* F. C. How; *Pertusadina hainanensis* (F. C. How) Ridsdale.

Shrubs to large trees, perhaps evergreen, to 30 m tall; branches angled to terete, reddish brown becoming gray, puberulent to glabrous, with scattered lenticels. Petiole 3–25 mm, glabrous or puberulent; leaf blade drying thickly papery, elliptic to elliptic-oblong or oblanceolate, 4–12 × 1.5–5 cm, adaxially glabrous and rather shiny, abaxially glabrous to puberulent, base cuneate to obtuse, apex acuminate; lateral veins 6–10 pairs, in abaxial axils with foveolate and/or pilosulous domatia; stipules linear-oblong to subulate, 4–6 × 1–2 mm, glabrous, apex acute or occasionally emarginate to shortly bifid. Inflorescence puberulent to glabrescent; peduncles 1–6.5 cm; flowering heads

solitary on peduncles or occasionally 3 in a cyme, 6–8 mm in diam. across calyces, ca. 15 mm in diam. across corollas; bracteoles linear-clavate to linear-spatulate, 0.5–1 mm, at apex ciliate. Calyx puberulent to pilosulous at least at junction of ovary and limb; ovary portion obconic, 0.5–0.7 mm, surrounded at base by ring of trichomes 0.2–0.5 mm; limb deeply lobed; lobes linear-oblong to spatulate, 1.5–2 mm. Corolla with tube 2–2.5 mm, glabrous inside; lobes deltoid, 0.7–1 mm. Stigmas obovoid, ca. 0.3 mm, exserted for 7–8 mm. Fruiting head 10–12 mm in diam. Capsules 2–4 mm, puberulent to strigose; seeds 1–2 mm. Fl. May–Jun, fr. Sep–Dec.

Dense forests; 100–900 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Zhejiang [Thailand].

*Pertusadina metcalfii* was illustrated by How (*Sunyatsenia* 6: 239, f. 28; 241, f. 29. 1946, the first as “*Adina affinis*” and the second as “*Adina hainanensis*”). Ridsdale (*Blumea* 24: 354. 1979) treated this species as *P. hainanensis*, but, as noted by Deng and Hu (loc. cit.), the names listed in synonymy by him included an older name that has priority, *A. metcalfii*, confirmed by them as conspecific.

## 70. *PHUOPSIS* (Grisebach) Benth. & J. D. Hooker, *Gen. Pl.* 2: 151. 1873.

长柱草属 *chang zhu cao shu*

Chen Tao (陈涛); Friedrich Ehrendorfer

*Asperula* sect. *Phuopsis* Grisebach, *Spic. Fl. Rumel.* 2: 167. 1846.

Herbs, perennial, rhizomatous. Raphides present. Leaves and leaflike stipules in whorls of 6–10, sessile, without domatia, with margins minutely antrorsely aculeolate. Inflorescences terminal, pedunculate, capitate, ± many flowered, enclosed by a whorl of free leaflike bracts, flowers subtended by acuminate bracts. Flowers sessile, bisexual, monomorphic. Calyx limb obsolete. Corolla pink, slender, salverform, inside glabrous; lobes 5, valvate in bud. Stamens 5, inserted in corolla tube, included to partially exserted; filaments short; anthers dorsifixed. Ovary 2-celled, smooth, ovules 1 in each cell, erect, basal, anatropous; stigma clavate, shortly 2-lobed at apex, strongly exserted. Fruit schizocarpous, 2 mericarps ellipsoid to obovoid, dry, rather hard, indehiscent, 1-celled, each with 1 ellipsoid to curved, smooth to striate seed.

One species: SW Asia (Azerbaijan, NW Iran), occasionally cultivated as an ornamental in China.

*Phuopsis* belongs to the core genera of the tribe Rubieae (subtribe Rubiinae). Remote and DNA-supported affinities exist with *Crucianella*, some groups of *Asperula*, and particularly with the widespread annual *Sherardia*. In the present volume *Phuopsis* is briefly discussed in the introduction to the genus *Galium* and keyed out there. *Phuopsis* is a monotypic relict genus restricted to the small Hyrcanian area of NW Iran and Talysh in S Azerbaijan (Ehrendorfer et al., *Fl. Iranica* 176: 1–287. 2005). Its single species has secondary pollen presentation and is butterfly-pollinated.

**1. *Phuopsis stylosa*** (Trinius) Benth. & J. D. Hooker ex B. D. Jackson, *Index Kew.* 2: 505. 1894.

长柱花 *chang zhu hua*

*Crucianella stylosa* Trinius, *Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad.* 6: 485. 1818.

Herbs, 20–60(–70) cm tall; branches quadrangular, glabrous to sparsely hairy, at least at nodes and along angles ± retrorsely aculeolate. Leaves drying papery, narrowly lanceolate, narrowly elliptic, or narrowly oblanceolate, 12–30 × 1.5–6 mm, both surfaces glabrous, base acute to attenuate, margin and

midrib abaxially thickened and antrorsely aculeolate, apex acute to acuminate with acicular tip; secondary veins not visible. Inflorescences hemispherical to subglobose, 1.5–3 cm wide (not including involucre leaves); bracts leaflike, lanceolate, 8–12 mm, glabrescent, marginally and abaxially spinulose with acute apex. Ovary ellipsoid, ca. 1 mm, glabrous. Corolla glabrous outside; tube 9–12 mm; lobes 5, 1–2 mm, oblong-ovate, apex acute and somewhat thickened. Mericarps oblong-obovate, ca. 1.5 mm. Fl. May–Aug, fr. Aug–Sep.

Cultivated in Shaanxi (Wugong) [native in deciduous forests of SW Asia (Azerbaijan, NW Iran)].

## 71. *PORTERANDIA* Ridley, *Bull. Misc. Inform. Kew* 1939: 593. 1940.

绢冠茜属 *juan guan qian shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Randia* sect. *Anisophyllea* J. D. Hooker, *Fl. Brit. India* 3: 113. 1880.

Shrubs or trees, [sometimes dioecious], unarmed. Raphides absent. Leaves opposite, sometimes anisophyllous, sometimes with

domatia; stipules persistent, interpetiolar to shortly united around stem, triangular. Inflorescences pseudoaxillary [or terminal], cymose to thyrsiform, few to several flowered, pedunculate, bracteate. Flowers sessile to pedicellate, bisexual [or unisexual]. Calyx limb well developed, 5-lobed. Corolla white, salverform, outside densely sericeous, inside variously glabrous or pubescent; lobes 5 (or 6), convolute in bud. Stamens 5, inserted in upper part of corolla tube, included or partially exserted; filaments very short or absent; anthers dorsifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas; stigma clavate or fusiform, bifid, striate, included or perhaps exserted. Fruit perhaps yellow to brown, baccate, fleshy to woody, subglobose or obovoid, with calyx limb tardily deciduous; seeds numerous, medium-sized, ellipsoid or reniform, flattened, embedded in pulp.

About 22 species: S and SE Asia, Pacific islands; one species (endemic) in China.

Formerly several African species were included in *Porterandia*, but these have separated as *Aoranth* Somers (see Somers, Bull. Jard. Bot. Natl. Belg. 58: 47–75. 1988). Puff et al. (Rubiaceae of Thailand, 64. 2005) reported that the calyx limb is persistent in fruit in *Porterandia*, but their own figure seems to show it deciduous; on herbarium specimens of various *Porterandia* species the calyx limb appears to fall as the fruit approach mature size. W. C. Chen (in FRPS 71(1): 386. 1999) reported that the corolla lobes are rarely 6, but this number has not been reported by other authors; it is not clear if this number is consistent or is a report of infrequent unusual flowers, which occurs periodically in many species of Rubiaceae. W. C. Chen and Puff et al. described the stamens and stigmas as included, but they are shown as exserted in Chen's figure (loc. cit.: 385, t. 101). W. C. Chen (loc. cit.: 384) also described the ovary as incompletely 4-celled, but no other authors have reported this.

**1. *Porterandia sericantha*** (W. C. Chen) W. C. Chen, Fl. Reipubl. Popularis Sin. 71(1): 384. 1999.

绢冠茜 juan guan qian

*Randia sericantha* W. C. Chen, Guihaia 7: 298. 1987.

Shrubs or trees, 1–8 m tall; branches compressed to terete, moderately to densely ferruginous hirtellous. Petiole 3–15 mm, moderately to densely pilosulous or hirtellous to glabrescent; leaf blade drying papery, elliptic or oblanceolate-oblong, 5.5–16 × 2–5 cm, adaxially and sparsely strigillose, abaxially sparsely to densely pilosulous or hirtellous, base acute to obtuse, apex acute to usually shortly acuminate; secondary veins 8–12 pairs, in abaxial axils with pilosulous domatia; stipules ovate to trian-

gular, 5–7 mm, moderately to densely strigillose to hirtellous or glabrous. Inflorescences few to several flowered, cymose, 2–5.5 × 3–5 cm, densely pilosulous to hirtellous, sessile to pedunculate; peduncle to 0.5 cm; bracts triangular, lanceolate, or stipuliform, ca. 3 mm, acute to acuminate; pedicels 5–15 mm. Calyx densely pilosulous and/or strigose; ovary portion obconic, ca. 2 mm; limb 5–6 mm, lobed partially to deeply; lobes ovate-lanceolate, acute. Corolla white, outside densely yellow sericeous; tube ca. 30 × 3.5 mm, inside glabrous except with a villous ring at middle; lobes ovate-elliptic, ca. 12.5 × 6 mm. Stigma ca. 1.5 mm. Berry subglobose, 8–15 mm in diam., pilosulous to strigillose; seeds ca. 4 mm. Fl. May–Jun, fr. Aug–Jan.

● Forests or thickets at streambanks in valleys or on mountain slopes; 300–1500 m. Guangxi, Yunnan.

## 72. **PRISMATOMERIS** Thwaites, Hooker's J. Bot. Kew Gard. Misc. 8: 268. 1856.

南山花属 nan shan hua shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, unarmed; branches usually longitudinally ridged on each side and surrounded at base by persistent leafless stipules, with bark often yellowed and hardened. Raphides present. Leaves opposite, decussate on ascending branches and distichous on horizontal branches, without domatia; stipules persistent at least on younger nodes, interpetiolar, bilobed, often becoming hardened with age. Inflorescences terminal on principal branches, or terminal on axillary short shoots and apparently axillary, umbelliform to fasciculate and several flowered or reduced to 1 flower, sessile to pedunculate, bracteate with bracts usually reduced. Flowers pedicellate or sessile, bisexual, usually distylous [occasionally fused by their ovaries]. Calyx limb truncate or 4 or 5 (or 6)-lobed, with lobes infrequently unequal with 1 larger than others. Corolla white, salverform, inside glabrous; lobes (4 or 5) (or 6), valvate in bud. Stamens (4 or 5) (or 6), inserted at or above middle of corolla tube, included in long-styled flowers or partially exserted in short-styled flowers; filaments short; anthers dorsifixed. Ovary 2-celled, ovules 1 (or 2) in each cell, on axile placentas attached near or above middle of septum; stigma 2-lobed, exserted in long-styled flowers, included in short-styled flowers. Infructescences occasionally displaced to pseudoaxillary by subsequent branch growth. Fruit simple [or infrequently multiple], purple-black to blue-black, drupaceous, fleshy, subglobose or globose, with calyx limb persistent; pyrenes 1 or 2, 1-celled, subglobose when solitary to plano-convex when paired, thin-walled, with membranous preformed germination slits; seeds medium-sized, subglobose to plano-convex, on ventral face with deeply concave hilum; testa membranous; endosperm corneous; embryo small, with hypocotyl; radicle hypogynous.

Fifteen species: Bangladesh, Borneo, Cambodia, China, India (including Andaman Islands), Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; one variable species in China.

This genus was revised in a broad treatment by Johansson (Opera Bot. 94: 1–62. 1987), who reported that the flowers are strongly fragrant. This genus was also treated for China almost simultaneously and apparently independently by Ruan (Acta Phytotax. Sin. 26: 443–449. 1988), whose conclusions differed markedly from those of Johansson.

Two species have been recognized in China, *Prismatomeris tetrandra* and *P. connata*, with two subspecies recognized for *P. connata* (Y. Z. Ruan in FRPS 71(2): 178–179. 1999); *P. tetrandra* subsp. *multiflora* included only plants from Yunnan, while plants of the rest of China were treated

in *P. connata*, with plants from the mainland in subsp. *connata* and plants from Hainan in subsp. *hainanensis*. However, wide and continuous morphological variation was documented by Johansson (loc. cit.) and Puff et al. (Rubiaceae of Thailand, 118. 2005) within *P. tetrandra* in adjacent countries, both across the region and in local populations; and Johansson (in herb.) recognized one species and no infraspecific taxa in China. *Prismatomeris connata* was distinguished originally by its connate rather than separate stigmas; however, this character was later said by Y. Z. Ruan to vary within this species. Its subspecies were distinguished by the degree of lobing of the calyx limbs and the shape and degree of swelling of the stigmas, but as there appears on the specimens studied to be continuous variation in these characters and some plants from the mainland match the characters given for the Hainan subspecies these plants are not separated here.

**1. *Prismatomeris tetrandra* (Roxburgh) K. Schumann** in Engler & Prantl, Nat. Pflanzenfam. 4(4): 138. 1891.

四蕊三角瓣花 *si rui san jiao ban hua*

*Coffea tetrandra* Roxburgh, Fl. Ind. 2: 193. 1824; *Octotropis terminalis* C. B. Clarke; *Prismatomeris connata* Y. Z. Ruan; *P. connata* subsp. *hainanensis* Y. Z. Ruan; *P. multiflora* Ridley; *P. tetrandra* subsp. *multiflora* (Ridley) Y. Z. Ruan.

Shrubs or small trees, to 8 m tall; branches quadrangular to subterete, glabrous. Petiole 4–15 mm, glabrous; leaf blade drying leathery to stiffly papery and rather shiny, lanceolate, elliptic, elliptic-oblong, ovate, obovate, or oblong-lanceolate, 4–18 × 2–6 cm, glabrous, base cuneate to acute, apex acuminate or acute to obtuse; secondary veins 5–9 pairs; stipules with sheath portion 0.2–1 mm, truncate, persistent or deciduous by fragmentation, bilobed, lobes linear to narrowly triangular, 0.1–0.5 mm, caducous. Peduncles 1–16 and fascicled or umbellate, 5–35 mm, simple or bearing an umbellate group of pedicels, at base with stipuliform bracts; pedicels when present 5–15 mm. Flowers pedunculate or pedicellate. Calyx glabrous or sparsely glandular-puberulent; hypanthium portion hemispherical, 1.5–2 mm; limb 1–2 mm, truncate or 4- or 5-denticulate. Corolla

white or pale purple, salverform, glabrous outside; tube 14–20 mm; lobes 4 or 5, lanceolate, 7–10 mm, abaxially (i.e., dorsally) ridged at least in bud, acute to obtuse. Drupes subglobose, 8–12 mm in diam., glabrous, smooth. Fl. May–Sep, fr. Sep–Dec.

Forests, thickets; 300–2400 m. Fujian, Guangdong, Guangxi, Hainan, S Yunnan [Cambodia, India, Thailand, Vietnam].

Johansson (Opera Bot. 94: 29. 1987) recognized two subspecies, *Prismatomeris tetrandra* subsp. *tetrandra* and *P. tetrandra* subsp. *mala-yana* (Ridley) J. T. Johansson; he reported only subsp. *tetrandra* from China. However, Puff et al. (Rubiaceae of Thailand, 118. 2005) noted that further observation shows that even these taxa cannot be completely separated either morphologically or geographically. Y. Z. Ruan (in FRPS 71(2): 178. 1999) included the Chinese plants in *P. tetrandra* subsp. *multiflora*, which Johansson synonymized with subsp. *tetrandra*. Ruan (loc. cit.) reported that the flowers of *P. connata* are occasionally unisexual; this was not further documented there and has not been reported by others nor confirmed with specimens. Ruan (loc. cit.: 179) also described the calyx lobes as ca. 3 mm, which has not been reported by other authors nor seen on the rather ample materials studied.

This species was newly reported from India by Ayappan and Parthasarathy (J. Econ. Taxon. Bot. 29: 802–804. 2005), and its distribution in Cambodia and Vietnam is here reported based on specimens at P annotated by Johansson after the publication of his article.

### 73. *PSEUDOPYXIS* Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 189. 1867.

假盖果草属 *jia gai guo cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

Herbs, perennial, low, unarmed, rhizomatous, sometimes with fetid odor. Raphides present. Leaves opposite or sometimes basalmost pairs reduced to prophylls, without domatia; stipules persistent, interpetiolar and fused to petioles, triangular or 3(or 5)-lobed, often glandular-dentate. Inflorescences terminal and in uppermost leaf axils (or subtended by leaflike bracts), fasciculate and 2- to several flowered or sometimes 1-flowered, pedunculate or subsessile, bracteate or bracts reduced. Flowers pedunculate or pedicellate, bisexual, apparently monomorphic. Calyx limb deeply 5-lobed, usually markedly reticulate-veined, with lobes often unequal. Corolla white or purplish red, slenderly tubular-funnelform to salverform, inside glabrous or pubescent in throat; lobes 5, valvate-induplicate in bud. Stamens 5, inserted at base of corolla tube, included to exserted; filaments short to developed; anthers dorsifixed. Ovary 4- or 5-celled, ovules 1 in each cell, anatropous on basal placentas; stigmas 2-, 4- or 5-lobed, exserted. Fruit capsular, obconic to hemispherical, papery, dehiscent through apical lid or operculum within persistent calyx limb, with pedicels becoming reflexed; seeds 3–5, obovoid, longitudinally grooved (or with many longitudinal idioblasts containing raphides).

Three species: China, Japan; one species (endemic) in China.

H. S. Lo (in FRPS 71(2): 153–155. 1999) reported one species from China, *Pseudopyxis heterophylla* Maximowicz, with morphological characters that include some characters of both *P. heterophylla* and *P. depressa* Miquel as treated by the Fl. Japan (3a: 229. 1993). These two species were both reported there to be endemic to Japan: *P. depressa* with a height of 3–8 cm, uniformly distributed stem pubescence, purple corollas 20–25 mm, very short filaments, and 5 stigmas; and *P. heterophylla* with a height to 50 cm, stem pubescence arranged in lines, white corollas 6–7 mm, developed filaments, and 2 stigmas.

Subsequently, Chen (Edinburgh J. Bot. 64: 303–309. 2007) recognized three species in the genus, describing the Chinese plants as a new species, *Pseudopyxis monilirhizoma*, mainly based on root and stem characters (i.e., including number of leaf pairs). He considered this the species that was treated as *P. heterophylla* by H. S. Lo (in FRPS 71(2): 153–155. 1999).

One of us (Taylor) does not fully agree with the species treatment here but has not had adequate access to all the materials and specimens cited by Chen to evaluate the situation completely. The species circumscription and description given here do not seem to include or account for all the specimens of *Pseudopyxis* from China.

**1. *Pseudopyxis monilirhizoma*** Tao Chen, Edinburgh J. Bot. 64: 304. 2007.

胀节假盖果草 *zhang jie jia gai guo cao*

Herbs, to 10 cm tall, with fetid odor; rhizomes sparsely branched, with nodes tuberous and conspicuously enlarged, with internodes usually more than 2 cm; stems quadrate, glabrous except densely hirtellous or pilosulous in 2 interpetiolar rows. Leaves 2 or 3 pairs; petiole 0.3–2 cm, glabrous or densely pilosulous abaxially; blade drying membranous, deltoid-ovate, 0.8–4.5 × 0.6–3.5 cm, sparsely hispidulous on both surfaces, base cuneate to truncate, margins entire or ciliate, apex acute or

obtuse; secondary veins 4 or 5 pairs; stipules ca. 0.5 mm. Inflorescences 2–6-flowered; peduncles 2–4 mm, puberulent. Calyx hispidulous in lines; hypanthium portion obconic, longitudinally ribbed, ca. 1 mm; lobes ovate to ovate-lanceolate, ca. 2 mm. Corolla white or pink, salverform, externally glabrous, internally pilosulous in tube and on lobes; tube ca. 5 mm; lobes lanceolate or narrowly elliptic-oblong, ca. 4 mm, acute to subacute. Capsules obconic, size not noted; seeds ca. 1.2 mm. Fl. Jun–Aug, fr. Aug–Oct.

• Wet sites in rock crevices or on stream banks in forest understories; 1400–1600 m. Zhejiang (Longquan).

## 74. *PSYCHOTRIA* Linnaeus, Syst. Nat., ed. 10, 2: 906, 929, 1364. 1759, nom. cons.

九节属 *jiu jie shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Cephaelis* Swartz.

Shrubs, small trees, or rarely vines twining and/or climbing by adventitious roots (*Psychotria serpens*), [infrequently dioecious or polygamo-dioecious], unarmed, tissues and/or pubescence often drying dark gray or dark reddish brown. Raphides present. Leaves opposite or rarely in whorls of 3 or 4, often with foveolate and/or pubescent domatia; stipules caducous or infrequently persistent, interpetiolar or sometimes shortly united around stem, entire or 2-lobed, rarely with lobe glandular, inside (i.e., adaxially) at base with well-developed colleters, these usually persistent after stipule falls, usually drying red-brown. Inflorescences terminal often becoming displaced to pseudoaxillary or rarely axillary, cymose, corymbose, paniculiform, glomerulate, or capitate, several to many flowered, sessile to pedunculate, bracteate with bracts sometimes reduced or sometimes enlarged or involucre. Flowers sessile to pedicellate, bisexual, usually distylous [or infrequently unisexual]. Calyx limb (4 or)5(or 6)-lobed. Corolla white, yellow, or flushed with pink, funnelform to tubular, inside glabrous or variously pubescent, lobes (4 or)5(or 6), valvate in bud, sometimes abaxially with thickenings or horns near apex. Stamens (4 or)5(or 6), inserted in corolla tube or throat, usually included or partially exerted in long-styled flowers and exerted in short-styled flowers; filaments short to developed; anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, basal; stigmas 2, linear to subcapitate, usually exerted in long-styled flowers and included in short-styled flowers. Fruit red, orange, or infrequently white (*P. serpens*), purple (*P. manillensis*), or black (*P. cephalophora*, *P. straminea*), drupaceous, fleshy, ellipsoid, ovoid, or subglobose, with calyx limb persistent or infrequently deciduous, with pedicels or stipitate base sometimes elongating; pyrenes 2, 1-celled, each with 1 seed, plano-convex, bony, on dorsal (i.e., abaxial) surface smooth or longitudinally ridged, on ventral surface smooth or longitudinally sulcate; seeds medium-sized, ellipsoid to plano-convex, with testa thin; endosperm fleshy or corneous, sometimes ruminant; embryo small, basal; cotyledon flat.

About 800–1500 species: tropical and subtropical Africa, America, Asia, Madagascar, and Pacific islands; 18 species (five endemic) in China.

The genus *Cephaelis* was separated from *Psychotria* by numerous authors in the 19th and first part of the 20th centuries, based on inflorescence form: *Cephaelis* included species with capitate inflorescences with enlarged, often involucre bracts, vs. branched inflorescences with smaller bracts in *Psychotria*. However, it is now clear that this inflorescence arrangement has arisen far more than once within this group and that “*Cephaelis*” actually included a polyphyletic set of species that are more closely related to various other species of *Psychotria* than to each other. Consequently, recent authors (e.g., Steyermark, Mem. New York Bot. Gard. 23: 443–717. 1972; Taylor, Opera Bot. Belg. 7: 261–270. 1996) have formally synonymized *Cephaelis* with *Psychotria*.

A recent treatment of *Psychotria* in the Philippines (Sohmer & Davis, Sida, Bot. Misc. 27: 1–247. 2007) does not consider any species or names outside its study area but includes some Chinese species that occur in that region. However, these authors have a partially different species concept and morphological interpretation of inflorescence characters from C. M. Taylor, so their work is not completely comparable to the treatment here.

- 1a. Climbing or creeping vines or lianas with adventitious roots, often on tree trunks or rocks; fruit white ..... 14. *P. serpens*
- 1b. Erect, self-supporting subshrubs, shrubs, and small trees growing on ground; fruit orange or red.
  - 2a. Leaves strigose to hirsute in similar density on both sides; stipules 15–25 mm, deeply bilobed ..... 12. *P. pilifera*
  - 2b. Leaves glabrous adaxially, or pubescent adaxially with distinctly different pubescence than on abaxial surface; stipules 1.5–20 mm, entire to bilobed.
    - 3a. Inflorescences capitate, pedunculate, and enclosed by a cupuliform involucre formed of fused bracts ..... 9. *P. laui*
    - 3b. Inflorescences capitate to branched, sessile to pedunculate, and variously bracteate, bracts when present free and not forming a single involucre.
      - 4a. Calyx limb 1.3–3 mm, shallowly to deeply lobed.

- 5a. Inflorescences thyriform to paniculate, branched to 2 or 3 orders and with well-developed secondary axes ..... 18. *P. yunnanensis*
- 5b. Inflorescences capitate, subcapitate, or congested-cymose, unbranched or branched to 1 or 2 orders but without well-developed secondary axes.
  - 6a. Inflorescences capitate to densely congested-cymose, subglobose in outline, sessile or with peduncle to 1 cm ..... 13. *P. prainii*
  - 6b. Inflorescences capitate, subcapitate, or shortly congested-cymose, ellipsoid to ovoid or pyramidal in outline, sessile to pedunculate with peduncles to 6 cm.
    - 7a. Subshrubs, often rhizomatous; leaves with well-developed, generally straight submarginal vein extending along most or all of length of blade ..... 2. *P. calocarpa*
    - 7b. Shrubs or small trees; leaves without submarginal vein or with submarginal vein incomplete or only weakly developed, extending for up to 1/2–2/3 of length of blade.
      - 8a. Inflorescences sessile or with peduncle up to 0.6 cm; stipules 3–12 mm; Hainan ... 7. *P. hainanensis*
      - 8b. Inflorescences pedunculate, peduncle 0.5–6 cm; stipules 8–20 mm; Yunnan ..... 11. *P. morindoides*
- 4b. Calyx limb 0.5–1.2 mm, truncate to deeply lobed.
  - 9a. Inflorescences capitate to subcapitate or congested-cymose, unbranched or branched but without well-developed secondary axes, or with secondary axes but then primary axis not developed.
    - 10a. Flowers subsessile to pedicellate in a single head, with all flowers arising from one axis ..... 3. *P. cephalophora*
    - 10b. Flowers variously sessile to pedicellate in a subcapitate head or congested cyme, flowers arising from more than one point or axis ..... 8. *P. henryi*
  - 9b. Inflorescences thyriform, paniculate, corymbiform, or congested-cymose to laxly cymose, branched, with both primary and secondary axes developed.
    - 11a. Stipules 10–15 mm with at least some of them more than 10 mm; leaves with secondary veins 12–18 pairs with 13 or more pairs on at least some leaves ..... 4. *P. densa*
    - 11b. Stipules 1.5–12 mm with at least some less than 10 mm; leaves with secondary veins 4–12 pairs with less than 12 pairs on at least some leaves.
      - 12a. Inflorescences pyramidal, with primary axis developed and longer than secondary axes ..... 16. *P. symplocifolia*
      - 12b. Inflorescences rounded-corymbiform to broadly pyramidal, with primary axis reduced to developed but not longer than secondary axes.
        - 13a. Stipules fused around stem into a distinct sheath, mostly persistent with leaves; leaves with secondary veins prominulous adaxially ..... 15. *P. straminea*
        - 13b. Stipules interpetiolar, caducous or deciduous, falling before some of leaves; leaves with secondary veins flat or thinly impressed adaxially.
          - 14a. Leaves narrowly elliptic, narrowly elliptic-oblong, narrowly lanceolate, narrowly lanceolate-oblong, or oblanceolate, 4–15 × 1–4.5 cm; stipules at least shortly 2-lobed.
            - 15a. Leaves abaxially with distinctive thickened epidermis often mottled when dry, secondary veins covered by epidermis or visible but flat to only slightly thickened ..... 6. *P. fluviatilis*
            - 15b. Leaves abaxially with epidermis “normal,” thin and not mottled when dry, secondary veins visible, with different epidermal texture from lamina, flat to prominulous.
              - 16a. Plants usually drying dull green, grayish brown, yellowish green, or reddish brown; inflorescences congested-cymose ..... 8. *P. henryi*
              - 16b. Plants usually drying reddish brown to dark brown; inflorescences laxly cymose, corymbiform ..... 17. *P. tutcheri*
    - 14b. Leaves elliptic, broadly elliptic, broadly elliptic-oblong, ovate, lanceolate-oblong, or obovate, 5–23.5 × 2–9 cm; stipules entire to 2-lobed.
      - 17a. Bracts subtending flowers rather well developed, lanceolate to ligulate or triangular, 1.5–3 mm; stipules 2-lobed ..... 5. *P. erratica*
      - 17b. Bracts subtending flowers developed to reduced, triangular, 0.2–1.2 mm; stipules obtuse, acute, rounded, or shallowly emarginate.
        - 18a. Inflorescences sessile or with peduncle to 0.3 cm; leaves with secondary veins not or only weakly forming a submarginal vein ..... 1. *P. asiatica*

- 18b. Inflorescences pedunculate, peduncles 0.1–3.5 cm; leaves with secondary veins free or usually forming a weak to well-developed, looping submarginal vein ..... 10. *P. manillensis*

1. *Psychotria asiatica* Linnaeus, Syst. Nat., ed. 10, 2: 929. 1759.

九节 jiu jie

*Antherura rubra* Loureiro; *Psychotria esquirolii* H. Léveillé; *P. reevesii* Wallich; *P. reevesii* var. *pilosa* Pitard; *P. rubra* (Loureiro) Poiret; *P. rubra* var. *pilosa* (Pitard) W. C. Chen; *Uragoga rubra* (Loureiro) Kuntze.

Shrubs or small trees, 0.5–5 m tall; stems puberulent to glabrous. Petiole 0.7–5 cm, glabrous or rarely puberulent; leaf blade reportedly rather shiny in life, drying papery to leathery, dark red, brownish red, yellowish green, or gray-green, elliptic-oblong, lanceolate-oblong, or rarely oblong-ovate, 5–23.5 × 2–9 cm, adaxially glabrous, abaxially glabrous or puberulent, base acute to obtuse, margins flat to narrowly revolute, apex acute to acuminate or obtuse then abruptly narrowed and acuminate; secondary veins 5–8(–11) pairs, free or weakly forming a broadly looping, incomplete submarginal vein, usually with foveolate and sometimes pilosulous domatia; stipules caducous or sometimes persisting on 2 or 3 nodes, triangular to broadly triangular or broadly ligulate, interpetiolar or shortly united around stem, [3–]6–8 mm, glabrous to puberulent, broadly rounded to obtuse or shallowly emarginate. Inflorescences terminal or sometimes pseudoaxillary, cymose to paniculiform, many flowered, glabrous or usually densely puberulent, sessile and apparently tripartite to shortly pedunculate; peduncle to 0.3 mm; branched portion corymbiform-rounded to broadly pyramidal, 2–10 × 3–5 cm, with 1–3 pairs of developed secondary axes; bracts triangular, 0.2–1 mm; pedicels to 2.5 mm. Flowers subsessile to pedicellate in dichotomous cymes of 3–5. Calyx densely puberulent; hypanthium portion turbinate, 0.8–1.2 mm; limb 0.8–1 mm, subtruncate to denticulate. Corolla white, funnel-form, glabrous outside; tube 2–3 mm, in throat white villous; lobes triangular, 2–2.5 mm. Drupes red, subglobose to broadly ellipsoid, 5–8 × 4–7 mm, with pedicels to 10 mm; pyrenes shallowly 3–5-ribbed. Fl. and fr. year-round.

Thickets or forests in ravines, on hill slopes, or at village margins; near sea level to 1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Taiwan, Yunnan, Zhejiang, also cultivated in Zhejiang [Cambodia, India, Japan, Laos (commonly collected), Malaysia, Thailand, Vietnam (very commonly collected)].

This species has long been called *Psychotria rubra* in China and *P. reevesii* in Vietnam. However, recently Davis et al. (Bot. J. Linn. Soc. 135: 34–52. 2001) matched the Chinese plants to the type specimen of *P. asiatica*, which is thus the correct name for these plants. The objective of their work was limited, however, and they did not address the whole circumscription and range of this species, nor the identity of *P. rubra*. The Chinese specimens treated under this name here closely match the specimens included by them in *P. asiatica*, and the range of this species is here accordingly expanded to include this range. As noted by Davis et al. (loc. cit.), all the flowers seen have the anthers exerted and the stigmas included and positioned near the middle of the corolla tube, thus resembling the short-styled form of distylous species of *Psychotria*.

2. *Psychotria calocarpa* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 315. 1872.

美果九节 mei guo jiu jie

Subshrubs, 0.25–1 m tall, often rhizomatous; stems pilosulous to glabrous. Petiole 0.5–4 cm, glabrous or brown pilosulous; leaf blade drying papery, brownish red, gray, or dark green, elliptic-oblong, elliptic, obovate-oblong, or elliptic-lanceolate, 9.5–17 × 2.5–7 cm, glabrous on both surfaces or densely puberulent to hirtellous abaxially, base cuneate to acute, margins flat, apex acute, acuminate, or rarely obtuse; secondary veins 9–15 pairs, forming a generally straight submarginal vein, without domatia; stipules caducous, ovate to suborbicular, interpetiolar, basal portion 4–10 mm, glabrous or puberulent to hirtellous, 2-lobed, lobes narrowly triangular, 2–6 mm, acuminate to subulate. Inflorescences terminal or pseudoaxillary, congested-cymose, several to many flowered, hirtellous; peduncle 0.8–2 cm; branched portion corymbiform to subglobose, 1–3 × 2–4 cm, branched to 1 or weakly 2 orders; bracts lanceolate to narrowly triangular, 0.8–5 mm; pedicels 1–6 mm. Flowers pedicellate. Calyx glabrous to puberulent; limb ca. 2 mm, deeply lobed; lobes linear to linear-lanceolate, entire to ciliolate. Corolla white; tube ca. 2 mm, white villous inside; lobes elliptic-oblong, obtuse. Drupes red or orange, ellipsoid, 7–8.5 × 4.5–6 mm; pyrenes with 4 or 5 low ridges. Fl. May–Jul, fr. Aug–Feb of following year.

Forests on mountain slopes; 800–1700 m. Xizang, Yunnan [Bangladesh, Bhutan, India, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

This species is used medicinally.

W. C. Chen (in FRPS 71(2): 51. 1999) described the calyx lobes as 4, but they are 5 on all the specimens studied.

3. *Psychotria cephalophora* Merrill, Philipp. J. Sci., C, 3: 438. 1909.

兰屿九节木 lan yu jiu jie mu

*Psychotria kotoensis* Hayata.

Shrubs or small trees, height not noted; stems glabrous. Petiole 1.2–6 cm, glabrous; leaf blade drying papery, pale reddish brown, dark brown, or green sometimes tinged with red-purple, elliptic, elliptic-oblong, or elliptic-ovate, 10–16 × 3.5–7 cm, glabrous on both surfaces, base cuneate to acute, margins flat, apex acute or acuminate; secondary veins 6–12 pairs, free or forming a weak submarginal vein, without domatia; stipules caducous, ovate, interpetiolar or shortly fused around stem, 7–10 mm, glabrous, ciliate, 2-lobed for ca. 1/5 of length, lobes ligulate to triangular. Inflorescences terminal, subcapitate to congested-cymose, several flowered, subsessile to sessile, glabrous to densely hirtellous; bracts triangular to ligulate, 1–3 mm; pedicels to 2 mm. Flowers subsessile to pedicellate. Calyx glabrous; hypanthium portion turbinate, ca. 1 mm; limb ca. 1 mm, lobed for 1/3–1/2; lobes deltoid to narrowly triangular. Corolla

in bud white, funnellform, glabrous outside; tube ca. 1.5 mm, villous inside; lobes triangular-oblong, ca. 1.5 mm. Drupes becoming red then black, ellipsoid to obovoid, 8–10 × 6–8 mm, with pedicels to 7 mm; pyrenes smooth or very shallowly 3- or 4-ribbed. Fl. Apr, fr. Aug.

Broad-leaved forests; below 100–400 m. Taiwan (Lan Yu) [Philippines].

The stipules of these plants have been described by previous authors as acute to obtuse, but these are bilobed on all the specimens studied, although this is difficult to see in many cases because the lobes are usually imbricate in bud.

This name is here provisionally applied to these plants. Sohmer and Davis (Sida, Bot. Misc. 27: 60–63. 2007) excluded the Taiwanese plants from their circumscription of *Psychotria cephalophora*, without providing another name for them (presumably *P. kotoensis* would be available) or delimiting the differences between the two. They noted that the endosperm of *P. cephalophora* is ruminant although the pyrenes are smooth on the outer surface; the Taiwanese specimens studied do appear to have ruminant endosperm.

**4. *Psychotria densa*** W. C. Chen, Acta Phytotax. Sin. 30: 270. 1992.

密脉九节 mi mai jiu jie

Shrubs, 1–3 m tall; stems densely dark hirtellous to tomentulose. Petiole 1.5–7.5 cm, densely hirtellous; leaf blade drying papery or thinly leathery, dark brownish gray or greenish gray, elliptic, elliptic-oblong, or oblong-oblancoate, 10–26 × 4–12.5 cm, glabrous adaxially, hirtellous abaxially with pubescence denser along principal veins, base cuneate to obtuse, margins flat, apex acute or shortly acuminate; secondary veins 12–18 pairs, forming a weak to distinct submarginal vein, without domatia; stipules caducous, broadly triangular to triangular-ovate, interpetiolar, 10–15 mm, densely hirtellous to tomentulose, acute to acuminate or bilobed for 1/10–1/3, lobes ligulate to deltoid, rounded to acute or acuminate. Inflorescences terminal, congested-cymose to thyrsiform, many flowered, densely hirtellous to tomentulose, pedunculate; peduncle 1–3 cm; branched portion pyramidal to rounded, 3–7 × 2.5–7.5 cm; bracts triangular to ovate, 1–4 mm, often glabrescent. Flowers sessile or subsessile. Calyx glabrous; hypanthium portion obconic, ca. 2 mm; limb 0.5–1.2 mm, lobed for ca. 1/2; lobes triangular. Corolla presumably white, tubular, glabrous outside; tube ca. 4 mm, in throat white villous; lobes triangular-oblong, ca. 2 mm. Drupes red, ellipsoid, 8–10 × 5–6 mm; pyrenes 3- or 4-ribbed. Fl. Apr–May, fr. Jun–Jan of following year.

• Forests on mountains; 1200–1700 m. Yunnan (Hekou, Pingbian).

This name was validly published as cited above; the same article was republished later in the same journal in the same year, with this species treated on pp. 484–486. The later treatment is sometimes cited as the place of publication but is superfluous. The protologue described the stipules as “acuminate” and this was illustrated in the figure, but a paratype (*X. Q. Liu 100347*, MO!) has shortly bilobed stipules.

**5. *Psychotria erratica*** J. D. Hooker, Fl. Brit. India 3: 168. 1880.

西藏九节 xi zang jiu jie

Shrubs, 0.4–1 m tall; stems glabrous. Petiole 0.5–5 cm, glabrous to puberulent; leaf blade drying papery to stiffly papery, dark green, greenish brown, or reddish brown, elliptic, broadly elliptic, or obovate, 7–17 × 2–8 cm, glabrous adaxially, glabrous to densely puberulent abaxially, base acute to cuneate, margins flat, apex acute to acuminate; secondary veins 9–12 pairs, not forming a submarginal vein, without domatia; stipules caducous, oblong-lanceolate to broadly ovate, interpetiolar, 5–12 mm, puberulent, strigillose, or hirtellous, 2-lobed for 1/4–1/2, lobes triangular to narrowly triangular sometimes with linear tip 2–9 mm, sometimes erose and glandular. Inflorescences terminal or pseudoaxillary, cymose, sessile to pedunculate, puberulent to densely hirtellous with pubescence sometimes in lines; peduncle to 6.5 cm; branched portion corymbiform, 2.5–4.5 × 4–6 cm, with 1 or 2 pairs of developed secondary axes; bracts ligulate, lanceolate, or narrowly triangular, 0.5–3 mm, sometimes 2-lobed, those subtending flowers 1.5–3 mm; pedicels to 1.5 mm. Flowers subsessile to pedicellate in dichasial cymes of 3–11. Calyx glabrous to puberulent; hypanthium portion obconic, 0.8–1.2 mm; limb 0.8–1.2 mm, lobed for 1/4–1/2; lobes triangular to broadly triangular. Corolla white to pale green, tubular to tubular-funnelform, outside glabrous; tube 3.5–4 mm, densely villous in throat; lobes triangular, ca. 2.5 mm, thickened at apex. Drupes red or yellow, ellipsoid to obovoid, 6–8 × 5–6 mm, with pedicels to 5 mm; pyrenes shallowly 3- or 4-ribbed. Fl. Apr–May, fr. Aug, Oct–Nov.

Subtropical evergreen broad-leaved forests on mountains; 1000–2400 m. Xizang (Médog), Yunnan [Bhutan, India, Nepal].

This species, as represented by Indian specimens and circumscribed here, is quite variable in leaf size and shape, degree of stipule lobing, and inflorescence form (in particular peduncle development).

**6. *Psychotria fluviatilis*** Chun ex W. C. Chen, Acta Phytotax. Sin. 30: 268. 1992.

溪边九节 xi bian jiu jie

Shrubs, 0.4–3 m tall; stems glabrous. Petiole 0.5–1.8 cm, glabrous; leaf blade drying papery to thinly leathery, grayish olive-green, yellowish green, or occasionally dark brown (*Zhang Guicai 488*, MO!), sometimes paler below, oblanceolate, narrowly elliptic, or narrowly elliptic-oblong, 5–11 × 1–3.7 cm, glabrous, abaxially with silvery or mottled thickened epidermis, base acute to cuneate, margins flat, apex deltoid, acute, or acuminate; secondary veins 4–8 pairs, not forming a submarginal vein, without domatia; stipules caducous, lanceolate or triangular, interpetiolar, 4–7 × 2.5–5.5 mm, glabrous, 2-lobed for 1/10–1/4, lobes narrowly triangular to linear, sometimes gland-tipped. Inflorescences terminal or often to pseudoaxillary, cymose-paniculiform, few to several flowered, glabrous, sessile to pedunculate; peduncle to 0.7 cm; branched portion corymbiform or broadly pyramidal, 1–3 × 1–1.5 cm, with 1 or 2 pairs of developed secondary axes; bracts triangular to linear-lanceolate, 0.5–1.5 mm; pedicels to 2 mm. Flowers subsessile and pedicellate in small dichotomous cymes. Calyx glabrous; hypanthium portion obconic, 1–1.5 mm; limb 0.5–1 mm, lobed shallowly or for up to 1/5; lobes broadly triangular. Corolla white, tubular, glabrous outside; tube 3–3.5 mm, in throat white villous; lobes triangular-oblong, 1–1.7 mm. Drupes red, oblong-

ellipsoid or subglobose, 6–7 × 3–6 mm, with pedicels to 10 mm; pyrenes shallowly 3- or 4-ribbed. Fl. Apr–Sep, fr. Aug–Dec.

• Forests along valley streams; 500–1000 m. Guangdong, Guangxi.

This name was validly published as cited above; the same article was republished later in the same journal in the same year, with this species treated on pp. 482–483. The later treatment is sometimes cited as the place of publication but is superfluous.

**7. *Psychotria hainanensis*** H. L. Li, J. Arnold Arbor. 25: 213. 1944.

海南九节 hai nan jiu jie

Shrubs, 0.5–3 m tall; stems glabrous. Petiole 0.4–3.5 cm, glabrous; leaf blade drying papery, grayish brown, grayish green, abaxially paler to silvery, elliptic, oblong-elliptic, lanceolate, or lanceolate-oblong, 4.5–16 × 2–6 cm, glabrous on both surfaces or puberulent abaxially, base acute to cuneate, margins flat, apex acute to acuminate; secondary veins 6–14 pairs, forming a rather straight submarginal vein, without domatia; stipules caducous, subtriangular to ovate, interpetiolar, 3–12 mm, glabrous to puberulent, 2-lobed for 1/3–1/2, lobes linear-lanceolate to subulate. Inflorescences terminal, congested-cymose to subcapitate, few flowered, puberulent to glabrous, sessile to pedunculate; peduncle to 0.6 cm; branched portion subglobose, ca. 2 × 2 cm, without developed axes; bracts linear-lanceolate, 2–7 mm; pedicels 0.5–4 mm. Flowers subsessile to shortly pedicellate. Calyx glabrous; hypanthium portion turbinate, ca. 1 mm; limb 2–3 mm, deeply lobed; lobes linear-lanceolate to narrowly ligulate. Corolla white, glabrous outside; tube ca. 4 mm, white villous in throat; lobes oblong-triangular, 1.5–2 mm, apex incurved. Drupes red, ovoid or elliptic, 7–11 × 4.5–7 mm, with pedicels to 8 mm; pyrenes 3- or 5-ribbed. Fl. Apr–May, fr. Jun–Feb of following year.

• Forests along valley streams; 600–1200 m. Hainan.

In the protologue the stipules were incorrectly described as “*apice longe acuminatis*.” In fact, it is the individual lobes that are long acuminate, while the stipules are deeply bilobed.

**8. *Psychotria henryi*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 179. 1914.

滇南九节 dian nan jiu jie

Shrubs, 0.75–2 m tall; stems puberulent. Petiole 0.4–2 cm, puberulent; leaf blade drying papery, reddish brown, grayish brown, yellowish green, or greenish brown, often paler abaxially, narrowly elliptic or narrowly oblong-lanceolate, 4–14 × 1–4.5 cm, glabrous adaxially, puberulent to glabrous abaxially, base acute to cuneate, margins flat, apex acute to acuminate; secondary veins 6–10 pairs, free or forming a weak looping submarginal vein, without domatia; stipules caducous, ovate to triangular, interpetiolar, 1.5–4 mm, puberulent, 2-lobed for 1/5–1/2, lobes linear-lanceolate to subulate. Inflorescences terminal or pseudoaxillary, subcapitate to congested-cymose, few to several flowered, puberulent to glabrous, sessile to shortly pedunculate; peduncle to 0.5 cm; branched portion subglobose to corymbiform, 0.5–1.5 × 0.6–1.5 cm; bracts triangular, 1–1.5

mm; pedicels to 1 mm. Flowers subsessile to pedicellate. Calyx puberulent; hypanthium portion turbinate, ca. 1 mm; limb 0.8–1.2 mm, shallowly to deeply lobed; lobes triangular to narrowly triangular. Corolla white, funnelform, glabrous outside; tube 1.5–2 mm, densely villous in throat; lobes triangular, 1.2–1.5 mm. Infructescences sometimes expanding, to 2 × 3.5 cm; pedicels to 2 mm. Drupes red, ovoid or globose, 4–7 × 3–5 mm; pyrenes shallowly 3- or 4-ribbed. Fl. May–Jun, fr. Aug–Feb of following year.

Forests; 1100–1500 m. Yunnan [Vietnam].

**9. *Psychotria laui*** Merrill & F. P. Metcalf, Lingnan Sci. J. 16: 403. 1937.

头九节 tou jiu jie

*Cephaelis laui* (Merrill & F. P. Metcalf) F. C. How & W. C. Ko.

Shrubs, 1–2 m tall; stems glabrous. Petiole 0.3–0.6 cm, glabrous; leaf blade drying papery, reddish brown, elliptic, elliptic-oblong, or lanceolate, 5–11 × 1.5–3.5 cm, glabrous on both surfaces, base acute to cuneate, margins flat or weakly crisped, apex acute to shortly acuminate; secondary veins 6–8 pairs, not forming a submarginal vein, without domatia; stipules caducous, triangular, interpetiolar or shortly united around stem, 2–5 mm, glabrous, acute. Inflorescences terminal, capitate, glabrous to puberulent, pedunculate; peduncle 1–3.5 cm; heads 1 or rarely 2, hemispherical, 1–2 cm in diam.; outermost bracts connate into a cupuliform involucre 5–6 mm, marginally irregular. Flowers sessile. Calyx with hypanthium portion turbinate, ca. 2 mm, glabrous; limb ca. 2 mm, deeply 5-lobed; lobes narrowly triangular, densely hirsute, ciliate. Corolla white, funnel-form, glabrous outside; tube 2–3 mm, densely villous in throat inside; lobes subelliptic to triangular, 1–1.2 mm, apex rostrate. Drupes ellipsoid, oblong-ellipsoid, or narrowly ovoid, 6–8 mm, color not noted; pyrenes longitudinally 4- or 5-ribbed. Fl. Jul.

Mountain forests. Hainan (Changjiang, Dongfang) [Vietnam (*Poilarane 21252 P!*)].

The one developed flower seen resembles the long-styled form of distylous *Psychotria* species (*Lau 27455*, MO!). Several Vietnam specimens at P clearly belong to *P. laui*, and this species is here reported from that country as well.

**10. *Psychotria manillensis*** Bartling ex Candolle, Prodr. 4: 522. 1830.

琉球九节木 liu qiu jiu jie mu

Shrubs to 2(–6) m tall; stems glabrous. Petiole 0.5–3.6 cm, glabrous; leaf blade drying thinly leathery, reddish brown to reddish gray, elliptic-oblong, oblong-lanceolate, or obovate-elliptic, 9–18.7[–20.5] × 3–8 cm, glabrous on both surfaces, base acute to cuneate, margins flat to thinly revolute, apex acute or shortly acuminate; secondary veins [6 or] 7–12 pairs, free or usually forming a looping submarginal vein, sometimes with foveolate domatia; stipules caducous, triangular to ovate, interpetiolar, 3–6[–10] mm, glabrous, acute to obtuse. Inflorescences terminal or pseudoaxillary, cymose, glabrous [to puberulent], pedunculate; peduncle [0.1–]0.5–3.5 cm; branched portion cor-

ymbiform to broadly pyramidal, 2.5–6 × 3–7 cm; bracts triangular to broadly triangular, 0.3–1.5[–5.8] mm, those subtending flowers 0.3–1.2 mm; pedicels to 2 mm. Flowers sessile to pedicellate. Calyx glabrous; hypanthium portion obconic, 0.8–1 mm; limb 0.5–0.8 mm, lobed for ca. 1/2; lobes broadly triangular. Corolla white, tubular-funnelform, glabrous outside; tube ca. 2[–4] mm, densely villous in throat; lobes triangular, ca. 2 mm. Drupes red or purple, ellipsoid or ovoid-ellipsoid, 8–12[–15] × 5–6 mm; pyrenes 3- or 4-ribbed. Fl. Jun–Aug, fr. Aug.

Broad-leaved forests; near sea level [to 900 m in the Philippines]. Taiwan (Lan Yu) [Japan (Ryukyu Islands), Philippines].

Measurements included here in brackets were reported by Sohmer and Davis (Sida, Bot. Misc. 27: 138–142. 2007) for Philippine plants of this species.

**11. *Psychotria morindoides*** Hutchinson in Sargent, Pl. Wilson. 3: 414. 1916.

聚果九节 ju guo jiu jie

Shrubs, 0.5–3 m tall; stems densely hirtellous to tomentulose-pilosulous or glabrescent. Petiole 1.2–6 cm, densely hirtellous to glabrescent; leaf blade drying papery, dark reddish brown, gray, grayish brown, or greenish gray, oblanceolate, obovate, elliptic-obovate, or elliptic-oblong, 8–30 × 3–11.5 cm, glabrous adaxially, puberulent to densely hirtellous abaxially, base acute to obtuse and sometimes oblique, margins flat, apex acute to acuminate and sometimes curved; secondary veins 8–15 pairs, free or forming only a weak looping submarginal vein, without domatia; stipules caducous, oblong-ovate, interpetiolar, 8–20 mm, puberulent to densely hirtellous, ciliolate, 2-lobed for 1/4–1/2, lobes narrowly triangular to linear. Inflorescences terminal sometimes becoming pseudoaxillary, capitate to subcapitate, densely hirtellous, many flowered, subsessile to pedunculate; peduncle to 6 cm; head or branched portion ovoid, ellipsoid, or pyramidal in outline, 2–6.5 × 1.5–4 cm; bracts linear, ca. 5 mm. Flowers sessile. Calyx glabrous; hypanthium portion obconic, ca. 1.25 mm; limb 2.5–3 mm, deeply lobed; lobes linear-lanceolate, entire to sparsely ciliate. Corolla white, funnel-form to tubular-funnelform, outside glabrous; tube ca. 4 mm, densely villous in throat; lobes lanceolate, 1.2–1.5 mm, apex thickened. Drupes red, ellipsoid, 6–8 × 3–5 mm; pyrenes 3- or 5-ribbed. Fl. Apr–Nov, fr. Jul–Dec.

Forests along valley streams; 1000–2300 m. Yunnan [Laos, Thailand (Rock 1773, A!)].

**12. *Psychotria pilifera*** Hutchinson in Sargent, Pl. Wilson. 3: 415. 1916.

毛九节 mao jiu jie

Shrubs, 0.75–1.75 m tall; stems densely villous to villosulous. Petiole 1–5 cm, densely villous; leaf blade drying papery or membranous, dark reddish brown, elliptic, elliptic-obovate, or elliptic-oblong, 8–23 × 3–11 cm, moderately to densely and similarly strigose to hirsute on both surfaces, base acute or obtuse to rounded, margins flat and ciliate, apex acute to shortly acuminate with tip to 1 cm and sometimes curved; secondary veins 5–15 pairs, not forming a submarginal vein, apparently without domatia; stipules caducous to tardily deciduous, ovate-

triangular, interpetiolar, 15–25 mm, densely hirsute to villosulous, 2-lobed for ca. 1/2, lobes narrowly triangular, acuminate to caudate. Inflorescences terminal becoming pseudoaxillary, congested-cymose to subcapitate, densely hirsute or villous, pedunculate; peduncle 3–6.5 cm; branched portion pyramidal to subglobose, 2–3.5 × 2–5 cm; bracts linear-lanceolate, 4–10 mm, ciliate, acuminate. Flowers subsessile. Calyx glabrescent to sparsely villosulous; hypanthium portion obconic, ca. 1 mm; limb 2.5–3.5 mm, lobed for ca. 2/3; lobes narrowly triangular to linear-lanceolate. Corolla in bud funnelform, outside villosulous, to 4 mm. Drupes red, oblong-ellipsoid, 8–10 × 4–5 mm, sparsely villosulous to glabrescent; pyrenes 3- or 4-ribbed. Fl. Jul, fr. Aug–Dec.

• Forests in ravines; 1300–1700 m. Yunnan.

The protologue described the inflorescences as sometimes axillary, but this appears to be a description of the position separated here as pseudoaxillary. W. C. Chen (in FRPS 71(2): 59. 1999) described the petioles as becoming glabrescent with age and the secondary leaf veins as impressed above, but these conditions have not been seen on any of the specimens studied.

**13. *Psychotria prainii*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 324. 1911.

驳骨九节 bo gu jiu jie

*Cephalis siamica* Craib; *Psychotria siamica* (Craib) Hutchinson.

Shrubs, 0.5–2 m tall; stems densely hirtellous. Leaves opposite but sometimes crowded at stem apices; petiole 0.2–2.2 cm, densely hirtellous; blade drying papery or thinly leathery, dark reddish brown, grayish green, or brownish green, elliptic, elliptic-oblong, lanceolate-oblong, obovate-oblong, or ovate, 3–15 × 1.3–6.5 cm, glabrous adaxially, densely hirtellous to hirsute throughout abaxially, base acute to obtuse, margins flat, apex shortly obtuse and sometimes then shortly acuminate; secondary veins 6–11 pairs, free or forming a weak, looping, incomplete submarginal vein, without domatia; stipules caducous, ovate, interpetiolar, 5–15 mm, densely hirtellous, 2-lobed for 1/3–1/2, lobes subulate. Inflorescences terminal or pseudoaxillary, capitate to densely congested-cymose, several flowered, hirtellous, sessile to pedunculate; peduncle to 1 cm; head subglobose, 1–1.5 × 1–1.5 cm; bracts narrowly triangular, 3–7 mm. Flowers sessile or subsessile. Calyx hirtellous; hypanthium portion obconic, ca. 1 mm; limb 1.5–3.5 mm, deeply lobed; lobes narrowly lanceolate, spatulate, or narrowly elliptic, ciliolate. Corolla white, funnelform, outside glabrous except pilosulous on tips of lobes; tube ca. 3 mm, densely villous in throat; lobes triangular-ovate, ca. 1.5 mm. Drupes red, ellipsoid or obovoid, 5–8 × 4–5 mm; pyrenes shallowly 4- or 5-ridged. Fl. May–Aug, fr. Jul–Nov.

Rocky thickets, forests in ravines, mountain slopes; 1000–1700 m. Guangdong (Yangshan), W Guangxi, SW Guizhou, Yunnan [Laos, Thailand, Vietnam].

This species is used medicinally.

The illustration of the corollas of this species in FRPS (71(2): 56, t. 14, f. 5–9. 1999) does not agree with the specimens seen; in particular, the tube illustrated is too short in relation to the lobes. No differences

are evident between specimens of *Psychotria siamica* and of *P. prainii*, so the former are here synonymized.

**14. *Psychotria serpens* Linnaeus, Mant. Pl. 2: 204. 1771.**

蔓九节 man jiu jie

*Psychotria scandens* Hooker & Arnott.

Climbing or creeping vines or lianas, to 6 m or more, rather fleshy, juvenile stems appressed to substrate with adventitious roots, reproductive stems spreading at apex; stems glabrous. Petiole 1–10 mm, glabrous; leaf blade drying papery to leathery, pale green, dark reddish green, reddish brown, or dark brown, often paler below, ovate or obovate on juvenile stems and elliptic, elliptic-oblong, lanceolate, oblanceolate, or obovate-oblong on reproductive stems, 0.7–9 × 0.5–3.8 cm, glabrous, base acute to obtuse, margins plane or sometimes thinly revolute, apex acute, obtuse, or sharply acuminate; secondary veins not visible or 3–10 pairs, not forming a submarginal vein, without domatia; stipules caducous, triangular to ovate, interpetiolar or shortly united around stem, 2–3 mm, glabrous, acute to rounded. Inflorescences terminal, cymose, glabrous to puberulent, few to many flowered, branched for 3–5 orders, pedunculate; peduncle 0.5–3 cm; branched portion corymbiform, 1–5 × 1–5.5(–10) cm; bracts subtending secondary axes 1–2 mm and triangular or often leaflike and 3–6 mm, those subtending pedicels triangular, 0.2–1.5 mm; pedicels 0.5–1.5 mm. Flowers pedicellate. Calyx glabrous to puberulent; hypanthium portion obconic, 0.8–1 mm; limb flared, 0.5–1 mm, partially lobed; lobes triangular, ca. 0.5 mm. Corolla white, funnelform, outside glabrous to usually puberulent; tube 1.5–3 mm, in throat densely villous; lobes ligulate-oblong, 1.5–2.5 mm. Drupes white, subglobose or ellipsoid, 4–7 × 2.5–6 mm, with pedicels to 5 mm; pyrenes shallowly 4- or 5-ribbed. Fl. Apr–Jun, fr. year-round.

Thickets or forests in ravines, mountains, hills, flat lands; below 100–1400 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Zhejiang [Cambodia, Japan, N Korea, Laos, Thailand, Vietnam].

This species is used medicinally.

W. C. Chen (in FRPS 71(2): 60. 1999) described the stems, petioles (but not the leaf blades), inflorescence axes, and calyces as spreading pubescent, but this has not been seen on any of the specimens studied nor reported by other authors.

This species is commonly collected and morphologically quite variable, including in drying color, leaf size and shape, inflorescence size, and fruit size. The climbing habit and white fruit of this species are unusual in the genus but similar to some other species of Asian *Psychotria* (Sohmer & Davis, Sida, Bot. Misc. 27: 1–247. 2007). The name *P. ixoroides* Bartling ex Candolle has been considered a synonym of *P. serpens* by some authors, notably Merrill, but Sohmer and Davis (loc. cit.: 41–45) considered *P. ixoroides* an accepted species in the Philippines. However, they did not make any comparison there with *P. serpens*. *Psychotria serpens* is also similar to *P. sarmentosa* Blume, which was considered a distinct species by Sohmer (in Dassanayake, Revis. Handb. Fl. Ceylon 6: 349–352. 1987) again without any comparison to *P. serpens*.

**15. *Psychotria straminea* Hutchinson in Sargent, Pl. Wilson. 3: 416. 1916.**

黄脉九节 huang mai jiu jie

Shrubs, 0.5–3 m tall; stems glabrous. Petiole 0.5–3.5 cm, glabrous; leaf blade drying papery to membranous, yellowish green, often pale below, elliptic, elliptic-oblong, oblanceolate, or obovate, 5.5–29 × 0.8–10.5 cm, glabrous on both surfaces, base cuneate to obtuse, margins flat, apex acuminate or acute; secondary veins 5–10 pairs, thinly prominulous adaxially, free or forming an incomplete looping submarginal vein, without domatia; stipules persistent on apical nodes, triangular to ovate or elliptic, shortly fused around stem, 2.5–6.7 mm (including lobes), glabrous, 2-lobed, lobes linear, 0.5–1.2 mm, often tipped with a caducous gland. Inflorescences terminal, few flowered, cymose, glabrous, pedunculate; peduncle 1–2.5 cm; branched portion corymbiform, 1–5 × 1.5–4 cm, branched to 1–3 orders; bracts triangular, 0.2–1 mm; pedicels 1.5–4 mm. Flowers pedicellate in dichotomous cymes of 3–7. Calyx glabrous; hypanthium portion obconic, ca. 1 mm; limb ca. 1 mm, lobed shallowly or to 1/2; lobes triangular. Corolla white or pale green, tubular-funnelform, glabrous outside; tube 1.5–2 mm, villous in throat; lobes ovate-triangular, 1.5–2.5 mm. Drupes red or perhaps ultimately black, subglobose or ellipsoid, 7–13 × 4–9 mm, with pedicels or stipes to 10 mm; pyrenes smooth or shallowly 3- or 4-ridged. Fl. Jan–Jul, fr. Jun–Jan of following year.

Forests in ravines, hill slopes; 100–2700 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

W. C. Chen (in FRPS 71(2): 52. 1999) described the fruit as black at maturity, and the dried fruit seen have this color; but it remains to be confirmed in living fruit by field observations. Some other *Psychotria* species have fruit that are red at maturity but dry black, while some species have fruit that turn red then ultimately black when ripe.

**16. *Psychotria symplocifolia* Kurz, Forest Fl. Burma 2: 11. 1877.**

山矾叶九节 shan fan ye jiu jie

Shrubs or small trees, 1–5 m tall; stems glabrous. Petiole 0.5–3.5 cm, glabrous; leaf blade drying papery to leathery, dark reddish green, brownish green, or clear green, oblong-obovate, elliptic-obovate, or elliptic-lanceolate, 6–12.7 × 2–6 cm, glabrous on both surfaces, base cuneate to acute, margins flat to thinly revolute, apex shortly and abruptly acuminate; secondary veins 6–12 pairs, free or forming a weak, incomplete, looping submarginal vein, sometimes with foveolate domatia; stipules caducous, ovate, interpetiolar or shortly fused around stem, 6–12 mm, glabrous outside (abaxially), inside (adaxially) densely villous, acuminate, entire or 2-denticulate. Inflorescence terminal, cymose-paniculiform, puberulent to hirtellous with pubescence often in lines, often glabrescent with age, pedunculate; peduncle 1–2.5 cm; branched portion pyramidal, 2.5–6 × 1.5–2.5 cm, with 2 or 3 pairs of developed secondary axes; bracts triangular, 0.1–1 mm. Flowers sessile and subsessile in glomerulate groups. Calyx glabrous; hypanthium portion turbinate, ca. 1 mm; limb ca. 0.5 mm, truncate to shallowly lobed; lobes triangular. Corolla presumably white, salverform to funnelform, glabrous outside; tube ca. 2 mm, in throat white villous; lobes ovate-triangular, 1.5–2.2 mm. Drupes red, ellipsoid, 6–9 × 4–6 mm; pyrenes with 1 longitudinal ridge. Fl. Feb–Apr, fr. Jun.

Forests on mountains; 1200–2300 m. Yunnan [India, Myanmar, N Thailand].

**17. *Psychotria tutcheri* Dunn, J. Bot. 48: 324. 1910.**假九节 *jia jiu jie*

Shrubs, 0.5–4 m tall; stems puberulent to glabrous. Petiole 0.5–2 cm, puberulent to glabrous; leaf blade drying papery to thinly leathery, pale or usually reddish brown to dark brown, narrowly elliptic, narrowly lanceolate-oblong, narrowly lanceolate, or narrowly elliptic-oblong, 5.5–15 × 1.5–4 cm, glabrous adaxially, glabrous to puberulent abaxially, base cuneate to acute, margins flat, apex acuminate or caudate-acuminate; secondary veins 4–8 pairs, free or forming a weak, looping, submarginal vein, without or rarely with pilosulous domatia; stipules caducous, ovate-triangular, triangular, or lanceolate, interpetiolar, 2–8 mm, glabrous to puberulent, 2-lobed for 1/4–1/2, lobes narrowly triangular to linear. Inflorescences terminal and sometimes pseudoaxillary or rarely in uppermost leaf axils (*He Guosheng* 6040, MO!), cymose, densely puberulent, sessile to pedunculate; peduncle to 0.6 cm; branched portion corymbiform, 1.5–6 × 1–4 cm, with 1 or 2 pairs of developed secondary axes; bracts lanceolate to triangular, 0.3–2 mm; pedicels to 0.5 mm. Flowers sessile to subsessile in congested small cymes. Calyx puberulent to glabrescent; hypanthium portion obconic to turbinate, 0.8–1 mm; limb 0.5–0.8 mm, lobed shallowly or up to 1/2; lobes broadly triangular. Corolla white or greenish white, tubular, glabrous outside; tube 2–3 mm, in throat white villous; lobes oblong-lanceolate, 1.5–2 mm. Drupes subglobose, 5–7 × 4–6 mm, color unknown; pyrenes shallowly 3- or 4-ribbed to subsmooth. Fl. Apr–Jul, fr. Jun–Dec.

Thickets or forests in ravines or on hill slopes; 200–1000 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

W. C. Chen (in FRPS 71(2): 54. 1999) described leaf sizes and secondary vein numbers that are unusually large, to 22 × 6 cm and 13

pairs, respectively; these measurements have not been seen on any specimens studied nor reported by any other authors.

**18. *Psychotria yunnanensis* Hutchinson in Sargent, Pl. Wilson. 3: 414. 1916.**云南九节 *yun nan jiu jie**Psychotria kwangsiensis* H. L. Li.

Shrubs, 1–4 m tall; stems glabrous. Petiole 1–5.5 cm, glabrous; leaf blade drying papery to membranous, dark brown or greenish brown, sometimes paler below, obovate-oblong, elliptic, ovate-oblong, or oblanceolate, 9–30.5 × 3–11 cm, glabrous on both surfaces or puberulent to hirtellous along principal veins abaxially, base acute to obtuse, margins flat, apex acuminate or acute; secondary veins 8–16 pairs, not forming a submarginal vein, without domatia; stipules caducous, ovate, interpetiolar, 6–15 mm, glabrous or hirtellous in basal portion, 2-lobed for 1/4–1/3, lobes narrowly triangular, acuminate. Inflorescences terminal or pseudoaxillary, thyrsiform to panicle, many flowered, puberulent or hirtellous in lines often becoming glabrescent; peduncle 1–6 cm; branched portion pyramidal to broadly pyramidal, 3–10 × 2.5–6.5 cm, with 1 or 2 pairs of well-developed secondary axes, with 3–11 glomerules or cymes; bracts triangular to lanceolate, 1–10 mm, acuminate; pedicels to 3 mm. Flowers subsessile to pedicellate in groups of 5–15. Calyx glabrous; hypanthium portion obconic, ca. 1 mm; limb campanulate, 1.3–2.5 mm, lobed shallowly to deeply; lobes deltoid to narrowly triangular or narrowly lanceolate. Corolla white, salverform, outside glabrous; tube ca. 5 mm, in throat villous; lobes elliptic-oblong, ca. 3 mm. Drupes ellipsoid or subglobose, 6–12 × 4–7 mm, color not noted; pyrenes 4- or 5-ribbed. Fl. Apr–Dec.

• Forests in ravines, hill slopes; 800–2300 m. Guangxi (Napo), Xizang (Médog), Yunnan.

**75. *PSYDRAX* Gaertner, Fruct. Sem. Pl. 1: 125. 1788.**假鱼骨木属 *jia yu gu mu shu*

Chen Tao (陈涛); Charlotte M. Taylor, Henrik Lantz

Shrubs or small trees [or sometimes scandent], unarmed. Raphides absent. Leaves opposite [or sometimes ternate], sometimes with domatia; stipules persistent, interpetiolar or shortly fused to petioles or united around stem, generally triangular to ovate. Inflorescences axillary, cymose and several flowered [or rarely 1-flowered], sessile to pedunculate, bracteate or bracts reduced. Flowers subsessile to pedicellate, bisexual, monomorphic. Calyx limb truncate or 4- or 5-dentate. Corolla white to yellow, tubular to funnelform, inside variously pubescent; lobes 4 or 5, valvate in bud, markedly reflexed at anthesis. Stamens 4 or 5, inserted in corolla throat, partially to fully exerted; filaments developed, reflexed at anthesis; anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, pendulous from apical placentas; stigma exerted, ovoid to cylindrical, bifid, with style attachment recessed. Fruit generally yellow, drupaceous, fleshy, subglobose to ellipsoid or sometimes dicoccos, with calyx limb persistent; pyrenes 2, 1-celled with 1 seed, bony or cartilaginous; seeds medium-sized, ellipsoid, cylindrical, or plano-convex; testa membranous; endosperm fleshy; radicle ascending.

About 100 species: tropical Africa and Asia; one species in China.

The species now treated in *Psydrax* were long included in *Canthium*, but they were separated out and *Psydrax* was revived as a genus by Bridson (Kew Bull. 40: 687–725. 1985), subsequently supported by Lantz and Bremer (Bot. J. Linn. Soc. 146: 272–276. 2004). The type species was published as "*Psydrax dicoccos*," using for the epithet a Greek term that is presumably analogous to "dicoccus" or "dicocum" (cf. Stearn, Botanical Latin. 1983, Group II nouns and Group A adjectives, respectively). Bridson was the first author to accept *Psydrax* in almost two centuries, and she clearly and explicitly gave feminine endings to all its species including the type, *P. dicocca*. Thus ICBN Art. 62.1 seems to apply here: the assignment of gender to a genus is based on predominance of usage, not the original publication, and *Psydrax* is here treated as feminine and the epithet of our species as adjectival following Bridson. Bridson also suggested that *P. dicocca* is restricted to Sri Lanka and S India and the Chinese and Malesian plants that have long gone under that name are not conspecific; however, no differences are evident on the specimens studied, and further resolution of this is outside the scope of the current work.

**1. *Psydrax dicocca*** Gaertner, Fruct. Sem. Pl. 1: 125. 1788 [“*dicoccos*”].

假鱼骨木 jia yu gu mu

Shrubs to trees, to 15 m tall; branches compressed or quadrangular becoming terete, glabrous. Petiole 6–15 mm, glabrous; leaf blade drying leathery, shiny on both surfaces, dark green adaxially, and pale brown abaxially, ovate, elliptic, ovate, ovate-elliptic, or ovate-lanceolate, 4–10 × 1.5–4 cm, glabrous on both surfaces, base cuneate to obtuse, margins often crisped, apex shortly to long acuminate, acute, or obtuse; secondary veins 3–5 pairs, in abaxial axils sometimes with small foveolate domatia; stipules 3–5 mm, glabrous, acute to shortly aristate. Inflorescences 2–3.5 cm, cymose, umbelliform, or fasciculate, puberulent; peduncle 3–8 mm; bracts reduced; pedicels 3–8 mm. Calyx glabrous; ovary portion obconic to cupuliform, 1–1.2 mm; limb ca. 0.5 mm, truncate or usually shallowly 5-dentate. Corolla greenish white or pale yellow, funnelform, outside glabrous; tube ca. 3 mm, tomentose in throat; lobes 5, triangular to ligulate, 2.5–3 mm, acute. Stigma ca. 1 mm. Drupes obovoid to ellipsoid or subglobose, often weakly dicoccos and/or somewhat flattened, 8–10 × 6–8 mm, glabrous; pyrenes rugose. Fl. Jan–Aug, fr. Jun–Nov.

Sparse forests or thickets at low to middle elevations, broad-leaved forests; 100–600 m. Guangdong, Guangxi, Hainan, Xizang, Yunnan [India, Indochina, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand; Australia].

The filaments are bent at ca. 180° at anthesis, so the anthers are fully reflexed and held parallel to the corolla tube but upside-down. W. C. Ko (in FRPS 71(2): 11. 1999, as *Canthium dicoccum*) described the corolla lobes as slightly shorter than the tube, but on several specimens studied these structures appear to be essentially equal in length. The fruit color at maturity seems not to have been noted by any authors or collectors.

The varieties recognized by W. C. Ko (loc. cit.: 11–13) are treated here for reference. In addition to the characters given in the key below,

W. C. Ko distinguished *Canthium dicoccum* var. *dicoccum* by its stigmas entire to bilobed and *C. dicoccum* var. *obovatifolium* by its stigmas entire or often bifid or emarginate; however, the stigmas of all of these plants are held together and appear entire when young, then spread and become shallowly to markedly bifid at anthesis. Thus, the stigma distinctions may be developmental rather than population-level differences.

- 1a. Leaf blade ovate, elliptic, or ovate-lanceolate; flowers in axillary cymes; fruit obovoid to ellipsoid ..... 1a. var. *dicocca*
- 1b. Leaf blade obovate or ovate-elliptic; flowers 4–6 in axillary fascicles; fruit subglobose or ellipsoid ..... 1b. var. *obovatifolia*

**1a. *Psydrax dicocca* var. *dicocca***

假鱼骨木(原变种) jia yu gu mu (yuan bian zhong)

*Canthium dicoccum* (Gaertner) Merrill; *C. didymum* C. F. Gaertner; *Plectronica dicocca* (Gaertner) Merrill; *P. didyma* (C. F. Gaertner) Merrill.

Leaf blade ovate, elliptic, or ovate-lanceolate. Inflorescences cymose. Stigma entire. Fruit obovoid or obovoid-ellipsoid. Fl. Jan–Aug, fr. Jun–Nov.

Sparse forests or thickets at low to middle elevations; 100–600 m. Guangdong, Guangxi, Hainan, Xizang (Médog), Yunnan [India, Indochina, Indonesia, Malaysia, Philippines, Sri Lanka; Australia].

**1b. *Psydrax dicocca* var. *obovatifolia* (G. A. Fu) Lantz, comb. nov.**

倒卵叶假鱼骨木 dao luan ye jia yu gu mu

Basionym: *Canthium dicoccum* var. *obovatifolium* G. A. Fu, Bull. Bot. Res., Harbin 5(1): 183. 1985.

Leaf blade obovate or ovate-elliptic. Inflorescences fasciculate, 4–6-flowered. Stigma entire or often bifid or emarginate. Fruit subglobose or ellipsoid. Fl. May–Jun.

- Broad-leaved forests. Hainan (Tunchang).

**76. *RICHARDIA* Linnaeus, Sp. Pl. 1: 330. 1753.**

墨苜蓿属 mo mu xu shu

Chen Tao (陈涛); Charlotte M. Taylor

*Ricardia* Adanson; *Richardsonia* Kunth.

Herbs, annual or perennial, unarmed. Raphides present. Leaves opposite, without domatia; stipules persistent, interpetiolar and fused to petioles or leaf bases, truncate to rounded, setose. Inflorescences terminal, capitate, several to many flowered, pedunculate and enclosed by paired leaflike bracts (or sessile with involucre leaves in other morphological interpretations), bracteate. Flowers sessile, bisexual, monomorphic. Calyx with ovary portion turbinate to globose, limb deeply 4–8-lobed. Corolla white or pink, funnel-form, inside glabrous or pubescent at throat; lobes 4–6, valvate in bud. Stamens 3, 4, or 6, inserted in corolla throat, exerted; filaments developed; anthers dorsifixed near middle. Ovary 3- or 4-celled, ovules 1 in each cell, axile and attached at middle of septum; stigmas 3 or 4, linear or spatulate, exerted. Fruit schizocarpous, subglobose to obovoid or tricoccos, dry, bony, with calyx limb deciduous; mericarps 3 or 4, indehiscent, 1-celled with 1 seed, ellipsoid to angled, usually papillose to muricate on dorsal surface (i.e., abaxially) and with 1 or more grooves and sometimes papillose to muricate on ventral surface (i.e., adaxially); seeds medium-sized, ellipsoid to plano-convex; endosperm corneous; cotyledon leaflike; radicle cylindrical, hypogeous.

Fifteen species: widespread in the Antilles and North and South America, three species naturalized in the Old World tropics; two species (both introduced) in China.

As noted by Chaw and Peng (J. Taiwan Mus. 40: 71–83. 1987), Asian collections of *Richardia* have long been confused in herb. with various other weedy Rubiaceae. *Richardia* was studied in detail by Lewis and Oliver (Brittonia 26: 271–301. 1974). The synonymous name *Richardsonia* has

frequently been used for this genus, including in older references about invasive weeds. H. S. Lo (in FRPS 71(2): 203, 1999) described the flowers as sometimes polygamo-dioecious, but the origin of this description is unknown. Lewis and Oliver did not report this condition, although they did mention that the plants frequently have both chasmogamous and cleistogamous flowers. H. S. Lo also described the anthers as dorsifixed near the base, but other authors have all considered them to be dorsifixed near the middle, which agrees with specimens studied.

*Richardia stellaris* (Chamisso & Schlechtendal) Steudel is naturalized in Australia and perhaps may be expected in China; it can be recognized by its narrowly triangular to narrowly elliptic, sharply acute leaves.

- 1a. Mature mericarps somewhat dorsiventrally flattened, with 2 broad parallel depressions along length of inner (i.e., adaxial) face ..... 1. *R. brasiliensis*  
 1b. Mature mericarps triangular to somewhat rounded, with 1 narrow groove along length of inner (i.e., adaxial) face ..... 2. *R. scabra*

**1. *Richardia brasiliensis*** Gomes, Mem. Ipecacuanha Brasil, 31. 1801.

巴西墨苜蓿 *ba xi mo mu xu*

Herbs, annual, decumbent or suberect, to 80 cm or longer; stems flattened to subterete, hispidulous or scaberulous and hirsute. Petiole 5–10 mm, hispidulous to pilosulous; leaf blade drying membranous to thickly papery, ovate, elliptic, or lanceolate, 1–5 × 0.5–3.5 cm, both surfaces scaberulous to glabrescent, base acute to cuneate, apex acute to obtuse; stipule sheaths 1–3 mm, pilose to pilosulous, with 3–11 setae 2–4 mm. Inflorescences ca. 1 cm in diam. (not including leaflike bracts or subtending leaves). Calyx with ovary portion obovoid, 1–1.5 mm, densely papillose or hispidulous to smooth; lobes 6, lanceolate or narrowly lanceolate, 1.5–3.5 mm, glabrescent, margins ciliate, apex acute. Corolla white, glabrous inside and outside; tube 3–8 mm; lobes 6, 1–3 mm. Fruit with mericarps 3, ellipsoid to obovoid, laterally somewhat dorsiventrally flattened, 2–3 mm, dorsally papillose to subsmooth, ventrally with 2 broad parallel grooves along length of face. Fl. and fr. Feb–Sep.

Wastelands; ca. 300 m. Naturalized in Guangdong and Taiwan [native to South America; adventive and naturalized occasionally throughout Old World tropics].

This species was reported as naturalized in Taiwan by Ou (Bull. Exp. Forest Natl. Chung Hsing Univ. 8: 11–30, 1987, article not seen, cited by Wu et al., Taiwania 49: 16–31, 2004) and later by Wu et al. (loc. cit.) but not by other contemporaneous authors (e.g., Chaw &

Peng, J. Taiwan Mus. 40: 71–83, 1987). It was not cited at all by H. Y. Liu and T. Y. A. Yang (Fl. Taiwan, ed. 2, 4: 245–340, 1998).

**2. *Richardia scabra*** Linnaeus, Sp. Pl. 1: 330, 1753.

墨苜蓿 *mo mu xu*

*Richardia pilosa* Ruiz & Pavon; *Richardsonia scabra* (Linnaeus) A. Saint-Hilaire.

Herbs, annual, decumbent or suberect, to 80 cm or longer; stems flattened to subterete, hirsute. Petiole 5–10 mm, hirsute to glabrescent; leaf blade drying membranous to thickly papery, ovate, elliptic, or lanceolate, 1–5 × 0.5–3.5 cm, both surfaces scabrous to glabrescent, base acute to cuneate, apex acute to obtuse; stipule sheaths 1–4 mm, pilose to pilosulous, with 3–15 setae 2–5 mm. Inflorescences ca. 1 cm in diam. (not including leaflike bracts or subtending leaves). Calyx with ovary portion obovoid, 1–1.5 mm, papillose to hispidulous; lobes 6, lanceolate or narrowly lanceolate, 1.5–3.5 mm, glabrescent, margins ciliate, apex acute. Corolla white, glabrous inside and outside; tube 2–8 mm; lobes 6, triangular, 1–3 mm. Fruit with mericarps 3, ellipsoid to obovoid, in cross-section triangular to somewhat rounded, 2–3.5 mm, dorsally densely papillose to hispidulous, ventrally with 1 narrow groove along length of face. Fl. and fr. Feb–Nov.

Wastelands; sea level to 200 m. Naturalized in Guangdong, Hainan, and Taiwan [native to the Antilles and North and South America; adventive and naturalized occasionally throughout Old World tropics].

H. S. Lo (in FRPS 71(2): 203, 1999) noted that this species was introduced to China in the 1980s.

## 77. *RONDELETIA* Linnaeus, Sp. Pl. 1: 172, 1753.

郎德木属 *lang de mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees, unarmed. Raphides absent. Leaves opposite or rarely verticillate, sometimes with domatia; stipules persistent or caducous, interpetiolar, generally triangular. Inflorescence terminal or infrequently axillary, congested-cymose to panicate or corymbiform, several to many flowered, pedunculate, bracteate. Flowers sessile to pedicellate, bisexual, distylous. Calyx limb 4- or 5-lobed, with lobes often unequal. Corolla white, yellow, orange, or red, funnelform or salverform with tube often slender and prolonged, inside glabrous or villous, with thickened annular ring at throat; lobes 4 or 5, imbricate in bud, with margins frequently crisped. Stamens 4 or 5, inserted in corolla throat, included or exserted; filaments short or reduced; anthers dorsifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas; stigmas capitate or 2-lobed, included or exserted. Fruit capsular, globose to depressed globose or dicocous, loculicidally dehiscent into 2 valves with these valves often then splitting, woody to papery, with calyx limb persistent; seeds numerous, small, fusiform or discoid, flattened, winged; endosperm fleshy; embryo small, clavate.

About 20 species: tropical America, one species widely cultivated in tropical regions; one species (introduced) in China.

This genus was formerly circumscribed broadly, to include as many as 140 species, but neotropical taxonomists now separate the species formerly treated in *Rondeletia* s.l. into a number of smaller genera, notably *Arachnothryx* Planchon and *Rogiera* Planchon. The cultivated species treated here belongs to *Rondeletia* s.s.

**1. *Rondeletia odorata*** Jacquin, Enum. Syst. Pl. 16. 1760.

郎德木 lang de mu

Shrubs, to 2 m tall; branches flattened to subterete, hirtellous or villosulous to glabrescent. Leaves opposite, decussate; petiole 1–2 mm, hirtellous to glabrescent; blade drying stiffly leathery, ovate, elliptic, or elliptic-oblong, 2–5 × 1–3.5 cm, adaxially scabrous and often rugulose or bullate, abaxially glabrescent to pilosulous or hirtellous at least on principal veins, base obtuse to subcordate, margins thinly revolute, apex broadly obtuse to acute; secondary veins 3–6 pairs, sometimes with pilosulous to pilose domatia; stipules persistent, triangular, 4–5 mm, strigillose to pilosulous, acute. Inflorescences terminal, cymose, several to many flowered, 2–3 × 3–4.5 cm, hirtellous to hirsute; peduncle 0.7–1.5 cm; bracts narrowly triangular

to ovate or elliptic, 2–15 mm, acute; pedicels 1.5–5 mm. Calyx with ovary portion subglobose, 1.5–2 mm, densely strigillose to pilosulous; limb lobed essentially to base; lobes 5, narrowly triangular to linear, 4–5 mm, sparsely strigillose to puberulent. Corolla bright red with yellow throat, salverform, pilosulous to strigillose outside; tube 12–20 mm; lobes suborbicular, ca. 3.5 × 4 mm, crisped, obtuse to rounded. Capsules globose to depressed globose, 3–4 mm in diam., densely hirtellous or villosulous; seeds ca. 0.8 × 0.5 mm. Fl. Jul–Sep.

Cultivated in Fujian, Guangzhou, and Hong Kong [native to Cuba; cultivated sporadically in tropical regions worldwide].

The cultivated plants apparently do not produce fruit; the description of the fruit here is taken from plants in the native range of this species. The few Chinese species seen are all long styled.

**78. *ROTHMANNIA*** Thunberg, Kongl. Vetensk. Acad. Handl. 37: 65. 1776.

野梔子属 ye zhi zi shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or large trees, unarmed. Raphides absent. Leaves opposite and generally isophyllous or frequently apparently verticillate in whorls of 3 due to marked anisophylly grouping 2 leaves at a node plus an apparently single leaf on a short to reduced axillary branch, sometimes with domatia; stipules persistent, interpetiolar, triangular. Inflorescences terminal or pseudoaxillary, congested-cymose and several flowered or reduced to 1 flower, sessile or pedunculate, bracteate or bracts reduced. Flowers sessile to pedicellate or pedunculate, bisexual, monomorphic. Calyx limb velvety pubescent inside, truncate to 5-lobed. Corolla white to pale green with red or purple to brown spots, narrowly to broadly funnelform or campanulate, often fleshy to leathery, glabrous inside; lobes 5(–7), convolute in bud to left or right depending on species. Stamens 5(–7), inserted in corolla tube, included or partly exserted; filaments short or reduced; anthers dorsifixed. Ovary partially to perhaps completely [1 or] 2-celled, ovules numerous on 2 to several large parietal or perhaps sometimes axile placentas; stigma clavate, with receptive surface confined to shortly bilobed apex, exserted or included. Fruit baccate, thickly fleshy to leathery, globose to ellipsoid and sometimes relatively large, smooth or ridged, yellow to brown, with calyx limb persistent; seeds numerous, large, angled to sublenticular, embedded in pulp.

At least 30 species: tropical Africa, Asia, and Madagascar; one species in China.

*Rothmannia* does not seem at all well known in Asia, as to species or generic limits. The distinctive growth form of *Rothmannia*, with some or several nodes bearing apparently unequal and ternate leaves, is due to the development of one very short axillary branchlet that bears one leaf (the other being reduced to absent). The flowers are often if not usually nocturnal. *Rothmannia* has been described by some authors as having a 1-locular ovary with parietal placentas, at least in Africa (Bridson & Verdcourt, Fl. Trop. E. Africa, Rub. (Pt. 2), 511–512. 1988), but the Asian species have 2-celled ovaries with apparently axile placentas (Puff et al., Rubiaceae of Thailand, 60. 2005).

The African species *Rothmannia longiflora* Salisbury is occasionally cultivated in tropical Asia, including Hong Kong (S. Y. Hu & K. H. Yung 403, MO!). This species has elliptic leaves that are 6–11 × 3–5 cm and relatively large showy flowers, with the tubular calyx limb 5–10 mm and subtruncate or with small lobes 1–4 mm, and a slenderly funnelform, relatively large corolla with tubes 12–14 cm and lobes 1–4 cm.

**1. *Rothmannia daweishanensis*** Y. M. Shui & W. H. Chen, Novon 13: 322. 2003.

大围山野梔子 da wei shan ye zhi zi

Trees, 10–15 m tall; bark dark gray; branches glabrous, lenticellate. Petiole ca. 3 mm, glabrous; leaf blade drying stiffly papery, greenish brown, ovate to elliptic, 10–14 × 4–5 cm, both surfaces glabrous and shiny, base cuneate to acute and sometimes slightly decurrent, apex acuminate with tip then blunt; secondary veins 5 or 6 pairs; stipules broadly triangular-ovate, 1.5–2 × 2–3 mm, acuminate. Inflorescence terminal or pseudoaxillary, 1-flowered, glabrous; peduncle articulate, basal portion ca. 0.5 cm, apical portion (“pedicel”) 20–25 mm; bracteoles triangular, ca. 1.5 mm, sericeous adaxially, glabrous abaxially. Calyx sparsely sericeous outside; ovary portion ellipsoid, ca. 3 mm; limb with basal tubular portion 2–2.5 mm, inside densely

villous and with short colleters; lobes linear-oblong to spatulate, 14–16 × 0.7–0.9 mm, 1-veined, obtuse. Corolla campanulate, glabrous throughout; tube white outside, inside striate and/or speckled with purple, 50–55 mm, at base with slender portion 6–7 × ca. 5 mm, abruptly dilated above this, ca. 30 mm in diam. at middle; lobes white outside, purple-speckled inside, overlapping to left, broadly ovate, 18–20 × 22–23 mm, obtuse. Ovary with placentas parietal, apparently confluent; style ca. 50 mm; stigmatic portion ca. 20 × 1 mm. Berry ellipsoid becoming subglobose with base swollen-stipitate, 4–5 cm in diam., color inside and out unknown, smooth; seeds ca. 12 × 8 × 4 mm. Fl. Oct–Dec, fr. Dec–Mar.

Rocky crevices in limestone rain forests; 300–600 m. Yunnan (Maguan) [Vietnam].

Shui and Chen described the flowers of this species as being

(paraphrased here) terminal on a reduced branch that is produced in an axillary position. The inflorescence in other species of *Rothmannia* is a congested or reduced cyme generally borne on a short peduncle produced in a terminal or pseudoaxillary position; thus their “reduced

branch” is here treated as being the peduncle (i.e., the structure directly bearing the solitary flower. In general, these structures have been interpreted variously by different authors. Zhang et al. (Acta Phytotax. Sin. 45: 92. 2007) reported this species also from Vietnam.

## 79. RUBIA Linnaeus, Sp. Pl. 1: 109. 1753.

茜草属 qian cao shu

Chen Tao (陈涛); Friedrich Ehrendorfer

Shrubs, subshrubs, or perennial herbs, not rarely clambering or climbing vines or rarely lianas, unarmed; stems often prickly and/or longitudinally ribbed or winged. Raphides present. Leaves opposite and with interpetiolar, triangular or ovate, persistent to caducous (*Rubia siamensis*) or reduced (*R. tibetica*) stipules or with leaflike stipules in whorls of 4, 6, to many in middle stem regions; domatia none; main veins single or 3–5 (or more) and then palmate, secondary veins lateral. Inflorescences thyrsoid, with terminal and/or axillary cymes, usually paniculiform and often expanding from new axes developing with age; individual cymes few to many flowered, pedunculate, bracteate. Flowers pedicellate or sessile, rather small, usually bisexual and monomorphic, rarely polygamo-dioecious (*R. cordifolia*). Ovary inferior (hypanthium), ellipsoid, subglobose, 2-celled, ovules 1 in each cell, erect, axile. Calyx limb reduced and obsolete. Corolla white to cream, yellow, greenish or red to purplish, often turning black when dried, mostly rotate, but rarely also campanulate to funnel-shaped, inside glabrous or infrequently papillose; lobes predominantly 5 (rarely also less or more), valvate in bud, often long acuminate. Stamens usually 5, inserted at corolla base (or tube), exserted; filaments developed to reduced; anthers dorsifixed. Stigmas 2-lobed, included or exserted. Fruit developing into 2 separate or (by reduction) into only 1 subglobose, baccate, berrylike mericarp with fleshy meso- and endocarp, dark red, purple, black, or infrequently orange (*R. cordifolia*), glabrous or somewhat hairy; seeds (“pyrenes”) 2, ellipsoid, subglobose, or plano-convex, with membranous testa; endosperm corneous; embryo subincurved; cotyledons leaflike; radicle prolonged, basiscopic.

About 80 species: extending from tropical and temperate Asia to Japan and Indonesia, through the Himalaya to SW Asia, E to S Africa, through the Mediterranean to W Europe, Macaronesia, and the Azores; locally introduced and persisting from cultivation in Mexico, Chile, and elsewhere; 38 species (20 endemic) in China.

As already mentioned in the present volume under *Galium*, *Rubia* is the type genus of the family, the tribe Rubieae, and the subtribe Rubiinae. As an Old World clade, *Rubia* is related to the Mesoamerican genus *Didymaea* and occupies a relative basal position within Rubiinae: its 5-lobed corollas, fleshy fruit, and always perennial growth form apparently are plesiomorphic features. This and its clear separation from the somewhat more apomorphic *Sherardia-Asperula-Galium* group is well documented by DNA data (Natali et al., Opera Bot. Belg. 7: 193–203. 1996; Soza & Olmstead, Taxon 59: 755–771. 2010). *Rubia* is keyed out from among the other Chinese taxa of Rubieae under *Galium* on p. 107. Its best differential characters are the dominantly 5-merous flowers combined with baccate, berrylike mericarps. The latter also occur independently among New World taxa of *Galium* (and *Relbunium*).

Among the Rubieae tribe *Rubia* (after *Galium* and *Asperula* in their present circumscription) is the third largest and obviously monophyletic genus. Nearly half of its recognized species occur in China. Because of excessive variability, the occurrence of hybridization and polyploidy as well as the lack of detailed studies (particularly on material in the major herbaria of China and elsewhere), our knowledge of *Rubia* is limited and the present treatment of the genus still quite provisional.

More recent taxonomic surveys of *Rubia* are available for the former Soviet Union (Pojarkova, Fl. URSS 23: 382–417. 1958), India (Deb & Malick, Bull. Bot. Surv. India 10(1): 1–16. 1968), Iran (Ehrendorfer et al., Fl. Iranica 176: 48–72. 2005), Bhutan (Long, Edinburgh J. Bot. 53: 108–110. 1996; Long, Fl. Bhutan 2(2): 823–825. 1999), and Taiwan (T. Y. A. Yang, Fl. Taiwan, ed. 2, 4: 321–324. 1998). Particularly in the first of these contributions, but also in the following two, the infrageneric taxonomy of *Rubia* is briefly considered. The majority of the Chinese species are characterized by 3–5 (–11) palmate veins in their relatively broad leaves. These taxa correspond to *R. ser. Oligoneura* Pojarkova (= *R. [unranked] Cordifoliae* Candolle; *R. ser. Cordifoliae* (Candolle) K. Schumann ex Deb & Malick). Within this section Pojarkova (loc. cit.) has recognized two series: one predominantly climbing vines with long leaf petioles as *R. ser. Cordifoliae* (Candolle) Pojarkova (with 16 species in China; see under *R. cordifolia*), the other mostly erect perennial herbs with very short leaf petioles as *R. ser. Chinenses* (with three species in China; see under *R. chinensis*). The latter is close to the informal *R. mandersii* group, where the leaves are sessile (three species in China; see under *R. mandersii*). Finally, there are two species groups with vines. One is the *R. sikkimensis* group with sessile leaves and leaflike stipules (two Chinese species; see under *R. tenuis*), in the other, the *R. siamensis* group, typical (not leaflike) interpetiolar stipules appear between the opposite leaves (four species in China; see under *R. siamensis*).

The remaining ten Chinese species have leaves with only 1 (–3) main vein(s) and predominantly pinnate vein branching. In the present treatment this refers to the species *Rubia chitralensis*, *R. deserticola*, *R. dolichophylla*, *R. reznitzenkoana*, *R. schugnanica*, *R. tibetica*, and *R. tinctorum*, here provisionally accommodated in *R. ser. Rubia* s.l. (including *R. ser. Meganthera* Pojarkova (= *R. ser. Rubia* s.s.), *R. ser. Campylanthera* Pojarkova, and *R. ser. Chonanthe* Pojarkova). The placement of the E Asiatic species *R. haematantha* (the *R. haematantha* group; see there) as well as *R. pseudogalium* and *R. truppeliana* (the *R. truppeliana* group; see there) is doubtful; they may belong to *R. ser. Oligoneura* in spite of their very narrow leaves and only 1 main vein. The more detailed infrageneric subdivisions of *Rubia* by Pojarkova listed above have been based on size and form of anthers and other flower details and are in need of more general and detailed study.

Relevant characters for the separation of *Rubia* taxa on the species level are growth habit, indumentum, number, shape and consistency of leaves and stipules, presence or absence of petioles, inflorescence structures, color and morphology of corollas from rotate to funnel-shaped, fruit color, etc. Particularly, leaf characters often vary excessively under different environmental and developmental conditions (e.g., in more widespread taxa as *Rubia cordifolia* and its allies; see further comments there). These facts are difficult to evaluate, at least on dried specimens.

The ground-up rhizomes and roots of *Rubia tinctorum*, the type species of the genus, have long been the source of important red textile dyes (madder red, alizarin, rose madder, alizarin crimson). This use was of course much more important before the invention of aniline dyes (e.g., madder colored the red coats of the 18th-century British army). Nevertheless, *R. tinctorum* is still widely cultivated at a local scale and used, in particular, to color wool for handmade oriental rugs in C and SW Asia (Murphy, Root of Wild Madder, 1–297. 2005) but also in fine art painting. The worldwide occurrence, cultivation, chemistry, and cultural role of this species was discussed in detail by Chenciner (Madder Red, 2000). The stems of *R. manjith* are also used to produce a red dye (fide Long, loc. cit. 1999).

The key here generally follows that of H. S. Lo (in FRPS 71(2): 287–290. 1999), with the measurements updated from the descriptions and species added as appropriate.

- 1a. Leaves with only 1 evident midvein; lateral veins pinnate, when palmate weak and obscure.
  - 2a. Leaves linear to narrowly lanceolate or oblong, mostly 3.5–30 × as long as wide.
    - 3a. Leaves with well-developed petioles; plants of forests.
      - 4a. Leaves in whorls of up to 6–8, with petioles 6–35 mm; peduncles 10–40 mm; corolla lobes ca. 2 mm; Shandong ..... 36. *R. truppeliana*
      - 4b. Leaves in whorls of never more than 4, with petioles 3–6 mm; peduncles 3–6 mm; corolla lobes 1.2–1.5 mm; Yunnan ..... 24. *R. pseudogalium*
    - 3b. Leaves without distinct petioles, sessile to subsessile; plants of open habitats.
      - 5a. Corolla dark red or perhaps sometimes white; leaves 6–8 per whorl, narrowly linear, less than 1 mm wide, midvein without evident lateral veins ..... 12. *R. haematantha*
      - 5b. Corolla yellow or white; leaves 4–6 per whorl, linear-lanceolate to lanceolate-oblong, wider than 1 mm.
        - 6a. Leaves 5–14 mm wide, midvein with pinnate lateral veins; stems with aculeolate angles; inflorescence cymes terminal and distributed along lower stem nodes; corolla lobes ca. 2 mm ..... 8. *R. dolichophylla*
        - 6b. Leaves 20–50 mm wide, lateral veins not evident; stems smooth; inflorescence cymes clustered near stem apices; corolla lobes 2.3–2.7 mm ..... 28. *R. schugnanica*
  - 2b. Leaves broadly (ob)lanceolate, lanceolate-oblong, ligulate, elliptic, elliptic-oblong, lanceolate-ovate, ovate, or broadly ovate, mostly 1–3.5 × as long as wide.
    - 7a. Corolla lobes with apex aristate, arista 0.5–0.8 mm; leaves 4–6 in a whorl, lanceolate or elliptic-oblong, drying firmly leathery ..... 7. *R. deserticola*
    - 7b. Corolla lobes obtuse, acute, or acuminate to mucronate, with arista up to 0.4 mm; leaves lanceolate to broadly ovate, drying papery to leathery.
      - 8a. Larger leaves longer and wider than 3 × 1.5 cm, dried papery to subleathery.
        - 9a. Leaves dried papery; corolla limb 6–7.5 mm in diam.; anthers ca. 0.4 mm ..... 4. *R. chitralensis*
        - 9b. Leaves dried papery to subleathery; corolla limb 3–4.5 mm in diam.; anthers ca. 0.6 mm ..... 34. *R. tinctorum*
      - 8b. Leaves 0.5–3 × 0.2–1.5 cm, dried leathery.
        - 10a. Leaves and leaflike stipules similar, mostly up to 6 per whorl; lower nodes of older stems not sheathed with old leaf bases; corolla yellow, lobes often 4, obtuse with short incurved cusp ..... 26. *R. reznichenkoana*
        - 10b. Leaves 2 with 2 smaller leaflike interpetiolar stipules in whorls of 4; lower nodes of older stems shortly sheathed with membranous bases of old leaves; corolla whitish, lobes usually 5, acuminate ..... 33. *R. tibetica*
- 1b. Leaves with 3–11 evident principal and palmate veins (including midrib), arising from at or near base.
  - 11a. Leaves opposite, with evident interpetiolar stipules; plants of moist forests.
    - 12a. Leaves tuberculate-hispidulous; stipules ± leaflike but smaller than true leaves ..... 6. *R. crassipes*
    - 12b. Leaves glabrous, scabrous, or ± hairy; stipules ovate to triangular, very different from true leaves.
      - 13a. Leaf margins entire and smooth, petioles 0.3–2.5 cm; inflorescence axes slender and filiform ..... 11. *R. filiformis*
      - 13b. Leaf margins aculeolate, petioles (1–)2–4(–8) cm; inflorescence axes stout.
        - 14a. Ovary and fruit densely hairy ..... 10. *R. falciformis*
        - 14b. Ovary and fruit glabrous.
          - 15a. Stipules large, ovate, acuminate, (5–)12–35(–60) × (3–)8–25(–40) mm; dried leaves light green and ± ferruginous, particularly below and on main veins ..... 15. *R. magna*
          - 15b. Stipules small, triangular, 3–5(–7) × 2–3 mm; dried leaves dark green ..... 30. *R. siamensis*
  - 11b. Leaves and leaflike stipules similar, in whorls of 4–12; plants of various habitats.
    - 16a. Erect herbs, if ± climbing vines then leaves (sub)sessile; leaves and leaflike stipules 4 or sometimes 6 per whorl.
      - 17a. Leaves markedly cordate at base.
        - 18a. Older stems broadly 4-winged ..... 25. *R. pterygocaulis*
        - 18b. Older stems quadrangular to narrowly 4-angled.
          - 19a. Stem angles retrorsely aculeate; mountains of Taiwan ..... 2. *R. argyi*
          - 19b. Stem angles smooth; Sichuan ..... 13. *R. latipetala*
      - 17b. Leaves cuneate, obtuse, truncate, rounded, or shallowly cordulate at base.

- 20a. Leaves sessile or subsessile (if flowers 4-merous then see *Galium*).
- 21a. Principal leaf veins 7–11; stems and leaves strongly hairy; fused basal part of corolla only 0.2–0.3 mm, lobes 1–1.2 mm ..... 23. *R. polyphlebia*
- 21b. Principal leaves veins 3 or 5; stems and leaves  $\pm$  glabrescent to glabrous, scabrous; fused basal part of corolla 0.5–0.6 mm.
- 22a. Slender vines; leaves drying papery; flowers ca. 3 mm in diam. .... 32. *R. tenuis*
- 22b. Erect to spreading herbs; leaves drying mostly  $\pm$  leathery; flowers 3–5 mm in diam.
- 23a. Stems 8-ribbed; leaves lanceolate to lanceolate-elliptic, 4–7 cm ..... 9. *R. edgeworthii*
- 23b. Stems 4-angled; leaves broadly elliptic, linear-lanceolate, ovate, obovate, or elliptic-oblong, 1–5 cm.
- 24a. Stems and leaves glabrous to scabrous, latter drying papery; principal main veins 5; corolla ca. 5 mm in diam. .... 16. *R. mandersii*
- 24b. Stems and leaves often  $\pm$  hairy or scabrous, latter drying  $\pm$  papery; principal veins 3–5; corolla ca. 3 mm in diam. .... 38. *R. yunnanensis*
- 20b. Leaves petiolate, petioles 0.3–9 cm.
- 25a. Stems clearly retrorsely aculeolate.
- 26a. Leaves suborbicular to ovate, length/breadth index 1–1.8, dried papery ..... 2. *R. argyi*
- 26b. Leaves lanceolate to ovate, length/breadth index 2–3, dried papery to subleathery ..... 22. *R. podantha*
- 25b. Stems smooth to sparsely scaberulous.
- 27a. Leaves  $\pm$  broadly elliptic, principal veins 5–7, dried thinly papery; fused part of corolla 0.2–0.6 mm ..... 3. *R. chinensis*
- 27b. Leaves broadly lanceolate to  $\pm$  broadly ovate, principal veins 3–5, dried papery to subleathery; fused part of corolla 0.8–2 mm.
- 28a. Leaves  $\pm$  broadly ovate, length/breadth index 1.2–1.5, base cordulate to cordate, dried papery, principal veins 3–5; fused part of corolla 1.5–2 mm ..... 13. *R. latipetala*
- 28b. Leaves broadly lanceolate to ovate, length/breadth index 1.5–2.5, base obtuse, rounded, or cordulate, dried thickly papery to subleathery, principal veins often impressed; fused part of corolla 0.8–1 mm ..... 29. *R. schumanniana*
- 16b. Vines or lianas, climbing to sprawling; leaves petiolate, petioles 0.1–12 cm.
- 29a. Fruit, stems, and leaves hirsute, strigillose, hirtellous, or villosulous ..... 35. *R. trichocarpa*
- 29b. Fruit glabrous, stems and leaves glabrous or with diverse indumentum.
- 30a. Leaves 4–12 per whorl, at least middle stem nodes with 6 or more leaves.
- 31a. Leaves oblanceolate, base cuneate to acute; petioles 0.6–3.5 cm ..... 36. *R. truppeliana*
- 31b. Leaves ovate to suborbicular or lanceolate to oblong-lanceolate, base truncate, rounded, cordulate, or cordate; petioles 1–11 cm.
- 32a. Leaves ovate to suborbicular, largest mostly longer than 4 cm, length/breadth index 1.2–1.5, base cordulate or cordate; petioles 2–11 cm ..... 31. *R. sylvatica*
- 32b. Leaves lanceolate to oblong-lanceolate, largest mostly shorter than 4 cm, length/breadth index 2.5–4, base truncate, rounded, or cordulate to cordate; petioles 1–9 cm ..... 5. *R. cordifolia*
- 30b. Leaves 4, very rarely more per whorl.
- 33a. Stems, leaves abaxially, and/or outside of corolla moderately to densely hirtellous or hispidulous with trichomes regularly hooked at apex; leaves small, 0.8–3.5  $\times$  0.3–1.5 cm ..... 19. *R. oncotricha*
- 33b. Stems, leaves, and corollas outside glabrous, or with diverse indumentum, but never with regularly hooked hairs; leaves larger, 0.7–13  $\times$  0.3–6.5 cm.
- 34a. Leaves drying thickly leathery, oblong-ovate to elliptic, apex obtuse ..... 6. *R. crassipes*
- 34b. Leaves drying papery to leathery, ovate, oblong-lanceolate, ovate-lanceolate, oblong-ovate, cordiform, suborbicular, or lanceolate, apex subacute, acuminate, caudate, or obtuse and cuspidate.
- 35a. Dried plants flushed with red, particularly on lower leaf side; corolla rotate, purplish red, red, or orange, with spreading lobes of 1.2–1.5 mm; mature fruit dark red ..... 17. *R. manjith*
- 35b. Dried plants green, gray, or yellowish (if rarely flushed with red then corollas campanulate with reflexed lobes); corolla white, yellow, greenish, or red; mature fruit black, dark blue, or orange.
- 36a. Corollas (sub)campanulate, tube (0.5–)0.8–1.2 mm, lobes  $\pm$  reflexed, 1.2–1.5 mm.
- 37a. Stems 4-ridged to markedly winged; leaves lanceolate, length/breadth index more than 3 ..... 1. *R. alata*
- 37b. Stems quadrangular but never winged; leaves broader, length/breadth index less than 3.
- 38a. Leaves of main stems ovate-cordiform to suborbicular-cordiform,  $\pm$  as long as wide or slightly longer than wide, when dry adaxially mealy green or pale green ..... 20. *R. ovatifolia*
- 38b. Leaves lanceolate, oblong-ovate, oblong-suborbicular, or ovate, 2–3  $\times$  as long as wide, when dry green, brownish green, black, or perhaps red ..... 22. *R. podantha*

- 36b. Corollas rotate, fused part 0.2–0.5 mm, lobes  $\pm$  spreading.  
 39a. Corollas purplish red, with lobes 3–4 mm ..... 18. *R. membranacea*  
 39b. Corollas white, yellow, greenish yellow, or purplish red, with lobes 1–2.5 mm.  
 40a. Corollas pale yellow to white, with lobes 2–2.5 mm ..... 21. *R. pallida*  
 40b. Corolla variously colored, with lobes 1–1.5 mm.  
 41a. Leaves linear to narrowly lanceolate, 5–10  $\times$  as long as wide ..... 27. *R. salicifolia*  
 41b. Leaves broader, oblong-lanceolate, oblong-ovate, ovate, cordiform, or suborbicular, not more than 4  $\times$  as long as wide.  
 42a. Leaves ovate to suborbicular, length/breadth index 1–1.8, base cordate or cordulate.  
 43a. Largest leaves mostly shorter than 4 cm, usually cuspidate or apiculate toward apex, length/breadth index 1–1.8, drying  $\pm$  thickly papery, blackening, with lateral veins usually  $\pm$  impressed and tertiary venation visible; petioles 0.5–5 cm ..... 2. *R. argyi*  
 43b. Largest leaves mostly longer than 4 cm, usually attenuate toward apex, length/breadth index 1.2–1.5, drying thinly papery, often remaining greenish, lateral veins never impressed and tertiary venation less visible; petioles 2–11 cm ..... 31. *R. sylvatica*  
 42b. Leaves lanceolate to oblong-lanceolate, attenuate toward apex, length/breadth index 2.5–4, lateral veins never impressed and tertiary venation less visible, base truncate, rounded, or cordulate.  
 44a. Flowers white; Taiwan ..... 14. *R. linii*  
 44b. Flowers purplish red, greenish, yellowish, or white; mainland.  
 45a. Stems smooth or sparsely aculeolate; flowers purplish red, greenish yellowish, or whitish; fruit 3.5–4 mm in diam., black at maturity ..... 37. *R. wallichiana*  
 45b. Stems rather markedly or sparsely aculeolate; flowers greenish, yellowish, or whitish; fruit 4–6(–7) mm in diam., orange at maturity ..... 5. *R. cordifolia*

**1. *Rubia alata*** Wallich in Roxburgh, Fl. Ind. 1: 384. 1820.

金剑草 *jin jian cao*

*Rubia cordifolia* Linnaeus var. *longifolia* Handel-Mazzetti;  
*R. lanceolata* Hayata.

Climbers and vines, herbaceous, perennial; stems to 4 m, quadrangular, 4-ridged, or usually 4-winged at least when older with wings to 1.5 mm wide, glabrous or hirtellous-puberulent at nodes, retrorsely aculeolate. Leaves and leaflike stipules in whorls of 4, often unequal (stipules smaller); petiole 0.2–10 cm, on principal axes longer than on lateral ones, those of stipules often shorter or even lacking; blade drying thinly leathery, linear-lanceolate or narrowly lanceolate, 3.5–9  $\times$  0.4–2 cm, with length/breadth index above 3, glabrous and smooth or sometimes sparsely scaberrulous, base rounded to cordulate, margin thinly revolute and usually aculeolate, apex acute; principal veins palmate, 3(or 5) with lateral veins sometimes weakly evident. Inflorescences thyrsoid, paniculate, with terminal and axillary, many-flowered cymes; axes smooth to aculeolate, ridged to thinly winged; bracts elliptic to lanceolate-elliptic, 0.8–3 mm; pedicels 1–4 mm. Ovary ca. 0.7 mm, smooth. Corolla white, pale yellow, or greenish, campanulate, fused base 0.5–1 mm, glabrous; lobes triangular to lanceolate, 1.2–1.5 mm, apex caudate-acuminate. Mericarp berry black, 5–7 mm. Fl. May–Aug, fr. Aug–Nov.

Forest margins on mountain slopes, thickets; 600–2000 m. Provinces south of the Chang Jiang, east to Taiwan, west to Sichuan, north to C Henan and S Shanxi: Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [Nepal].

*Rubia alata*, an obvious member of *R. ser. Cordifoliae*, is here treated in the sense of H. S. Lo (in FRPS 71(2): 312, t. 70, f. 1–6. 1999),

which may or may not correspond to its original application and its type. Accordingly, it is mainly characterized by relatively narrow leaves, petioles frequently bent near the base of the blade, stem angles with thin ridges to narrow or remarkably well-developed wings, and paniculate inflorescences, small flowers, and black fruit similar to other species of the *R. cordifolia* group (see additional comments under that species). The protologue of *R. alata* does not address the shape of the leaves and describes the stems as winged or not. This suggests the possibility that that the type's leaves are not markedly narrower and its stems not more markedly winged than those of *R. cordifolia* and related species. *Rubia alata* was not treated by Deb and Malick (Bull. Bot. Surv. India 10(1): 1–16. 1968) for India, nor by Long (Fl. Bhutan 2(2): 823–825. 1999) for Bhutan. The Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) considers it to be a synonym of *R. cordifolia* but gives no source for this conclusion. From the relatively abundant herbarium material studied and the rather narrow species concept used in the present treatment, we believe that it is justified to distinguish *R. alata* sensu H. S. Lo and *R. cordifolia* s.s.

*Rubia lanceolata* from Taiwan is provisionally referred here as a synonym to *R. alata*. Some of the named varieties of *R. cordifolia* may also belong to this species but a clarification is impossible with our present insufficient knowledge of *R. ser. Cordifoliae*. The herbarium name “*R. cordifolia* var. *stenophylla* Franchet” does not appear to have ever been published anywhere.

The numerous collections from the Biodiversity Survey of the Gaoligong Shan area in Yunnan have revealed the common occurrence of *Rubia alata* and the presence of rare *R. siamensis* together with many populations, which link these two quite different taxa. These intermediates exhibit most varied differential character recombinations of the two species with respect to leaf shape, from broadly lanceolate to cordate (length/breadth index below 3) or from small triangular and sessile stipules to fully leaflike elements with long petioles. In addition, new characters appear, such as greenish to yellowish fruit colors. The suspicion that all this is the result of hybridization needs support by further studies.

**2. *Rubia argyi*** (H. Léveillé & Vaniot) H. Hara ex Lauener & D. K. Ferguson, Notes Roy. Bot. Gard. Edinburgh 32: 114. 1972.

东南茜草 *dong nan qian cao*

*Galium argyi* H. Léveillé & Vaniot, Bull. Soc. Bot. France 55: 58. 1908; *Rubia akane* Nakai; *R. akane* var. *erecta* Masamune; *R. chekiangensis* Deb.

Vines, herbaceous, perennial (rarely erect in mountains of Taiwan: *Rubia akane* var. *erecta*); stems probably to 2 m or more, quadrangular to narrowly 4-winged especially when older, glabrous to pilosulous, retrorsely aculeolate sometimes becoming smooth with age. Leaves nearly exclusively in whorls of 4, equal or sometimes unequal; petiole 0.5–5 cm; blade when drying often blackening,  $\pm$  thickly papery, suborbicular-cordiform, broadly ovate-cordiform, or oblong-suborbicular, (1–)2–4.5(–5)  $\times$  (1–)1.5–3.5(–4) cm, length/breadth index 1–1.8, glabrous or sparsely to densely pilosulous or hirtellous, scaberulous, base cordate to cordulate, margins sparsely to densely retrorsely aculeolate, apex cuspidate to apiculate; principal veins palmate, 5 or 7, veins usually  $\pm$  impressed and tertiary venation visible. Inflorescences thyrsoid, paniculate, with terminal and axillary, many-flowered cymes, axes aculeolate, glabrous to pilosulous; bracts lanceolate or lanceolate-elliptic, 1–4 mm; pedicels rather stout, 1–2.5 mm. Ovary ca. 0.8 mm, smooth. Corolla yellowish-greenish to white, rotate to bell-shaped, glabrescent, fused base 0.5–0.7 mm; lobes lanceolate, 1.3–1.4 mm, spreading to  $\pm$  reflexed. Mericarp berry black, subglobose 5–7(–9) mm in diam. Fl. Jul–Oct, fr. Aug–Nov.

Forest margins, thickets, fences at village sides; 300–3400 m. Anhui, Fujian, Guangdong, Guangxi, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Zhejiang [Japan, Korea].

*Rubia akane* is here treated as a synonym of *R. argyi*, following the Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010), Yamazaki (Fl. Japan 3a: 232. 1993), and H. S. Lo (in FRPS 71(2): 316. 1999). The recent Taiwanese flora (T. Y. A. Yang, Fl. Taiwan, ed. 2, 4: 322. 1998), however, continues to regard *R. akane* as a separate species and characterizes it by white flowers, whereas *R. argyi* generally is regarded as yellowish-greenish flowering. Aside from corolla color, no differential characters are apparent between the two taxa. However, in addition to the typical climbing and vinelike “var. *akane*” in Taiwanese localities below 2000 m, at higher elevations and more open habitats of the Taiwanese mountains, there is an upright growing type called *R. akane* var. *erecta*, which seems to be endemic. As a species it has been called *R. nankotaizana* Masamune (Hokuriku J. Bot. 2: 40. 1953). If it is actually conspecific, it should be transferred as a variety to *R. argyi*.

*Rubia argyi* belongs to *R. ser. Cordifoliae* and is well illustrated in the FRPS treatment by H. S. Lo (loc. cit.: 317, t. 71, f. 1–6). With the differential characters available (mainly the relatively broad and short leaves with veins impressed), it can be separated rather clearly from the very closely related members *R. cordifolia* s.l. (or better *R. cordifolia* agg., see there). To lump it with *R. cordifolia* (e.g., Z. Ying Zhang, Fl. Tsinling. 1(5): 14. 1985) does not appear justified. Within the *R. cordifolia* agg. *R. argyi* comes closest to *R. sylvatica*, from which it deviates primarily by its larger leaves, partly in whorls of more than 4. *Rubia ovatifolia* can be separated by its definitely campanulate flowers with a fused base of 0.8–1 mm. For additional comments see under *R. cordifolia*.

**3. *Rubia chinensis*** Regel & Maack in Regel, Tent. Fl. Ussur. 76. 1861.

中国茜草 *zhong guo qian cao*

Herbs, perennial, rhizomatous; stems erect, to 60 cm tall, solitary or usually grouped, unbranched or few branched, quadrangular, glabrous to pilosulous at least near nodes, ribs rounded, smooth to sparsely scaberulous. Leaves in whorls of 4; petiole (0.3–)0.5–2 cm; blade drying thinly papery, ovate, oblong-ovate, or broadly elliptic, 3–10  $\times$  1.2–4.5 cm, length/breadth index 1.8–2.3, adaxially subglabrous and scaberulous, abaxially glabrous to pilosulous, base obtuse, rounded, or cordulate, margin scaberulous to ciliate, apex acute or acuminate; principal veins 5 or 7, palmate. Inflorescences thyrsoid, terminal and axillary in upper nodes, paniculate, many flowered, 5–30 cm, glabrous to pilosulous; axes scaberulous to smooth; bracts lanceolate, 1.5–8 mm; pedicels 2–7 mm. Ovary ca. 0.8 mm, smooth to scaberulous. Corolla greenish white, rotate, 3–4 mm in diam., glabrous, with fused base 0.2–0.6 mm; lobes 5, lanceolate, 1.7–2 mm, acute to caudate. Mericarp berry black, ca. 4 mm in diam., smooth. Fl. May–Jul, fr. Sep–Oct.

Forests on mountains, forest margins, meadows; 200–1400 m. E and N China [Japan, Korea, Russia].

*Rubia chinensis* and a few related species with erect (not climbing) stems and broad leaves with short petioles have been placed by Pojarkova (Fl. URSS 23: 391–392. 1958) into *R. ser. Chinenses*. Other Chinese species of this group include the closely related *R. latipetala* and *R. schumanniana*. The *R. mandersii* species group (see there) is similar but has sessile leaves.

For *Rubia chinensis* H. S. Lo (in FRPS 71(2): 301, t. 66, f. 8–13. 1999) gives good drawings and differentiates two varieties (elsewhere also treated as forms). They are listed here for reference but apparently are not well marked in China. They were not included in the Fl. Hebei. (2: 577. 1988), and in Fl. Japan (Yamazaki, 3a: 231–232. 1993) they were synonymized and said to be difficult to distinguish. Generally, it appears that Japanese populations of *R. chinensis* have somewhat smaller leaves than those from China.

- 1a. Leaves adaxially subglabrous or hirtellous along principal veins, pilosulous abaxially ..... 3a. var. *chinensis*
- 1b. Leaves glabrous or aculeolate along midvein ..... 3b. var. *glabrescens*

### 3a. *Rubia chinensis* var. *chinensis*

中国茜草(原变种) *zhong guo qian cao* (yuan bian zhong)

*Rubia mitis* Miquel.

Leaves subglabrous or hirtellous adaxially along principal veins, abaxially pilosulous, margin ciliate.

E and N China [Japan, Korea, Russia].

**3b. *Rubia chinensis* var. *glabrescens*** (Nakai) Kitagawa, Lin. Fl. Manshur. 405. 1939.

无毛大砧草 *wu mao da zhen cao*

*Rubia mitis* f. *glabrescens* Nakai, J. Jap. Bot. 14: 115. 1938; *R. chinensis* f. *glabrescens* (Nakai) Kitagawa.

Leaves glabrous except aculeolate adaxially along midvein, abaxially glabrous, margin scaberulous.

NE China [Japan, Korea].

**4. *Rubia chitralensis*** Ehrendorfer, Nytt Mag. Bot. 3: 228. 1954.

高原茜草 gao yuan qian cao

Herbs, perennial, with woody rootstock; stems up to 50 cm tall, clustered, subterete to slightly winged, glabrous, smooth. Leaves in whorls of up to 6 (or 7), sessile; blade drying membranous, lanceolate-ovate to lanceolate, (2–)4–5 × 0.7–1.5 cm, adaxially glabrous or sparsely antrorsely scaberulous, abaxially glabrous with midrib antrorsely aculeolate, margins retrorsely scaberulous, apex acute to acuminate; principal vein 1, lateral veins 2, weak. Inflorescences terminal, pyramidal, leaflike, with 1- to several-flowered cymes; peduncles glabrous, smooth; bracts elliptic to ovate, 6–7 mm; pedicels 2–6 mm. Ovary 1–2 mm, glabrous. Corolla yellowish green to whitish yellow, rotate, 6–7.5 mm in diam., fused basal part 0.5–0.7 mm; lobes lanceolate, ca. 3 mm, acuminate to incurved-mucronate, arista to ca. 0.8 mm. Mericarp berry black and shiny, 3.5–5 mm in diam., glabrous. Fl. Jun–Jul, fr. Jul–Oct.

Stony slopes in *Juniperus* and subalpine belt; ca. 2900[–4000] m. Xinjiang [Afghanistan, Pakistan, Tajikistan, Uzbekistan].

*Rubia chitralensis* is distantly related to other SW to C Asiatic but rather subshrubby taxa, as *R. gedrosiaca* Bornmüller, *R. laxiflora* Gontscharow, or *R. tibetica*. These taxa were placed by Pojarkova (Fl. URSS 23: 398–417. 1958) into several series of the heterogeneous *R. sect. Campylanthera*, distributed from C Asia to the Mediterranean.

**5. *Rubia cordifolia*** Linnaeus, Syst. Nat., ed. 12, 3: 229. 1768.

茜草 qian cao

*Rubia cordifolia* var. *coriacea* Z. Ying Zhang; *R. cordifolia* subsp. *pratensis* (Maximowicz) Kitamura; *R. cordifolia* var. *pratensis* Maximowicz; *R. cordifolia* var. *rotundifolia* Franchet; *R. pratensis* (Maximowicz) Nakai.

Vines, herbaceous, climbing or scrambling herbs, with red rhizomatous base and roots; stems to 3.5 m, several to many from base, often much branched, quadrangular, glabrous to puberulent, with ribs rounded to thinly winged, sparsely to densely retrorsely aculeolate. Leaves in whorls of 4 or more (up to 8 or rarely 12); petiole (1–)1.5–3(–6) cm; blade drying papery to thickly papery, usually remaining ± greenish, lanceolate, oblong-lanceolate, ovate, or oblong-ovate, (1–)1.5–4(–7) × (0.3–)0.5–1.5(–2.5) cm, length/breadth index mostly 2.5–4, glabrous to pilosulous or hirtellous, sparsely to densely scaberulous, base rounded, truncate, cordulate, or cordate, margin serrulate-aculeolate, apex obtuse and apiculate to acute or acuminate; principal veins 3 or 5, palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, several- to many-flowered cymes; axes glabrous to puberulent or pilosulous, ± aculeolate; bracts linear-lanceolate to ligulate, 1–3 mm; pedicels 1–4 mm. Ovary 0.5–0.8 mm, smooth to scaberulous. Flowers hermaphroditic (rarely polygamo-dioecious?). Corolla pale yellow or greenish yellow, rotate, glabrous, fused base 0.2–0.4 mm; lobes lanceolate, spreading to reflexed, 1.2–1.5 mm, cau-

date. Mericarp berry becoming orange then apparently black, 4–6 mm in diam. Fl. Aug–Sep, fr. Oct–Nov.

Sparse forests, forest margins, grasslands; 300–2800 m. Anhui, Gansu, Hebei, Hunan, Qinghai, Shandong, Shanxi, Sichuan, Xizang, Yunnan [Japan, Korea, Mongolia, Russia (Far East); S and SE Asia to Sri Lanka and Java, through the Himalaya to Afghanistan; (sub)tropical Africa].

As noted by most previous authors (Pojarkova, Fl. URSS 23: 387–391. 1958; Ehrendorfer et al., Fl. Iranica 176: 52–53. 2005), the plants included in *Rubia cordifolia* s.l. comprise a geographically very widespread (from E and SE Asia to Afghanistan, from Sudan to S Africa), morphologically extremely “polymorphic,” polyploid, and still most insufficiently understood racial complex. Its populations, together with related taxa, have been grouped into *R. ser. Cordifoliae* by Pojarkova (loc. cit.), characterized by their generally clambering to climbing habit; leaves and leaflike stipules in whorls of 4 or more, petiolate, palmately 3–7-veined; and corollas rotate to shortly campanulate, with anthers ellipsoid, somewhat curved, and 4–6 × shorter than the corolla lobes. Depending on narrow or wider species concepts and differential characters chosen, the elements of this series have been quite variously treated. In the present flora the following 16 species are assembled in *R. ser. Cordifoliae*: 1. *R. alata*, 2. *R. argyi*, 5. *R. cordifolia*, 6. *R. crassipes*, 14. *R. linii*, 17. *R. manjith*, 18. *R. membranacea*, 19. *R. oncotricha*, 20. *R. ovatifolia*, 21. *R. pallida*, 22. *R. podantha*, 25. *R. pterygocaulis*, 27. *R. salicifolia*, 31. *R. sylvatica*, 35. *R. trichocarpa*, and 37. *R. wallichiana*. Species 5, 14, 20, 31, and 37 are so close and linked by occasional intermediates that they can be understood as *R. cordifolia* s.l. or *R. cordifolia* agg. The above species description refers to *R. cordifolia* s.s.

The type specimen of *Rubia cordifolia* in the Linnaean Herbarium (no. 131.7, LINN) has no flowers or fruit, but its distinct habit with leaves in whorls of 4, oblong-cordate, acute, and with long petioles corresponds to the above description of the species in a more narrow sense and to the figure in H. S. Lo (in FRPS 71(2): 307, t. 68, f. 7–12. 1999). The complications in the typification of *R. cordifolia* have been detailed by Jarvis (Order Out of Chaos, 800. 2007). The description by Linnaeus was emended by Gaertner (Novi Comment. Acad. Petrop. 14(1): 541. 1770). The original reference to “4-merous flowers” may have been due to the occasional occurrence of 4- among the typical 5-merous flowers or simply to a mistake. The fruit were originally described as unknown, but later their color was given as red. Pojarkova (loc. cit.: 466–467) noted for *R. cordifolia* and for *R. ser. Cordifoliae* as a whole that the fruit were orange or brownish when immature and black when fully mature and dry. Personal observations revealed a group of distinctive Chinese specimens with vegetative parts drying yellowed and the mature, or near-mature, fruit drying clear bright orange but evidently turning black at maturity (e.g., *Fu Kunjun 10394*, MO!). Thus, fruit color may be of taxonomic relevance in *Rubia* but is in need of more detailed studies.

Even with the present, rather narrow circumscription, there is still much variation among the Chinese populations of *Rubia cordifolia*. This refers to indumentum, consistency, shape and size of leaves, number of leaves and leaflike stipules per whorl, flower shape, and fruit color. Leaf indumentum does not seem to be correlated with that of the inflorescence axes. Instead, either may be glabrous or pubescent, apparently independently, which is unusual in Rubiaceae. In zones of contact, particularly with the closely related *R. sylvatica* and *R. ovatifolia*, one has to expect transitional individuals. The status of *R. wallichiana* (see there) and its separation from *R. cordifolia* is doubtful anyway.

The infraspecific synonymy of *Rubia cordifolia* listed above follows H. S. Lo (loc. cit.: 315); it has not yet been checked in detail for lack of any more authoritative treatment of *R. ser. Cordifoliae*. *Rubia cordifolia* var. *coriacea* was not listed by H. S. Lo and is here synony-

mized provisionally, as we have seen no authentic material. According to its protologue, it differs from typical *R. cordifolia* in its subleathery leaves, which are glabrous below. With respect to *R. cordifolia* var. *munjista* (Roxburgh) Miquel see *R. manjith*.

**6. *Rubia crassipes*** Collett & Hemsley, J. Linn. Soc., Bot. 28: 68. 1890.

厚柄茜草 *hou bing qian cao*

Vines, herbaceous, climbing, to 3 m; stems quadrangular becoming subterete, tuberculate-hispid, scabrous. Leaves in whorls of 4, often  $\pm$  unequal; petiole 0.5–1.8 cm or smallest leaves sometimes subsessile; blade drying thickly leathery, ovate-oblong to elliptic, (0.7–)2–4.5 cm, tuberculate-hispid, base rounded to cordulate, margin slightly revolute, apex obtuse; principal veins 5, palmate. Inflorescences thyrsoid, paniculate, 3–7 cm, with axillary and terminal cymes; axes rather stout; bracteoles ovate or lanceolate, 2.5–3.5 mm. Flowers unknown. Immature mericarp berry black when dry, ca. 4 mm in diam. Fr. autumn.

Forest margins on mountain ridges; 1400–2400 m. Yunnan [Myanmar, Thailand].

We have seen no authentic material of *Rubia crassipes*. The above description corresponds to the protologue and to H. S. Lo (in FRPS 71(2): 313. 1999). The extended description and photo of plants from Thailand regarded as this species by Puff (Fl. Thailand: Rubiaceae; [http://homepage.univie.ac.at/christian.puff/FTH-RUB/FTH-RUB\\_HOME.htm](http://homepage.univie.ac.at/christian.puff/FTH-RUB/FTH-RUB_HOME.htm); accessed on 5 Oct 2010) deviates by straight and soft hairs in addition to the scabrous indumentum and considerably larger leaves. Puff also added data on the shallowly campanulate, 5-lobed flowers 2.4–4 mm in diam., and considered the taxon as part of the *R. cordifolia* group. Only further extensive studies will clarify the doubtful delimitation and taxonomic placement of *R. crassipes*.

**7. *Rubia deserticola*** Pojarkova in Schischkin, Fl. URSS 23: 722. 1958.

沙生茜草 *sha sheng qian cao*

Plants herbaceous, perennial, with woody rootstock; stems suberect, to 1 m tall quadrangular, angles recurved prickly. Leaves in whorls of 4–6, subsessile; blade drying firmly leathery, lanceolate to elliptic-oblong, aculeolate abaxially on midrib and along thickened margins, base acute, apex acuminate; principal vein 1. Inflorescences terminal, many flowered, leafy and bracteose. Ovary 1–2 mm, glabrous. Corolla yellowish white, rotate, fused basal part ca. 0.3 mm; limb 3.5–4.5 mm in diam.; lobes lanceolate, aristate. Anthers very small, ca. 0.3 mm. Mericarp berry black, 3.5–5 mm in diam. Fl. Jun, fr. Jul.

Sandy and salty semideserts. Xinjiang (Yili) [Kazakhstan].

We have seen no authentic material of *Rubia deserticola*. This local C Asiatic semidesert species was regarded as close to the common Mediterranean *R. peregrina* Linnaeus by Pojarkova (loc. cit.) and placed into *R. ser. Peregrinae* Pojarkova of *R. sect. Campylanthera*.

**8. *Rubia dolichophylla*** Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 2: 115. 1844.

长叶茜草 *chang ye qian cao*

Herbs, perennial, rhizomatous; stems erect, to 1 m tall, glabrous, angled, retrorsely aculeolate. Leaves in whorls of 4,

sessile or subsessile; blade drying papery, linear to lanceolate-oblong, 5–12  $\times$  0.5–1.4 cm, glabrous, abaxially prickly on midrib and often on veins, base acute to cuneate, margins revolute and antrorsely aculeolate, apex acute to acuminate; lateral veins pinnate, 6–10 pairs. Inflorescences thyrsoid, with terminal and axillary, several- to many-flowered cymes, nearly as long as or shorter than subtending leaves; axes aculeolate; bracts linear, 2–5 mm; pedicels 2–6 mm. Ovary 1–1.2 mm in diam. Corolla pale yellow, rotate, fused basal part ca. 0.6 mm; lobes ovate, ca. 2 mm, abruptly contracted with arista ca. 0.5 mm. Mericarp berry black, 2.5–5 mm. Fl. May–Aug, fr. Jul–Sep.

Along rivers and among rocks; 1900–2100 m. Xinjiang [Afghanistan, Kazakhstan, Pakistan, Tajikistan; SW Asia (Iran)].

*Rubia dolichophylla*, well illustrated in H. S. Lo (in FRPS 71(2): 293, t. 62, f. 1–6. 1999), according to Pojarkova (Fl. URSS 23: 404–407. 1958) is one of the two species of *R. ser. Dolichophyllae* Pojarkova, both C Asiatic rhizome-forming herbs. Specimens of *R. jesoensis* (Miquel) Miyabe & Miyaki from Japan with a similar growth form might key out as *R. dolichophylla* but are readily separable by their stems with vegetative apex and exclusively axillary inflorescences with cymes borne along the lower stem portion and usually shorter than the supporting leaves. In *R. dolichophylla* the partial inflorescences are terminal and axillary. As already correctly shown by Pojarkova (loc. cit.), *R. jesoensis* appears related to *R. tatarica* (Treviranus) F. W. Schmidt from SE Russia and adjacent Siberia, and both belong to *R. ser. Tataricae* Pojarkova.

**9. *Rubia edgeworthii*** J. D. Hooker, Fl. Brit. India 3: 203. 1881.

川滇茜草 *chuan dian qian cao*

Herbs, scandent to climbing; stems 8-ribbed, scabrous. Leaves in whorls of 4, subsessile; blade drying papery, lanceolate to lanceolate-elliptic, 4–7  $\times$  1.2–2 cm, both surfaces scaberrulous and sometimes hirtellous, base acute to obtuse, margins entire, apex acute to acuminate; principal veins 3 or 5, palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, many-flowered cymes, usually much longer than subtending leaves; axes hirtellous, scaberrulous to glabrescent; bracts lanceolate or subovate, 2–5 mm; pedicels 2–5 mm. Ovary subglabrous to hirtellous. Corolla pale yellow, somewhat funnel-shaped, glabrous or hirtellous outside, fused basal part ca. 0.5 mm; lobes 5, ovate to lanceolate, 1–1.2 mm, obtuse to acute. Mericarp berry unknown. Fl. Sep.

Grassy slopes; ca. 2100 m. Guangxi (Longlin), Sichuan (Miyi), Yunnan (Heqing) [N India].

We have not seen authentic material of *Rubia edgeworthii*, but both Deb and Malick (Bull. Bot. Surv. India 10(1): 11–12. 1968) and H. S. Lo (in FRPS 71(2): 304, t. 67, f. 8–13. 1999) presented good drawings. Nevertheless, nothing is known about the important underground organs of this species (rootstock or rhizome?). Judging from other characters, *R. edgeworthii* may belong to the vines of the *R. sikimensis* group with *R. tenuis* (see there), but one also has to consider the upright, not climbing members of the *R. mandersii* group; both are elements of *R. sect. Oligoneura*. H. S. Lo (loc. cit.: 308) noted that the unpublished name "*Rubia lancilimba* F. C. How" has been written on specimens of this species.

**10. *Rubia falciformis*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 23. 1999.

镰叶茜草 *lian ye qian cao*

Herbs, perennial, presumably scandent vines; stems quadrangular, scabrous. Leaves opposite; petiole 3–4 cm, rather stout, retrorsely aculeolate; blade drying greenish, thickly leathery, falcate-lanceolate, 11–15 cm, both surfaces scabrous, usually aculeolate along principal veins, base rounded or subcordate, margin revolute and aculeolate, apex acuminate; principal veins 5, palmate, impressed above, with higher order reticulate veins immersed; stipules caducous, unknown. Inflorescences axillary, with many-flowered cymes. Flowers unknown. Mericarp berries dark orange-yellow when dry, 3.5–4 mm in diam., binary or solitary, densely villous with pubescence drying ferruginous. Fr. Oct.

- Wet lands in forests; ca. 1100 m. Yunnan (Lianghe).

Authentic material of *Rubia falciformis* has not been available, but H. S. Lo (in FRPS 71(2): 295, t. 63, f. 9–11. 1999) presented a good drawing. With the exception of the strongly hairy fruit and the deciduous (and unknown) stipules, its description corresponds to *R. siamensis*, also known from Yunnan, and thus belongs to its group within *R. sect. Oligoneura*.

**11. *Rubia filiformis*** F. C. How ex H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 24. 1999.

丝梗茜草 si geng qian cao

Vines, herbaceous, to 2–3 m tall; stems quadrangular or narrowly 4-winged, glabrous or subglabrous, retrorsely aculeolate on angles. Leaves opposite; petiole (2–)3–15(–25) mm; blade drying thinly leathery or papery, ovate or rarely ovate-lanceolate, 2–9 × 1–4.5 cm, both surfaces glabrous and smooth or sparsely aculeolate along veins, base rounded, subcordate, or obtuse, margins entire and smooth, apex acute to acuminate; principal veins 3 or 5(or 7), palmate, adaxially impressed; stipules ovate, ca. 5 mm, usually caducous. Inflorescences thyrsoid, paniculiform, with terminal and axillary, many-flowered cymes and slender, subfiliform, smooth and glabrous axes. Flowers unknown. Fruiting pedicels 7–14 mm; mericarp berries black, 4–5 mm in diam. Fr. in late winter.

- Forests; 1000–1500 m. Yunnan (Malipo).

We have seen no authentic specimens of *Rubia filiformis*, but there is a good drawing in H. S. Lo (in FRPS 71(2): 297, t. 64, f. 1–5. 1999). The species evidently belongs to the *R. siamensis* group of *R. sect. Oligoneura*.

**12. *Rubia haematantha*** Airy Shaw, Bull. Misc. Inform. Kew 1931: 450. 1931.

红花茜草 hong hua qian cao

Herbs, perennial, erect to somewhat climbing, with woody rootstock; stems 0.5 m or more, clustered, quadrangular, angles ± retrorsely aculeolate. Leaves in whorls of up to 6–8(–10), narrowly linear, 20–50 × 0.5–1 mm, base acute, margins revolute and antrorsely aculeolate, otherwise glabrous and smooth, single vein forming a thick midrib ca. 1/2 of leaf breadth, apex acute, with hyaline point. Inflorescence thyrsoid, with lax, few-flowered axillary and terminal cymes; bracts filiform; pedicels ca. 5 mm. Ovary ca. 0.5 mm, glabrous. Corolla dark red (perhaps sometimes ?white), rotate, 3–4 mm in diam., glabrous; lobes triangular, 3-veined, abruptly caudate with acumen ca. 1

mm. Mericarp berry black, 3–4 mm in diam. Fl. summer–early autumn, fr. late autumn–early winter.

- Dry and rocky meadows; 3000–3800 m. Sichuan, NW Yunnan.

Together with *Rubia angustissima* Wallich ex G. Don and *R. charifolia* Wallich ex G. Don from the Himalaya, both with greenish-yellowish flowers, the dark-red flowering *R. haematantha* forms an aberrant, closely related species assembly, provisionally called *R. angustissima* group. It occurs from the W Himalaya (Kashmir) to Nepal, Myanmar, Bhutan, and SW China. The group shares retrorsely aculeate stems, linear to filiform leaves in whorls of up to 8(–10), and caudate corolla lobes. Species delimitation within this group is still provisional. Whereas Deb and Malick (Bull. Bot. Surv. India 10(1): 5. 1968) unite *R. angustissima* and *R. charifolia* (“*R. charaefolia*”), the two taxa are maintained by Long (Fl. Bhutan 2(2): 823–825. 1999). The reliability of the flower color as differential character of *R. haematantha* also needs further study. If only one species is accepted, its name would have to be *R. angustissima*.

**13. *Rubia latipetala*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 23. 1999.

阔瓣茜草 kuo ban qian cao

Herbs, perennial, with ?rootstock; stems erect, to 20 cm tall, little branched, quadrangular, glabrous, smooth. Leaves in whorls of 4; petiole 0.8–1.8 cm; blade drying greenish, papery, ± broadly ovate, 1.5–3.5 × 1–3 cm, length/breadth index 1.2–1.5, glabrous except hispid on principal veins, base cordulate to cordate, apex acute; principal veins 3–5, palmate. Inflorescences thyrsoid, with terminal and sometimes axillary, 2–5-flowered and 0.5–1 cm long cymes; axes glabrous. Corolla green, turning blackish when dry, bell-shaped, fused part 1.5–2 mm; lobes triangular, ca. 1.5 mm. Mericarp berries unknown. Fl. Aug.

- Forest margins; ca. 3400 m. Sichuan (Barkam).

No authentic material of *Rubia latipetala* was available to us. From the description it belongs to *R. ser. Chinenses*. A completely glabrous and smooth specimen with larger, ovate-cordate leaves (to 5.5 × 3.5 cm) and petioles up to 3.5 cm (1800 m, 21 Jul 1988, PE – sheet no. 1847036) may belong here.

**14. *Rubia linii*** J. M. Chao, Biol. Bull. Natl. Taiwan Norm. Univ. 1: 48. 1966.

林氏茜草 lin shi qian cao

Herbs, climbing or scrambling, to 1.5 m; stems subterete, glabrous, smooth to sparsely aculeolate. Leaves in whorls of 4; petiole 1–4.5 cm, glabrous; blade drying thinly papery, lanceolate, lanceolate-oblong, or oblong-ovate, 2–7.5 × 0.5–3 cm, length/breadth index 2.5–4, glabrous, upper side sparsely scabrous, base truncate, rounded, or cordulate, margin flat to thinly revolute and smooth, apex acute to acuminate; principal veins 3(or 5), palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, several- to many-flowered cymes; axes glabrous and smooth; bracteoles lanceolate to narrowly elliptic, 1–3 mm; pedicels 1–4 mm. Ovary 0.3–0.5 mm, smooth. Corolla white, rotate, ca. 2.5 mm in diam., with lobes usually reflexed, outside glabrous, fused base ca. 0.5 mm; lobes 5, triangular, 1–1.2 mm, acute. Mericarp berry black, 4–7 mm in diam. Fl. May–Aug, fr. Apr, Jul.

- Margins of evergreen forests; 500–3000 m. Taiwan.

*Rubia linii* was accepted in the Fl. Taiwan (ed. 2, 4: 324. 1998), where neither *R. cordifolia* nor *R. wallichiana* figure. In FRPS (71(2): 316. 1999) it was treated in a comment under *R. wallichiana*, as a possible misidentification of that species. *Rubia linii* is an obvious member of the *R. cordifolia* complex (= *R. cordifolia* agg., see additional comments under that species). More detailed studies will have to demonstrate its doubtful specific status; it is obviously very close to *R. cordifolia* and *R. wallichiana*.

**15. *Rubia magna*** P. K. Hsiao, Acta Phytotax. Sin. 23: 390. 1985.

峨嵋茜草 e mei qian cao

Vines, herbaceous, to 3 m; stems quadrangular or narrowly 4-winged, sparsely retrorsely aculeolate on angles. Leaves opposite; petiole 1–4(–6) cm, retrorsely aculeolate and sometimes ferruginous hirtellous; blade drying thickly papery to leathery, light green and ± ferruginous, particularly below and on main veins, ovate, lanceolate, or oblanceolate, larger leaves 4–12.5 × 1.5–5(–7) cm, smaller 2–3 × 1–2 cm, glabrous to hirtellous, retrorsely aculeolate at least along veins on both surfaces, base rounded to cordate, margins serrulate-aculeolate, apex acuminate; principal veins 3 or mostly 5; stipules conspicuous, persistent, ± broadly ovate, (5–)10–60 × (4–)8–40 mm, acuminate. Inflorescences predominantly axillary, with several- to many-flowered cymes; axes glabrous to hirtellous, sparsely aculeolate; bracts ovate or sub lanceolate, 1–5 mm; pedicels 1–4 mm. Ovary ca. 1 mm, glabrous to glabrescent. Corolla yellow to green, 5-merous, cup-shaped to campanulate, 3.5–4.5 mm in diam., papillose to ± hairy outside; tube 0.8–1.3 mm; lobes triangular-ovate, 1.5–1.7 mm, caudate. Mericarp berry black, 4–5 mm in diam. Fl. Jun–Jul, fr. Aug–Oct.

- Broad-leaved subtropical forests; 1200–1500 m. Sichuan, Yunnan.

The above description of *Rubia magna* combines data from the protologue, H. S. Lo in FRPS (71(2): 295, t. 63, f. 1–8. 1999), and new collections from the Gaoligong Shan region of Yunnan. The latter are conspicuous by their lack of hairiness and their conspicuous stipules (much larger than shown in FRPS). Certain discrepancies (protologue: leaves sometimes sessile and opposite but sometimes petiolate and 3–5-verticillate; H. S. Lo (loc. cit.: 294): corolla lobes 4) may be due to mixed material and still need clarification.

*Rubia magna* is mainly characterized by its opposite leaves, dried green and ferruginous blades, and large stipules. It belongs, together with *R. falciformis* and *R. filiformis*, to the closely related *R. siamensis* group from SW China and adjacent areas.

Originally, *Rubia magna* was described as “a new species of medicinal *Rubia*,” and presumably its uses are detailed in that article.

**16. *Rubia mandersii*** Collett & Hemsley, J. Linn. Soc., Bot. 28: 68. 1890.

黑花茜草 hei hua qian cao

Herbs, perennial, with slightly woody rootstock; stems 20–60 cm tall, erect, unbranched to diffusely branched, quadrangular to narrowly winged, glabrous, ribs retrorsely aculeolate and scabrous to glabrous. Leaves in whorls of 4, sessile; blade drying thickly papery, broadly elliptic-oblong, ovate, or subor-

bicular, 1.5–3.5 × 0.8–1.9 cm, glabrous but scaberulous at least on upper surface, base rounded to cuneate and subpetiolate, margin aculeolate, apex obtuse or acute; principal veins palmate, 3–5. Inflorescences thyrsoid, narrowly paniculate, with terminal and axillary, many-flowered, long-pedunculate cymes; axes glabrous; bracteoles reduced, narrowly ligulate to lanceolate; pedicels 2–4 mm. Ovary ca. 1.5 mm, glabrous. Corolla greenish, yellowish, or whitish, rotate, ca. 5 mm in diam., glabrous, fused basal part 0.5–0.6 mm; lobes lanceolate or ovate, 1.6–2 mm, apex incurved. Immature mericarp berry ca. 3 mm in diam. Fl. Aug, immature fr. Oct.

Dry rocky mountains, *Pinus* forests; 1900–3000 m. Sichuan, Yunnan [Myanmar, Thailand].

*Rubia mandersii*, together with the closely related *R. polyphlebia* and *R. yunnanensis*, forms a SW Chinese group of erect herbaceous perennials with rootstock and ± sessile, lanceolate to broadly ovate, and scabrous or hairy leaves in whorls of 4(–6), which belongs to *R. sect. Oligoneura*.

**17. *Rubia manjith*** Roxburgh ex Fleming, Asiat. Res. 11: 177. 1810.

梵茜草 fan qian cao

*Rubia cordifolia* Linnaeus var. *khasiana* Watt; *R. cordifolia* var. *munjista* (Roxburgh) Miquel; *R. munjista* Roxburgh.

Vines, herbaceous, drying with reddish cast; stems to 3 m, quadrangular, glabrous, retrorsely aculeolate to smooth, with red pith. Leaves in whorls of 4, equal or unequal; petiole 0.8–4 cm, sparsely aculeolate; blade drying papery, mostly greenish adaxially and purplish red abaxially, oblong-lanceolate, ovate-lanceolate, or ovate, (2.5–)4–6(–8.5) × (0.8–)1.8–2.5(–4) cm, length/breadth index 2–3, both surfaces glabrous and scaberulous, base rounded to cordate, margin flat to thinly revolute, aculeolate, apex long acuminate or caudate; principal veins (3 or)5(or 7), palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, many-flowered and 2.5–10 cm long cymes; axes glabrous and smooth to sparsely aculeolate; bracteoles elliptic-oblong or lanceolate, 0.5–2 mm; pedicels 1.5–3.5 mm. Ovary ca. 0.5 mm, smooth. Corolla red, purplish red, or orange, rotate, glabrous, fused basal part 0.5–0.6 mm; lobes 5, lanceolate to triangular, 1.2–1.5 cm, acuminate. Mericarp berry dark red, 3.5–5 mm in diam. Fl. Jul–Aug, fr. Oct.

Broad-leaved forests, *Pinus* forests and thickets; 700–3600 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

*Rubia manjith* belongs to *R. ser. Cordifoliae*. Among the taxa with small rotate flowers (*R. cordifolia* agg.) it is mainly characterized by its conspicuous reddish cast, particularly on lower leaf sides and flowers (see additional comments under *R. cordifolia*). A similar cast also appears in the otherwise quite different *R. podantha*, a taxon with campanulate flowers.

Deb and Malick (Bull. Bot. Surv. India 10(1): 6–8. 1968), after a lengthy discussion, treated *Rubia manjith* (“*R. munjista*”) as a synonym of *R. cordifolia* only and identified it with *R. cordifolia* var. *khasiana*. In contrast, Long (Fl. Bhutan 2(2): 823–825. 1999) distinguished *R. manjith* from *R. cordifolia* largely by its red cast, both alive and dried, but agreed with the inclusion of *R. cordifolia* var. *khasiana* as a synonym. The same was maintained by H. S. Lo (in FRPS 71(2): 314. 1999), who added “*R. cordifolia* f. *rubra* Kitamura” as a synonym of *R. manjith* and

qualified it as "nom. non rite publ." Both Deb and Malick (loc. cit.) and Long (loc. cit.) mention the economic and historical importance of the taxon as a source of an excellent red dye.

**18. *Rubia membranacea*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 279. 1912.

金钱草 *jin qian cao*

*Rubia membranacea* var. *caudata* Z. Ying Zhang; *R. membranacea* var. *incurvata* Z. Ying Zhang.

Vines or climbing herbs; stems to 2 m, quadrangular, glabrous or hirtellous at nodes, scaberulous, retrorsely aculeolate, or sometimes subsmooth. Leaves in whorls of 4; petiole 0.5–2.5(–4) cm; blade drying membranous to papery, lanceolate to subovate, 1–6(–8) × 0.5–2(–4) cm, base rounded to cordate, margins usually aculeolate, apex acuminate or shortly acuminate; principal veins 3 or 5, palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, few- to many-flowered cymes, 2–3 cm; axes glabrous and smooth; pedicels 2–5 mm; bracts narrowly lanceolate, 1–5 mm. Ovary ca. 1.8 mm, glabrous. Corolla purplish red, rotate, fused basal part 0.2–0.6 mm; lobes spreading, ovate-lanceolate, 2–3(–4) mm, caudate. Mericarp berry dark blue or black, 5–9 mm in diam. Fl. May–Jun, fr. Aug–Oct.

• Sparse forests, forest margins, thickets, grasslands; 1100–3000 m. Hubei, Hunan, Sichuan, Yunnan.

We have seen no authentic material of *Rubia membranacea*, which was well illustrated in H. S. Lo (in FRPS 71(2): 293, t. 62, f. 7–12. 1999). The short cymes indicated together with small leaves and relatively large rotate purplish flowers might be distinctive. We have seen only one ± corresponding collection (Sichuan: Mianning Xian, Lamagetou Nature Reserve, D. E. Boufford et al. 32941), but it deviates in habit and more loose cymes.

The two varieties of this species listed above were described and figured by Z. Ying Zhang (Fl. Tsinling. 1(5): 17, 421. 1985) but not cited by H. S. Lo (loc. cit.: 314–315). They were distinguished from var. *membranacea* by the orientation of the corolla lobes, said to be "incurved" in var. *incurvata* and long caudate and glabrous in var. *caudata*, differences of doubtful taxonomic relevance.

**19. *Rubia oncotricha*** Handel-Mazzetti, Symb. Sin. 7: 1031. 1936.

钩毛茜草 *gou mao qian cao*

Herbs, climbing or scrambling; stems 0.5–1.5 m, quadrangular, densely hirtellous or hispidulous with trichomes usually hooked, angles aculeolate. Leaves in whorls of 4; petiole 0.2–1.5 cm, hirtellous; blade drying rather thickly papery, lanceolate to ovate, 0.8–2.5(–3.5) × 0.3–0.8(–1.5) cm, adaxially densely scaberulous and sometimes also hooked hirtellous, abaxially moderately to densely hirtellous, base rounded to usually cordulate, margin thinly revolute and aculeolate, apex obtuse to shortly acute; principal veins 3(or 5), palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, several- to many-flowered cymes; axes hirtellous or pilosulous, aculeolate; bracteoles lanceolate to narrowly elliptic, 2–5 mm; pedicels 0.5–3(–8) mm. Ovary 0.8–1 mm, smooth. Corolla white or yellow, cup-shaped, outside sparsely to densely hirtellous, fused basal part 0.8–1 mm; lobes triangular-ovate, 1.8–2 mm, cau-

date-acuminate. Mericarp berry 3–3.5 mm in diam., color unknown. Fl. Jul–Sep, fr. Sep–Nov.

• Forest margins, sparse forests, and grasslands on mountain slopes; 500–3200 m. Guangxi, Guizhou, Sichuan, Yunnan.

*Rubia oncotricha*, apparently endemic to SW China, is aberrant by its mostly hooked indumentum (H. S. Lo in FRPS 71(2): 300, t. 65, f. 10–14. 1999). Nevertheless, it clearly belongs to *R. ser. Cordifoliae* (see additional comments under *R. cordifolia*).

**20. *Rubia ovatifolia*** Z. Ying Zhang ex Q. Lin, J. Wuhan Bot. Res. 24: 212. 2006.

卵叶茜草 *luan ye qian cao*

Vines, herbaceous, perennial, climbing; stems to 1.5 m, slender, quadrangular, glabrous and smooth to sparsely aculeolate. Leaves in whorls of 4; petiole (1.5–)2.5–5.5(–13) cm; blade drying thinly papery, adaxially green, abaxially pale green, ovate-cordiform to suborbicular-cordiform, on lateral branches sometimes ovate, (2–)4–7(–12) × (1–)2–5(–6.5) cm, length/breadth index 1.5–2, glabrous to scaberulous, base cordulate to cordate, margins retrorsely ciliolate or smooth, apex caudate-acuminate, rarely ± obtuse; principal veins 5, palmate. Inflorescence thyrsoid, leafy, with terminal and axillary, few- to many-flowered cymes; axes glabrous and smooth or sparsely aculeolate; bracts linear or lanceolate-linear, 1–3.5 mm; pedicels 1–3 mm. Ovary ca. 1 mm, glabrous. Corolla whitish or pale yellow, subcampanulate, glabrous; tube 0.8–1 mm; lobes spreading and somewhat bent, ovate to lanceolate-triangular, ca. 1.4 mm, caudate. Mericarp berry black at maturity, 4–5 mm in diam. Fl. Jul, fr. Oct–Nov.

• Sparse forests or thickets on mountains; 1700–2200 m. Gansu, Guizhou (Bijie), ?Hubei, Hunan, Shanxi, Sichuan, Yunnan, Zhejiang (Changhua).

This name was first published by Z. Ying Zhang (Fl. Tsinling. 1(5): 15, 420. 1985) but not validly so because two gatherings were designated as types (*Vienna Code*, Art. 37.2). This was corrected in the above citation from 2006.

We have not seen authentic material of *Rubia ovatifolia*, but there are good drawings in the Tsinling flora and in H. S. Lo (in FRPS 71(2): 307, t. 68, f. 1–5. 1999). This and the description show that it belongs to the taxa of *R. ser. Cordifoliae* and the group with campanulate flowers, as *R. alata* or *R. podantha*. This differential character, so far rather neglected, separates these taxa, e.g., from *R. argyi*. Nevertheless, one has to expect intermediates that link *R. ovatifolia* with *R. sylvatica* and *R. cordifolia* s.s. (see the latter for additional comments).

H. S. Lo (loc. cit.: 306) differentiated two varieties of doubtful status: the ranges of petiole length indicated can be found on a single specimen among the principal and the lateral stems; the descriptions do not specify which leaves to measure. The so-called "var. *oligantha*" may be a depauperate or very young specimen of this or some other species. The name was not validly published because no type was indicated and because the name of the species to which it was assigned was not validly published (*Vienna Code*, Art. 37.1 and Art. 43.1, respectively). Without further study it should not be validated.

**21. *Rubia pallida*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 277. 1912.

浅色茜草 *qian se qian cao*

Herbs, climbing to scandent; stems to 2 m, quadrangular, glabrous or sometimes pilose, retrorsely aculeolate. Leaves in whorls of 4(or 6); petiole 0.5–6 cm; blade drying papery, lanceolate or subovate, 0.6–3.5 × 0.3–1.5 cm, length/breadth index ca. 2, subglabrous or adaxially sparsely hirtellous, abaxially scaberulous, base rounded to cordulate, margin densely serrate-aculeolate, apex acuminate; principal veins 3 or 5, palmate. Inflorescences thyrsoid, paniculate, with terminal or axillary, few-to several-flowered cymes; axes retrorsely aculeolate; bracts lanceolate, 1–2 mm, subglabrous or hirtellous; pedicels 1–4 mm. Ovary ca. 0.7 mm, smooth. Corolla white or pale yellow, rotate, glabrous or papillose, fused basal part ca. 0.5 mm; lobes spreading, ovate-triangular or lanceolate-triangular, 2–2.5 mm, acuminate. Mericarp berry black, ca. 4 mm in diam. Fl. Jun–Jul, fr. Sep–Oct.

- Thickets, roadsides; 2600–3100 m. NW Yunnan.

*Rubia pallida* belongs to *R. ser. Cordifoliae*. It is obviously close to *R. cordifolia* but deviates by its larger flowers. See further comments under that species.

**22. *Rubia podantha*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 277. 1912.

柄花茜草 bing hua qian cao

*Rubia nephrophylla* Deb.

Plants herbaceous, perennial, erect or ± climbing, with rootstock and rhizomes; stems to 1.2 m, quadrangular, glabrous to strigose, with retrorsely aculeolate ribs or narrow wings. Leaves in whorls of 4(or 6), sometimes unequal; petiole 1–5 cm; blade drying papery to subleathery, reddish abaxially or brownish green, lanceolate, lanceolate-ovate, or oblong-ovate, 1.5–5 × 0.5–1.5 cm, length/breadth index 2.5–3.5, both surfaces glabrous, strigillose, or strigose and sparsely to densely scaberulous, base truncate to cordate, margin serrulate-aculeolate or ciliate, apex acute to acuminate; principal veins 3 or 5, palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, ± many-flowered cymes, axes strigillose to glabrous; aculeolate; bracts lanceolate, 1–5 mm; pedicels 1.5–4 mm. Ovary ca. 0.8 mm, subglabrous. Corolla purplish red or yellowish white, campanulate, glabrous to sparsely hirsutulous; fused part 0.8–1 mm; lobes ovate to lanceolate, 1–1.5 mm, strongly reflexed, caudate to shortly acuminate. Mericarp berry black at maturity, 4–5 mm in diam. Fl. Apr–Jun, fr. Jun–Sep.

- Forest margins, sparse forests, grasslands; 700–3000 m. W Guangxi, W Sichuan, Yunnan.

The type specimens of *Rubia podantha* collected by Forrest from the Lichiang Range, Yunnan, are described in the protologue as semi-scandent, with leaves lanceolate, base cordate, reddish below, and somewhat campanulate purplish flowers. This corresponds well with the figure in H. S. Lo (in FRPS 71(2): 317, t. 71, f. 7–12. 1999) and with a specimen collected from the type locality by Handel-Mazzetti in WU. Thus, *R. podantha* belongs to *R. ser. Cordifoliae* and appears related to other species with campanulate flowers, as *R. alata* or *R. ovatifolia*. It shares the reddish hue with the always scandent *R. manjith*, which has broader leaves and smaller, rotate flowers.

**23. *Rubia polyphlebia*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 22. 1999.

多脉茜草 duo mai qian cao

Herbs, perennial, with rootstock; stems erect and rather stout, to 50 cm tall, quadrangular, sulcate, densely shortly hirsute to hispid. Leaves in whorls of 4, sessile; blade drying papery, broadly elliptic-oblong, ovate, or sometimes suborbicular, 2–4.5 × 1–3 cm, both surfaces densely hairy and ± scabrous, base obtuse to subrounded, margins shortly aculeolate-ciliate, apex acute to weakly obtuse; principal veins 7–11, palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, many-flowered and to 10 cm long cymes; axes shortly hairy, aculeolate to glabrescent; bracts leaflike or lanceolate to linear-lanceolate, 1–2 mm; pedicels ca. 1 mm. Ovary 0.4–0.5 mm, subglabrous. Corolla pale yellow, rotate, 2.5–3 mm in diam., hairy outside, glabrous or scabrous inside, fused basal part 0.2–0.3 mm; lobes ovate or lanceolate, 1–1.2 mm, apex ± recurved. Immature mericarp berry 3–5 mm in diam.

- Sichuan.

*Rubia polyphlebia* belongs to the *R. mandersii* group (see there) of *R. sect. Oligoneura*. We have seen no material of this species, but there is a good drawing in H. S. Lo (in FRPS 71(2): 304, t. 67, f. 1–7. 1999).

**24. *Rubia pseudogalium*** Ehrendorfer, Novon 20: 268. 2010.

高黎贡山茜草 gao li gong shan qian cao

Herbs, perennial, sprawling or twining; stems to 2 m, branched, quadrangular, glabrous and smooth or sparsely retrorsely aculeolate. Leaves and leaflike stipules in whorls of never more than 4; petiole (1–)2–4(–6) mm; blade when drying blackening, subleathery, lower side somewhat brighter than upper, linear-lanceolate, lanceolate, or lanceolate-oblong, often somewhat falcate, 20–40 × 2–8 mm, base cuneate to acute, margins and vein adaxially somewhat retrorsely aculeolate or smooth, apex acute or shortly acuminate; principal vein 1, 2 basal lateral veins very weak, often hardly visible. Inflorescences thyrsoid, with axillary, somewhat narrowly elongate, many-flowered cymes; peduncles glabrous, 3–6 mm; bracts small, linear-lanceolate, 0.5–3 mm; pedicels 1–6 mm. Ovary inferior, obovoid, ca. 0.8 mm. Corolla yellowish green, white, or purple, rotate, fused part 0.2–0.5 mm; lobes 5, ovate-triangular, 1.2–1.5 mm, shortly acuminate. Mericarp berry blackening, globose, 3–5 mm in diam. Fl. May–Jun, fr. Jul–Aug.

- Subtropical montane evergreen broad-leaved forests; 2400–3000 m. Yunnan (Gaoligong Shan region).

This new species is strongly reminiscent of certain taxa of *Galium* in habit. Its technical features (as well as DNA data) clearly place it into *Rubia*. In spite of its narrow leaves with only 2 weak lateral veins, it appears to belong to *R. sect. Oligoneura*. It forms an obviously related group with *R. truppeliana* from the mountains of Shandong. Main differences are the leaf whorls never with more than 4 elements, the shorter leaf petioles and peduncles, and the smaller flowers. There is remarkable variation in leaf shape and flower color, as documented by the numerous specimens available from the Gaoligong Shan region, where *R. pseudogalium* may be endemic.

**25. *Rubia pterygocaulis*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 22. 1999.

翅茎茜草 chi jing qian cao

Herbs, perennials, with erect stems tufted from rootstock and from subterranean rhizomes; lower stem portions quadrangular, broadly winged, upper with wings reduced, retrorsely aculeolate. Leaves in whorls of 4–6; petiole 0.5–1 cm; blade drying leathery, ovate, 1–2 × 0.5–1 cm, both surfaces sparsely scaberrulous to aculeolate, base cordate, margin revolute and aculeolate, apex cuspidate-acuminate; principal veins 3, palmate, with lateral veins extending for ca. half of blade length. Inflorescences thyrsoid, with terminal and axillary, several-flowered and 1.5–2.5 cm long cymes; axes retrorsely aculeolate with reduced bracts; pedicels filiform, 1–2 mm. Ovary ca. 1 mm, smooth. Corolla dried dark brownish, rotate, ca. 2.5 mm in diam., glabrous; lobes lanceolate-ovate, 1–1.2 mm, cuspidate. Mericarp berry unknown. Fl. Jun.

● Forests, thickets; 300–1000 m. Sichuan (Jiuzaigou).

No authentic material of *Rubia pterygocaulis* was available, but a good drawing (including underground organs) is found in H. S. Lo (in FRPS 71(2): 300, t. 65, f. 1–9. 1999). The local taxon evidently is a somewhat xerophytic member of *R. ser. Cordifoliae*.

**26. *Rubia reznicekoana*** Litvinov, Trudy Bot. Muz. Imp. Akad. Nauk 7: 75. 1910.

小叶茜草 xiao ye qian cao

Subshrubs, with oblique rootstock; stems to 0.5 m, clumped, quadrangular, glabrous, smooth. Leaves in whorls of 4–6 (or 7), subsessile or sessile; blade drying stiffly papery, elliptic-oblong, ligulate, oblanceolate, or lanceolate, 0.5–1.7 × 0.2–0.8 cm, glabrous, smooth, base obtuse to cuneate, margins thickened and aculeolate, apex acute to obtuse with stiff short cusp; principal vein 1. Inflorescences thyrsoid, with terminal and axillary, several- to many-flowered cymes; axes glabrous and smooth; bracts leaflike, 2–5 mm; pedicels ca. 1 mm. Ovary ca. 0.8 mm, smooth. Corolla yellow, funnel-shaped, (2.5–)3–3.5(–4) mm; tube ca. 1.5 mm; lobes often only 4, oblong-lanceolate, ca. 2 mm, obtuse with short incurved cusp. Mericarp berry black-purple when dry, 6–7 mm in diam. Fl. Jun, fr. Aug.

Sandy lands. Xinjiang [Kazakhstan, Mongolia].

*Rubia reznicekoana* is a rather isolated C Asiatic psammophyte, for which Pojarkova (Fl. URSS 23: 397. 1958) has created the monotypic *R. sect. Chonanthe*, which we include provisionally into *R. sect. Rubia* (see introduction to *Rubia*).

**27. *Rubia salicifolia*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 23. 1999.

柳叶茜草 liu ye qian cao

Vines, herbaceous, or ± climbing herbs; stems to perhaps 1.5 m, quadrangular to 4-ridged, glabrous, ribs aculeolate. Leaves in whorls of 4; petiole 3–12 cm, aculeolate, often pulvinate and strongly bent at base of blade; blade drying papery, grayish brown, linear to narrowly lanceolate, 3–9 × 0.5–1 cm, both surfaces glabrous, smooth or sparsely scaberrulous, base obtuse to rounded, margin flat and smooth to denticulate, apex acute to acuminate; principal veins 3, palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, few- to many-flowered cymes; axes glabrous, aculeolate; bracts linear-lanceolate, 0.5–3 mm; pedicels 3–4 mm. Ovary ca. 0.5 mm, scaberu-

lous. Corolla green, rotate, glabrous; fused basal part ca. 0.5 mm; lobes lanceolate-triangular, ca. 1 mm, cuspidate. Fruit apparently black, 5–6 mm. Fl. Jun–Jul, fr. Sep.

● Moist valleys; ca. 2000 m. Guangdong, Sichuan (Jiulong), ?Yunnan.

This species belongs to *Rubia ser. Cordifoliae* and has been well illustrated in H. S. Lo (in FRPS 71(2): 312, t. 70, f. 7–12. 1999). The above description is based in part on provisionally identified specimens, some of them from Guangdong. Affinities may exist with *R. alata* and its transitional forms with *R. cordifolia* agg. (see additional comments under these species).

**28. *Rubia schugnanica*** B. Fedtschenko ex Pojarkova in Schischkin, Fl. URSS 23: 725. 1958.

四叶茜草 si ye qian cao

Herbs, perennial, or subshrubs, with a rootstock; stems numerous, erect, quadrangular, glabrous, smooth. Leaves in whorls of 4(–6), subsessile or sessile; blade drying subleathery, narrowly lanceolate to linear-lanceolate, 20–50 × 2–5 mm, both surfaces glabrous, smooth, sessile or base narrowed into a very short petiole, margins thickened and retrorsely aculeolate, apex long acuminate; principal vein 1. Inflorescences thyrsoid, with terminal and axillary, several-flowered cymes, shorter than or as long as subtending leaves; peduncles glabrous, 3–10 mm; pedicels 2–5 mm; bracts none or linear, 1–3 mm. Ovary ca. 0.8 mm, smooth. Corolla yellow, rotate; tube 0.2–0.7 mm; lobes lanceolate, 2.3–2.7 mm, acute to mucronate with cusp 0.4–0.6 mm. Mericarp berry black, 3–4 mm in diam. Fl. Jul, fr. Aug.

Sandy lands; ca. 2500 m. Xinjiang [Tajikistan].

We have not seen authentic material of *Rubia schugnanica*. Pojarkova (loc. cit.) placed it into the small C Asiatic and mostly subshrubby *R. ser. Laxiflorae* Pojarkova of *R. sect. Campylanthera*, which we provisionally include in *R. sect. Rubia*.

**29. *Rubia schumanniana*** E. Pritzel, Bot. Jahrb. Syst. 29: 583. 1901.

大叶茜草 da ye qian cao

*Rubia chinensis* Regel & Maack var. *esquirolii* (H. Lévillé) H. Lévillé; *R. cordifolia* Linnaeus var. *maillardii* (H. Lévillé & Vaniot) H. Lévillé; *R. esquirolii* H. Lévillé; *R. leiocaulis* Diels; *R. maillardii* H. Lévillé & Vaniot; *R. schumanniana* var. *maillardii* (H. Lévillé & Vaniot) Handel-Mazzetti.

Herbs, perennial, erect (or rarely ?climbing), with rhizomatous base; stems to 1 m, quadrangular to subterete, sometimes shallowly ribbed and/or sulcate, glabrous or puberulent near nodes, smooth or sometimes sparsely retrorsely aculeolate. Leaves in whorls of 4; petiole equal to unequal, 0.5–1.5(–3) cm; blade drying thickly papery to subleathery, broadly lanceolate, oblong-ovate, or ovate, 3–10 × 1.7–4 cm, length/breadth index 1.5–2.5, glabrous or usually hispidulous along principal veins and scaberrulous on lamina, base obtuse to rounded or cordulate, margins thinly revolute and smooth to scaberrulous, apex acuminate or subacute; principal veins 3 or 5, palmate, plane to impressed adaxially. Inflorescences thyrsoid-paniculate, cymes 5–12 cm, many flowered, terminal and from uppermost stem

axils; peduncles scaberulous, puberulent, or glabrescent; bracteoles lanceolate, 3–4 mm, ciliate; pedicels 1–6 mm. Ovary ca. 1 mm, glabrous. Corolla white or greenish yellow, somewhat campanulate, 4–5 mm in diam., outside glabrous, inside puberulent to scaberulous, fused base 0.8–1 mm; lobes lanceolate, 2–2.2 mm, acute to acuminate. Mericarp berry black, 5–7 mm in diam. Fl. May–Jul, Nov, fr. Aug–Oct.

• Forests; 800–3000 m. Sichuan, Yunnan.

*Rubia schumanniana* (see H. S. Lo in FRPS 71(2): 301, t. 66, f. 1–7. 1999) belongs to *R. ser. Chinenses*, where it is close to *R. chinensis* and *R. latipetala*, but also to taxa of the *R. mandersii* group with sessile leaves. This plant is described as rarely climbing in H. S. Lo (loc. cit.: 299), but that may be due to misidentified specimens.

**30. *Rubia siamensis*** Craib, Bull. Misc. Inform. Kew 1911: 397. 1911.

对叶茜草 *dui ye qian cao*

Vines, herbaceous, to 3 m; stems quadrangular, glabrous, scaberulous to retrorsely aculeate along angles. Leaves opposite; petiole (1–)2–4(–8) cm, aculeolate; blade drying papery to subleathery, ovate or ovate-lanceolate, 6–12 × (1.5–)3–6(–7.5) cm, glabrous on both surfaces, scaberulous and ± aculeolate on principal veins and margins, base cordate or rounded, apex acute or acuminate; principal veins 3–5(or 7), palmate, reticulate veinlets usually visible on both surfaces; stipules triangular, 3–5(–7) × 2–3 mm, persistent. Inflorescences thyrsoid, paniculiform, with axillary, many-flowered cymes; bracts reduced. Ovary ca. 0.5 mm, glabrous. Corolla greenish, campanulate, ca. 3 mm in diam.; tube ca. 1.25 mm; lobes linear-lanceolate, ca. 2 mm, acute. Fruit of 2 subglobose mericarp berries, 1 sometimes aborted, each 4–5 mm in diam., shiny and black when fresh. Fl. Jun–Jul, fr. Aug–Sep.

Evergreen moist forests; [900–]2200–2500 m. SW Yunnan [N Thailand].

*Rubia siamensis* has been illustrated by H. S. Lo (in FRPS 71(2): 297, t. 64, f. 6–9. 1999) and by Puff (Fl. Thailand: Rubiaceae; [http://homepage.univie.ac.at/christian.puff/FTH-RUB/FTH-RUB\\_HOME.htm](http://homepage.univie.ac.at/christian.puff/FTH-RUB/FTH-RUB_HOME.htm); accessed on 5 Oct 2010) who also gives an extended description. Together with other tropical taxa from SW China and N Thailand (*R. magna*, *R. falciformis*, and *R. filiformis*), all with opposite leaves and true stipules, it forms a well characterized group within *R. ser. Oligoneura*, obviously not closely related to the polymorphic *R. ser. Cordifoliae*. Nevertheless, in the intensively studied Gaoligong Shan region of Yunnan, where *R. siamensis* occurs sporadically, a remarkable series of transitional specimens was documented, linking it with *R. alata*, a member of *R. ser. Cordifoliae* (see under *R. cordifolia*).

**31. *Rubia sylvatica*** (Maximowicz) Nakai, J. Jap. Bot. 13: 783. 1937.

林生茜草 *lin sheng qian cao*

*Rubia cordifolia* Linnaeus var. *sylvatica* Maximowicz, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 140. 1859.

Vines, herbaceous, perennial; stems to 3.5 m, quadrangular, glabrous, aculeolate on ribs. Leaves in whorls of 4–10(–12); petiole 2–11 cm, aculeolate; blade drying thinly membranous or papery, brown-black or blackish green, ovate to suborbicular, 3–11 × 2–9 cm, length/breadth index 1.2–1.5, both surfaces

glabrous, scaberulous on lamina and aculeolate on principal veins, base cordulate to cordate, margins aculeolate, apex acuminate to caudate-cuspidate; principal veins 5 or 7, palmate. Inflorescences thyrsoid, with terminal and axillary, several- to many-flowered cymes; axes slender, glabrous, scaberulous; bracts lacking or linear to lanceolate-linear, 1–5 mm; pedicels 1–7 mm. Ovary ca. 0.8 mm, smooth. Corolla greenish, rotate to slightly patelliform, glabrous, fused basal part 0.4–0.6 mm; lobes triangular, 1–1.5 mm, acuminate. Mericarp berry black, 5–10 mm in diam., with pedicels elongating, to 15 mm. Fl. Jul–Aug, fr. Sep–Oct.

Moist forests or forest margins; 800–3500 m. Throughout N China, also in Sichuan [Russia].

*Rubia sylvatica* belongs to *R. ser. Cordifoliae*. It is apparently connected by transitional specimens with *R. cordifolia* s.s., *R. ovatifolia*, and other closely related species, but quite well separated from the similar *R. argyi*. See these taxa for additional comments and the key for differential characters.

A critical taxon is *Rubia hexaphylla* (Makino) Makino (1927) from Korea and Japan, of which we have not seen authentic specimens. From its description (Yamazaki, Fl. Japan 3a: 232. 1993) one could suspect it to be the same as *R. sylvatica*. If this is proven, the former name has priority. The Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) treats *R. sylvatica* as a synonym of *R. cordifolia* subsp. *cordifolia* but maintains *R. hexaphylla*.

**32. *Rubia tenuis*** H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 24. 1999.

纤梗茜草 *xian geng qian cao*

Vines, herbaceous, perennial; stems quadrangular, retrorsely aculeolate on ribs. Leaves in whorls of 4, sessile; blade drying thinly papery, broadly elliptic, 1.5–4 × 0.9–2.3 cm, both surfaces subsmooth or scaberulous to aculeolate on principal veins, base rounded to obtuse, margin sparsely aculeolate, apex cuspidate; principal veins 5, palmate. Inflorescences thyrsoid, with terminal and at lower stem nodes axillary, many-flowered cymes to 14 cm; peduncles slender; bracteoles lanceolate, 2.5–4 mm. Corolla yellow, shallowly campanulate to subrotate, 4–5 mm in diam.; lobes lanceolate, ca. 2 mm, apex incurved, acuminate. Fruit unknown. Fl. Jul.

• Forests, thickets. Sichuan (Luding).

We have not seen authentic material of *Rubia tenuis*, but there is a good drawing in H. S. Lo (in FRPS 71(2): 310, t. 69, f. 1–4. 1999). With respect to habit, indumentum, sessile leaves, inflorescences, and flowers, affinities are suggested with *R. edgeworthii* (see there) and *R. sikkimensis* Kurz. This latter species, well described and figured by Deb and Malick (Bull. Bot. Surv. India 10(1): 12. 1968), is distributed from NE India to Bhutan, but may also reach adjacent China. It mainly differs by larger leaves (5–13 × 2–5 cm) with a rather cuneate base and more acuminate leaf apex. The three species can be assembled provisionally in a *R. sikkimensis* group within *R. ser. Oligoneura*.

**33. *Rubia tibetica*** J. D. Hooker, Fl. Brit. India 3: 204. 1881.

西藏茜草 *xi zang qian cao*

Herbs, perennial, erect, or subshrubs, forming loose cushions from a massive woody rootstock; stems to 0.3 m, quadrangular,

gular, glabrous or mostly with  $\pm$  dense hirtellous indumentum, on angles shortly aculeolate and hispidulous with partly hooked trichomes, lower nodes usually shortly sheathed with membranous bases of old leaves. Leaves opposite and with interpetiolar and  $\pm$  leaflike stipules in whorls of 4(–6), sessile or subsessile; blade drying leathery, broadly to narrowly ovate, elliptic, elliptic-oblong, or lanceolate, 1–3  $\times$  0.3–1.5 cm, both surfaces hirtellous to  $\pm$  glabrous, base acute to obtuse, margins retrorsely aculeolate, toward acute and often cuspidate apex usually antrorsely aculeolate; principal vein 1, sometimes with 2 weak lateral veins. Inflorescences leafy and bracteose, with axillary and terminal, 1- to few-flowered cymes; axes mostly glabrous; pedicels (2–)4–6(–14) mm. Ovary 0.8–1.2 mm, sometimes hirtellous. Corolla yellow, rotate, 5–8 mm in diam., outside sometimes scaberulous; fused base ca. 0.5 mm; lobes lanceolate or lanceolate-ovate, 2–2.5 mm, acuminate. Mericarp berry 3–4 mm in diam. Fl. Jun, fr. Aug.

In gravel at river bottoms; [1700–]3600[–4400] m. Xinjiang, Xizang [Afghanistan, India (Punjab), Kashmir, Kyrgyzstan, Pakistan, Tajikistan].

*Rubia tibetica* is a relatively widespread SW to C Asiatic and typically montane to alpine pioneer species. It was illustrated by Deb and Malick (Bull. Bot. Surv. India 10(1): 4, f. 3. 1968), who lectotypified its name with a specimen from “Tibet” (i.e., Xinjiang). The species is notable for its shoot morphology: the well-developed vegetative leaves of lower stem nodes often appear in a 4-verticillate arrangement with  $\pm$  leaflike stipules, whereas the basalmost first leaves produced by the stems and also the leaves of reproductive nodes are generally paired and exhibit typical interpetiolar stipules.

Deb and Malick (loc. cit.: 4–5) described *Rubia aitchisonii* Deb & Malick from Bagdis, Afghanistan, and separated it by: “Lamina ovate, sub-orbicular, elliptic-ovate or lanceolate, 2–6 in a whorl” in *R. tibetica* vs. “Lamina elliptic-lanceolate, 2 opposite” in *R. aitchisonii*. Ehrendorfer and Schönbeck-Temesy (Fl. Iranica 176: 67. 2005) noted that the only locality of *R. aitchisonii* lies within the area of *R. tibetica* and that the suspected specific differences fall within the morphological variability of *R. tibetica*. Thus, future studies may show that *R. aitchisonii* is better synonymized under *R. tibetica*.

*Rubia tibetica* was placed by Pojarkova (Fl. URSS 23: 401–404. 1958) into *R. ser. Tibeticae* Pojarkova in *R. sect. Campylanthera* together with two other alpine, C Asiatic species: *R. regelii* Pojarkova and *R. komarovii* Pojarkova. They differ from *R. tibetica* by leaves and leaflike stipules in whorls of up to 6 but have not been recorded yet from N China. *Rubia garrettii* Craib from Thailand, also suspected to be a member of this group, certainly does not belong here (see Puff, Fl. Thailand: Rubiaceae; [http://homepage.univie.ac.at/christian.puff/FTH-RUB/FTH-RUB\\_HOME.htm](http://homepage.univie.ac.at/christian.puff/FTH-RUB/FTH-RUB_HOME.htm); accessed on 5 Oct 2010). Whereas the *R. tibetica* group is provisionally included in *R. sect. Rubia*, *R. garrettii* obviously belongs to *R. sect. Oligoneura*.

#### 34. *Rubia tinctorum* Linnaeus, Sp. Pl. 1: 109. 1753.

染色茜草 ran se qian cao

*Rubia iberica* (Fischer ex Candolle) K. Koch; *R. tinctorum* var. *iberica* Fischer ex Candolle.

Herbs, sprawling to climbing, perennial, with extensive stout, woody, and red rhizomes; stems to 1–2.5 m, often fascicled, quadrangular with  $\pm$  sharp angles, somewhat retrorsely aculeolate or glabrous. Leaves in whorls of 4–6, shortly petio-

late to subsessile; blade drying papery to subleathery, lanceolate, lanceolate-oblong, or elliptic-oblong, 3–10  $\times$  0.5–3.5 cm, glabrous or mostly along lower midrib and margins retrorsely aculeolate, base acute, apex acute; lateral veins 3 or 4 pairs, pinnate. Inflorescences thyrsoid, leaflike and many-flowered cymes terminal and axillary from upper stem nodes; axes  $\pm$  retrorsely aculeolate; peduncles up to 50 mm with bracts narrowly elliptic, 2–5 mm; pedicels (0.75–)1.5–8(–12) mm. Ovary ca. 0.8 mm, glabrous. Corolla yellow to greenish yellow, rotate-funnelform, glabrous; tube ca. 1 mm; limb 3–4.5 mm in diam.; lobes lanceolate, ca. 1 mm, shortly acuminate. Anthers large, 0.5–0.6(–0.8) mm, straight. Mericarp berry black, 3.5–4  $\times$  4–4.5 mm. Fl. Jun–Aug, fr. Jul–Sep.

Rather dry open ground; 400–2300 m. Xinjiang [Afghanistan, NW India, Kashmir, Kazakhstan, Pakistan, Turkmenistan; SW Asia (Iran, Turkey); widely cultivated and escaped or weedy from Europe and the Mediterranean throughout the world].

*Rubia tinctorum* is the madder of commerce, cultivated for the dye derived from its rhizomes and roots, and still used in textiles and fine paints. Mainly because of its relatively large and straight anthers, this and a few related taxa from C Asia have been placed into *R. sect. Meganthera* by Pojarkova (Fl. URSS 23: 392–397. 1958). As *R. tinctorum* is the type species of the genus, this section has to be called *R. sect. Rubia* (Ehrendorfer et al., Fl. Iranica 176: 54. 2005).

#### 35. *Rubia trichocarpa* H. S. Lo, J. Trop. Subtrop. Bot. 7(1): 23. 1999.

毛果茜草 mao guo qian cao

Vines, apparently climbing; stems quadrangular, hirsute at least at nodes, retrorsely aculeolate along ribs. Leaves in whorls of 4(–6); petiole slightly shorter than blade, retrorsely aculeate; blade drying thinly papery, grayish green, ovate to cordate, 4–12  $\times$  2.5–7 cm, adaxially glabrous and scaberulous, abaxially sparsely strigillose, hirsutulous, or villosulous, base deeply cordate, margins densely ciliate, apex acuminate; principal veins 3–5, palmate. Inflorescences thyrsoid, paniculate, axillary and perhaps also terminal cymes many flowered and longer than subtending leaves; axes slender, villosulous and retrorsely aculeolate; bracteoles lanceolate, 1.5–2 mm. Flowers not seen. Immature mericarp berry black and shiny when dry, densely ferruginous villous.

• Sichuan (Lixian).

*Rubia trichocarpa* evidently belongs to *R. ser. Cordifoliae*, but no authentic material was available to us. A specimen from Xizang, collected 17 Jul 1973 (PE), fits the above description, with its short hispidulous indumentum extending from stems and leaves to the inflorescence, flowers, and young fruit. It has cymes rather condensed; flowers sessile or on pedicels up to 1.2 mm; and corollas dried purple, ca. 2 mm in diam., campanulate with reflexed petals of ca. 0.8 mm.

#### 36. *Rubia truppeliana* Loesener, Beih. Bot. Centralbl., Abt. 2, 37: 183. 1920.

山东茜草 shan dong qian cao

Herbs, perennial, sprawling or twining, to 2 m; stems branched, quadrangular, glabrous or sparsely puberulent, retrorsely aculeolate on angles, sometimes sulcate-striate. Leaves in whorls of up to 6 or 8; petiole 6–35 mm, aculeolate; blade drying dark green, subleathery, oblanceolate, broadest toward

base, 20–35 × 4–6 mm, scaberulous to retrorsely aculeolate on margins and vein on lower or on both sides, base cuneate to acute, apex acute or shortly acuminate; principal vein 1, 2 lateral veins weaker and hardly reaching half of leaf length. Inflorescences thyrsoid, with terminal and axillary congested to subcapitate cymes; axes aculeolate; bracts lanceolate or linear-lanceolate, 0.5–3 mm; peduncles 10–40 mm; pedicels 0.5–4 mm. Ovary ca. 0.8 mm, smooth. Corolla rotate, glabrous, color not recorded; fused basal part ca. 0.4 mm; lobes ovate-triangular, ca. 2 mm, acuminate. Mericarp berry not seen. Fl. Jul–Aug.

- Forests, thickets; 100–300 m. Shandong.

This local species is certainly close to the newly described *Rubia pseudogalium* from the Gaoligong Shan region of Yunnan but clearly separable (see there). In habit both are quite similar to *Galium*. In spite of their very narrow leaves and only slightly palmate veins, this *R. trupeliana* group probably should be placed into *R. sect. Oligoneura*.

**37. *Rubia wallichiana*** Decaisne, Nouv. Mém. Acad. Roy. Sci. Bruxelles 12: 61. 1837.

多花茜草 duo hua qian cao

Vines or climbing herbaceous perennials; stems to 3 m, 4-angled, glabrous or puberulent at nodes, smooth or sparsely aculeolate. Leaves in whorls of 4(–6); petiole 0.6–6 cm; blade drying thinly papery, lanceolate or ovate-lanceolate, 2–7 × 0.5–2.5 cm, glabrous and sparsely scaberulous, base rounded, truncate, or sometimes cordulate, margins denticulate-aculeolate to smooth, apex acuminate; principal veins 3(or 5), palmate. Inflorescences thyrsoid, paniculate, with terminal and axillary, many-flowered cymes; axes glabrous, smooth to sparsely scaberulous; bracts lanceolate to ligulate, 1–3.5 mm; pedicels 1–4 mm. Ovary ca. 0.5 mm, smooth. Corolla purplish red, greenish yellow, or white, rotate, fused basal part 0.1–0.5 mm; lobes lanceolate to lanceolate-triangular, 1.3–1.5 mm, acuminate, glabrous. Mericarp berry black, 3.5–4 mm in diam. Fl. Aug–Oct, fr. Aug–Dec.

Forests, forest margins, thickets, open fields, village fences; 300–2600 m. Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan, Yunnan [Bhutan, NE India, Nepal].

The above description and distribution data of *Rubia wallichiana* have been taken over from H. S. Lo (in FRPS 71(2): 315–316. 1999). There are hardly any differential characters relative to *R. cordifolia* s.s. aside from vague references to less prickly stems or differences in flower and fruit color (see key). Thus, this dubious taxon clearly belongs to

*R. ser. Cordifoliae*. Deb and Malick (Bull. Bot. Surv. India 10(1): 1–16. 1968) do not even mention *R. wallichiana*. In Fl. Bhutan (2(2): 823–825. 1999) the name is used in a wide sense and evidently includes what is here treated as *R. cordifolia*, *R. sylvatica*, and possibly even *R. argyi*. The Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) accepts *R. wallichiana* as a distinct species. We have hardly seen specimens from China that clearly correspond to *R. wallichiana* (and not to other taxa of *R. cordifolia* agg.). In view of all this, we regard *R. wallichiana* as a possible synonym of *R. cordifolia* s.s. but maintain it as a species in the present flora in order to stimulate its clarification.

**38. *Rubia yunnanensis*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 278. 1912.

紫参 zi shen

*Rubia ustulata* Diels.

Herbs, perennial, with rootstock and somewhat thickened storage roots; stems usually clumped, suberect, to 0.5 m, quadrangular or narrowly 4-winged, hirsute at nodes to glabrescent, smooth or rarely scabrid. Leaves in whorls of 4(–6), subsessile; blade drying papery, lanceolate, ovate, obovate, elliptic-oblong, broadly elliptic, or suborbicular, 1–4(–5) × 0.3–2 cm, both surfaces hairy to scabrid, base cuneate to rounded, margins flat or often revolute, apex acuminate, shortly cuspidate, or acute; principal veins 3(or 5), palmate. Inflorescences thyrsoid, paniculate, terminal and axillary cymes usually longer than subtending leaves; axes subglabrous to sparsely hirsutulous; bractlets lanceolate, 2–5 mm; pedicels 1–3 mm. Ovary 0.3–0.4 mm in diam., glabrous. Corolla yellow or pale yellow, rotate, ca. 3 mm in diam., glabrous; fused basal part ca. 0.5 mm; lobes subovate, 1.2–1.5(–2) mm, apex thickened, incurved, shortly rostrate. Mericarp berries not seen.

- Thickets, grassy slopes, roadsides; 1700–3000 m. Sichuan, Yunnan.

In his publication of *Rubia yunnanensis* Diels referred to an unpublished herbarium name “*R. sikkimensis* var. *yunnanensis* Franchet” and commented that “it is quite different from *R. sikkimensis*.” *Rubia ustulata* was published on the same page immediately after *R. yunnanensis* and said to differ by its smaller size, smaller and more equal leaves and leaflike stipules, and more cuspidate petals. In view of the variability of these characters, its synonymization by H. S. Lo (in FRPS 71(2): 303. 1999) is accepted. The species evidently has a considerable altitudinal range and consequently varies from quite elongated to considerably condensed. Within *R. sect. Oligoneura*, *R. yunnanensis* belongs to the *R. mandersii* group of SW China.

## 80. RUBOVIETNAMIA Tirvengadam, Biogeographica (Paris) 74(4): 166. 1998.

越南茜属 yue nan qian shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs, unarmed, sometimes with some internodes markedly shortened. Raphides absent. Leaves opposite, sometimes appearing ternate due to reduced internode and marked anisophylly grouping 2 leaves at one node plus an apparently solitary leaf at another node, usually with domatia, at apex sometimes aristate; stipules caducous to late deciduous, shortly united around stem, triangular, inside (i.e., adaxially) pubescent, sometimes aristate. Inflorescences terminal and/or pseudoaxillary, cymose and 2–8-flowered or sometimes reduced to 1 flower, pedunculate, bracteate with bracts often stipuliform. Flowers pedunculate or pedicellate, bisexual, monomorphic. Calyx limb deeply 5-lobed; lobes sometimes imbricate in bud. Corolla white turning yellow with age, salverform to funnelform, inside glabrous except with a pilosulous ring near base; lobes 5, convolute in bud. Stamens 5, inserted near corolla throat, partially exserted; filaments reduced; anthers dorsifixed near base, becoming twisted with age, shortly sagittate at base, with

connective prolonged in an apical triangular appendage. Ovary 1-celled, ovules 2–4 on parietal placentas; stigmas 2, spatulate, partially exserted. Fruit baccate, fleshy to leathery, subglobose, smooth, mature color unknown, with calyx limb tardily deciduous; seeds few to several, medium-sized, ovoid to subglobose, smooth; endosperm abundant; embryo minute, basal, nail-shaped; radicle slightly longer than cotyledons; cotyledons suborbicular.

Two species: China, Vietnam; two species (one endemic) in China.

The protologue figure is labeled "*Vidalasia aristata*," but this species was treated in the text in *Rubovietnamia*; *Vidalasia* Tirvengadam was also described in this same article, and presumably *R. aristata* was to be included in that genus initially. *Vidalasia* has several-flowered compound cymes, erose-setose stipules and bracts, numerous ovules and seeds, and probably may be expected in China also.

- 1a. Leaf blade elliptic or oblanceolate, 4–12 × 1.5–4 cm, adaxially glabrescent to sparsely strigillose, abaxially sparsely strigillose, apex acuminate and aristate; stipules on each side deltoid to ovate, caudate-acuminate; corolla tube cylindrical, lobes glabrous inside, hairy outside; fruit strigillose to glabrescent ..... 1. *R. aristata*  
 1b. Leaf blade obovate, 8–18 × 3–5 cm, densely pubescent on both surfaces, apex acuminate; stipules terminating with reduced interpetiolar limbs; corolla tube funnelform, lobes mostly glabrous inside, pubescent outside; fruit tomentose ..... 2. *R. nonggangensis*

**1. *Rubovietnamia aristata*** Tirvengadam, Biogeographica (Paris) 74(4): 167. 1998.

长管越南茜 chang guan yue nan qian

Shrubs or small trees, to 5 m tall; branches compressed to terete, densely strigillose or hirtellous to glabrous. Leaves in equal to somewhat unequal pairs except in penultimate pair of each stem 1 leaf reduced to a stipulelike scale; petiole 0.4–1 cm, strigillose to glabrescent; blade drying thickly papery, elliptic or oblanceolate, 4–12 × 1.5–4 cm, adaxially glabrescent to sparsely strigillose, abaxially sparsely strigillose throughout, base cuneate and sometimes asymmetrical, apex acuminate and aristate with tip 1–2 mm, formed by prolongation of midrib and inserted 2–3 mm below apex from tip of blade tissue; secondary veins 7 or 8 pairs, with pilosulous domatia in abaxial axils; stipules deciduous throughout or persistent on distalmost several nodes, deltoid to ovate, 5–6 mm, sparsely strigillose, caudate-acuminate, entire to shortly aristate. Inflorescences 1–4-flowered, densely strigillose; bracts triangular to 3-lobed, 3–4 mm; pedicel and/or peduncle 15–25 mm. Calyx densely strigillose to villosulous; ovary portion ellipsoid to obovoid, 4–5 mm; limb lobed essentially to base; lobes ovate to lanceolate, 7–10 × 3–5 mm, often somewhat unequal on an individual flower, ciliolate, aristate. Corolla salverform, outside densely sericeous-strigose; tube 20–25 mm; lobes obovate to oblanceolate, 10–15 × 3–6 mm, acute or shortly acuminate. Anthers ca. 10 mm, with triangular appendage ca. 0.5 mm. Stigmas ca. 5 mm. Berry 1–1.7 cm in diam., strigillose to glabrescent; seeds 5–7 mm. Fl. May–Jul, fr. Jul.

Thickets or forests on limestone hills; 200–1400 m. Guangxi, Yunnan [Vietnam].

**2. *Rubovietnamia nonggangensis*** F. J. Mou & D. X. Zhang, Bot. Stud. (Taipei) 51: 123. 2010.

弄岗越南茜 nong gang yue nan qian

Shrubs or trees, to 3 m tall, without spines; young branches covered with hairs and densely hirsute under stipules. Petiole 0.5–1 cm; leaves thickly papery, obovate, 8–18 × 3–5 cm, densely pubescent on both surfaces, base cuneate, apex acuminate; main and lateral nerves visible adaxially, very prominent abaxially, secondary veins 7–14 pairs; stipules ca. 5 mm, papery, outside coated with thick hairs, terminating with 2 minute interpetiolar limbs. Inflorescences 2–8-flowered cymes, superaxillary on lateral branches, with both bracts and bractlets triangular, 3–4 mm; pedicels to 25 mm in open flowers. Flowers 5-merous, very fragrant. Calyx tube campanulate, to 8 mm, hispid, widening at apex with enlarged (well-developed) lobes; lobes elliptic-lanceolate, to 10 × 5 mm, imbricate, markedly veined, coated with dense hairs, apiculate, deciduous. Corolla tubular, glossy, fleshy, waxy, cream white at anthesis, turning yellow with age and without spots in tube; tube dilating gradually to throat, to 35 mm, very narrowly tubular in lower part and convex in middle, ca. 5 mm wide at middle, outside hairy, inside largely glabrous except for a zone 1–1.5 cm above base covered with hairs; lobes obovate to lanceolate, to 18 × 5.5 mm, contorted to left in bud stage, pubescent outside, mostly glabrous inside, reflexed at anthesis. Stamens 5, inserted just at corolla throat and between corolla lobes, sessile; anthers linear, to 5 mm, adnate, 1/2 of length exserted ± medifixed, exserted after anthesis. Ovary inferior, with 2 parietal placentas, numerous ovules each in 2 rows on an oblong-elliptic placenta fusing to form a compact mass when mature; style 3.5–4 cm, with glabrous columnar basal part and pubescent at 2 cm above base; stigma ca. 4.5 × 3 mm, with 2 lobes initially cohering together, fluted, wholly exserted. Floral disk annular. Berry to 2 × 1.5 cm, tomentose, crowned by remnants of calyx and a large yellow disk, lacking ribs; petiole to 2.5 cm; seeds to 6.

• Rocky crevices in moist forests of limestone areas; 200–400 m. SW Guangxi [?Vietnam].

## 81. *SAPROSMA* Blume, Bijdr. 956. 1826–1827.

染木树属 ran mu shu shu

Chen Tao (陈涛); Charlotte M. Taylor

Erect shrubs, unarmed, usually fetid when bruised. Raphides present. Leaves opposite or in whorls of 3 or 4, sometimes with domatia; stipules caducous or persistent, interpetiolar, triangular, entire or 1–3-setose or multifid. Inflorescences axillary or terminal,

fasciculate or cymose and several flowered or reduced to 1 flower, pedunculate to sessile, bracteate with bracts usually fused in pairs. Flowers sessile or pedicellate, bisexual, apparently monomorphic. Calyx limb 4–6-lobed, sometimes funnelform, lobes sometimes unequal. Corolla white, campanulate, tubular, or funnelform, inside villous in throat; lobes 4(–6), valvate-induplicate in bud, with margins sometimes crisped. Stamens 4(–6), inserted in corolla throat, usually partially exserted; filaments short or reduced; anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, basal, erect; style 2-lobed, included or exserted. Fruit blue or purplish black, drupaceous, fleshy, ellipsoid, with calyx limb persistent; pyrenes 1 or 2, 1-celled, with 1 seed, crustaceous to papery; seeds medium-sized, plano-convex, subobovoid, or ellipsoid, abaxially (i.e., dorsally) smooth to verrucose, endosperm fleshy; cotyledon tiny, leaflike; radicle slender, close to hilum.

About 30 species; tropical Asia; five species (four endemic) in China.

*Saprosma* is not well known. Analyses of relationships among *Lasianthus* and related genera support the transfer of *S. crassipes* into that genus, although the authors did not publish a formal nomenclatural transfer (Xiao & Zhu, Bot. Stud. (Taipei) 48: 227–232. 2007).

- 1a. Flowers sessile in sessile glomerules or heads.
  - 2a. Flowers mostly in terminal heads, sometimes also borne in uppermost leaf axils; petioles 1–3 mm ..... 2. *S. hainanensis*
  - 2b. Flowers in glomerules borne along much of length of stem, sometimes also in a terminal head; petioles 10–12 mm ..... 4. *S. merrillii*
- 1b. Flowers sessile to pedicellate in pedunculate and/or branched inflorescences.
  - 3a. Flowers on pedicels 2–10 mm, in branched cymes borne on peduncles 10–40 mm; leaves opposite or more often ternate; pyrenes smooth abaxially ..... 5. *S. ternata*
  - 3b. Flowers sessile in heads, borne on peduncles 5–20 mm; leaves opposite; pyrenes verrucose abaxially.
    - 4a. Peduncles 5–8 mm; secondary leaf veins 7–10 pairs; corolla tube 7–8 mm ..... 1. *S. crassipes*
    - 4b. Peduncles 10–20 mm; secondary leaf veins 4–6 pairs; corolla tube ca. 10 mm ..... 3. *S. henryi*

### 1. *Saprosma crassipes* H. S. Lo, Bot. J. S. China 2: 15. 1993.

厚梗染木树 hou geng ran mu shu

Shrubs 1–2 m tall or occasionally small trees to 5 m tall; branches weakly flattened to subterete, glabrous. Leaves opposite; petiole 3–10 mm, glabrous to sparsely strigillose; blade drying thinly leathery, dark to pale green, elliptic-ovate or oblong-ovate, 8–16 × ca. 6 cm, both surfaces glabrous, base obtuse or rounded, apex abruptly acuminate; secondary veins 7–10 pairs, joining in a submarginal vein, without domatia; stipules caducous, triangular, ca. 1.5 mm, strigillose to glabrous, acute. Inflorescences axillary and sometimes also terminal, capitate, several flowered, strigillose to glabrous; peduncle compressed, 5–8 mm; bracts ovate, 1–2 mm; pedicels to 2 mm. Flowers subsessile to pedicellate. Calyx with hypanthium portion cupuliform, ca. 1 mm, glabrous; limb 0.8–1 mm, shallowly lobed, strigillose to glabrous; lobes broadly triangular, ciliate. Corolla tubular-funnelform, glabrous outside, villous inside; tube 7–8 mm; lobes broadly ovate, ca. 2 mm. Drupes ellipsoid, 7–8 mm; pyrenes hemispherical, verrucose abaxially. Fl. May, fr. May–Oct.

• Forest margins; 300–1300 m. Hainan, Yunnan (Xishuangbanna) [?Vietnam].

A recent analysis of molecular data suggested that this species may be better placed in *Lasianthus*, though the authors did not make a formal nomenclatural transfer (Xiao & Zhu, Bot. Stud. (Taipei) 48: 227–232. 2007).

### 2. *Saprosma hainanensis* Merrill, Lingnan Sci. J. 9: 44. 1930 ["*hainanense*"].

海南染木树 hai nan ran mu shu

Erect shrubs, 1–2 m tall; branches weakly flattened to terete, glabrous, with epidermis often becoming hardened then fragmenting. Leaves opposite or sometimes appearing whorled due to congested nodes with internodes not expanded, sometimes in unequal pairs; petiole 1–3 mm, glabrous; blade drying

membranous to papery, oblong-ovate to oblong-elliptic, 3.5–15 × 1.5–5.5 cm, adaxially glabrous, abaxially glabrous or hirtellous on principal veins, base rounded to cuneate, apex acute or shortly acuminate; secondary veins 7–12 pairs, usually joining in a submarginal vein, usually with pilosulous or foveolate domatia; stipules caducous, ovate, 2–3 mm, glabrous, aristate with bristle 1–3 mm. Inflorescences terminal and in uppermost leaf axils, glomerulate or capitate, few flowered, glabrous; bracts ovate, usually fused in pairs, 1–2 mm. Flowers sessile. Calyx glabrous; hypanthium portion obconic, 1–2 mm; limb 1–2 mm, lobed for ca. 1/2; lobes 4(–6), triangular. Corolla tubular, glabrous or puberulent outside; tube ca. 3 mm, in throat villous; lobes 4, elliptic to elliptic-ovate, ca. 2.5 mm. Drupes obovoid, 6–7 × 3–4 mm; pyrenes plano-convex, smooth abaxially. Fl. Jun, fr. Oct–Nov.

• Ravines; 300–1700 m. Hainan.

H. S. Lo (in FRPS 71(2): 67. 1999) described the calyx lobes as 5 or 6, but they are consistently 4 on the specimens studied.

### 3. *Saprosma henryi* Hutchinson in Sargent, Pl. Wilson. 3: 417. 1916.

云南染木树 yun nan ran mu shu

Shrubs, ca. 3 m tall; branches glabrous. Leaves opposite; petiole 3–7 mm, glabrous; blade drying thinly papery, elliptic or oblong-elliptic, 6–9 × 3–5 cm, both surfaces glabrous, base obtuse, apex shortly acuminate; secondary veins 4–6 pairs, joining in a submarginal vein; stipules triangular, 1.5–2 mm. Inflorescence capitate, few flowered; peduncle 10–20 mm, longitudinally ridged. Flowers sessile. Calyx with hypanthium portion glabrous; lobes triangular, ca. 1.25 mm, subglabrous. Corolla tubular-funnelform, glabrous outside; tube ca. 10 mm, pilose inside; lobes ovate-triangular, ca. 2 mm, obtuse. Drupes oblate, ca. 8 mm; pyrenes verrucose abaxially.

• Mountain forests; 1300–1700 m. Yunnan.

**4. *Saprosma merrillii*** H. S. Lo, Bot. J. S. China 2: 15. 1993.

琼岛染木树 qiong dao ran mu shu

*Lasianthus hainanensis* Merrill, Philipp. J. Sci. 21: 355. 1922, not *Saprosma hainanensis* Merrill (1930).

Shrubs, 2–3 m tall; branchlets terete, strigose or hirtellous to glabrous. Leaves opposite; petiole 10–12 mm, hirtellous or strigillose; blade drying stiffly papery, elliptic-oblong to lanceolate, 10–17 × 3.5–6 cm, adaxially glabrous, abaxially glabrous or usually hirtellous along midrib, base cuneate to truncate, apex acuminate; secondary veins 14 or 15 pairs, joining in a submarginal vein, without domatia; stipules persistent, narrowly triangular, 2–3 mm, strigillose or hirtellous to glabrescent, acute. Inflorescences axillary along stem and sometimes also terminal, glomerulate or capitate, sessile, several flowered, strigillose or hirtellous; bracts apparently reduced. Flowers sessile. Calyx with hypanthium portion obconic, ca. 1 mm, pilosulous to glabrous; limb ca. 1 mm, deeply lobed; lobes triangular. Corolla tubular-funnelform, glabrous outside, villous in throat and on lobes inside; tube 4–4.5 mm; lobes ovate, ca. 1.5 mm. Drupes obovate to oblong-obovate, 7–8(–12) mm; pyrenes plano-convex, smooth abaxially. Fl. Apr.

• Sparse forests or forest margins; 300–1000 m. Hainan.

**5. *Saprosma ternata*** (Wallich) J. D. Hooker, Fl. Brit. India 3: 193. 1881 [*“ternatum”*].

染木树 ran mu shu

*Paederia ternata* Wallich in Roxburgh, Fl. Ind. 2: 520. 1824; *Serissa ternata* (Wallich) Kurz.

Erect shrubs 1–4 m tall, or sometimes small trees 5–6 m tall; branches angled, glabrous. Leaves in whorls of 3 or sometimes opposite; petiole 6–12 mm, glabrous; blade drying thinly leathery to papery, elliptic, oblong-lanceolate, or oblong-elliptic, 8–15 × 3–6.5 cm, both surfaces glabrous, base acute to obtuse, apex shortly acuminate; secondary veins 7–10 pairs, not joining in a submarginal vein, without domatia; stipules caducous, narrowly triangular to lanceolate, 5–12 mm, with 2–7 linear teeth or projections. Inflorescences axillary, cymose, glabrous; peduncles 1–3 per axil, 10–40 mm; bracts triangular to ovate, 1–5 mm, often aristate, usually deciduous after flowering; pedicels 2–10 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion cupuliform, 2–2.5 mm, glabrous; limb 1–2 mm, shallowly and sometimes irregularly lobed; lobes triangular. Corolla tubular, puberulent to tomentulose outside; tube 3–8 mm, pilose in throat; lobes triangular usually with expanded crisped margins, 3–4 mm. Drupes ellipsoid or subglobose, 8–12 × 6–8 mm; pyrenes plano-convex, smooth abaxially. Fl. Apr, Jun, fr. Sep–Nov.

Sparse forests at low to middle elevations, forests in ravines; 400–1000 m. Hainan, Yunnan [NE India, Malaysia].

**82. SCHIZOMUSSAENDA** H. L. Li, J. Arnold Arbor. 24: 99. 1943.

裂果金花属 lie guo jin hua shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs to small trees, unarmed. Raphides presumably absent. Leaves opposite, apparently without domatia or these infrequent and rudimentary; stipules persistent at least near stem apex, interpetiolar, generally triangular, 2-lobed. Inflorescences terminal and sometimes also in uppermost leaf axils and appearing sessile and tripartite, cymose with higher order axes often scorpioid, many flowered, pedunculate, bracteate with bracts persistent or caducous. Flowers sessile or subsessile, bisexual, distylous. Calyx limb deeply 5-lobed, on 1 or several flowers of an inflorescence with 1 white, elliptic or ovate calycophyll. Corolla orange-yellow to orange, salverform with tube slender then abruptly swollen in upper part, inside pubescent at least in throat; lobes 5, notably acuminate, in bud valvate-induplicate with tips pressed together and ascending. Stamens 5, inserted in upper part of corolla tube, included in long-styled form, partially exserted in short-styled form; filaments short; anthers apparently basifixed. Ovary 2-celled, ovules numerous in each cell on axile peltate placentas; stigmas 2, linear, exserted in long-styled form or included in short-styled form. Fruit capsular, ellipsoid to obovoid, slightly flattened perpendicular to septum, loculicidally dehiscent through apical half, woody, with calyx limb persistent, with calycophylls persistent; seeds numerous, small, angled.

One species: SW China, Laos, N Myanmar, N Thailand, N Vietnam.

This species was long included in *Mussaenda*, but morphological and molecular studies support its separation from that genus. Its morphology was studied by Puff et al. (Bull. Jard. Bot. Natl. Belg. 62: 35–68. 1993). Its lack of raphides has not been described but is presumed based on the classification of this genus by various authors in Isertieae.

**1. *Schizomussaenda dehiscens*** (Craib) H. L. Li, J. Arnold Arbor. 24: 100. 1943.

裂果金花 lie guo jin hua

*Mussaenda dehiscens* Craib, Bull. Misc. Inform. Kew 1916: 263. 1916; *Emmenopterys rehderi* F. P. Metcalf; *M. elongata* Hutchinson; *M. henryi* Hutchinson; *Schizophragma macrosepalum* Hu.

Shrubs to small trees, to 8 m tall; branches flattened or angled to terete, strigose to strigillose becoming glabrescent

with age, often with sparse to rather dense ellipsoid lenticels. Petiole 0.5–1.6 cm, strigose to strigillose; leaf blade drying thinly papery, lanceolate, lanceolate-elliptic, or ovate-lanceolate, 10–17 × 2.5–6 cm, adaxially sparsely hirsute or strigose at least along principal veins to glabrescent, abaxially strigose to strigillose along principal lateral veins, sparsely strigose along higher order veins, and glabrescent on blade, base cuneate to rounded, apex acuminate or acute; secondary veins 7–10 pairs, infrequently with a few pilosulous domatia; stipules 5–14 mm, abaxially strigose to strigillose, 2-lobed for 1/4 to nearly completely. Inflorescences densely hirtellous to strigillose; peduncle

2.5–9 cm; branched portion 7–18 × 7–17 cm; bracts 3–15 mm, acute to acuminate. Calyx puberulent; ovary portion obovoid to ellipsoid, 1.5–2 mm; lobes narrowly triangular, 1–2 mm, acute; calycophyll puberulent to strigillose at least on veins and margins, blade drying papery, ovate to broadly ovate, 3–10 × 3–6 cm, 5-veined from near base, base cuneate or acuminate, apex acute or obtuse, with stipe 2–3 cm. Corolla strigose to strigillose outside; tube 18–22 mm, inside densely sulfur-yellow pi-

lose in throat and similarly but more sparsely pubescent near base; lobes broadly ovate, 2.5–3 mm, acuminate to aristate with tip or arista 0.5–1 mm. Anthers ca. 3 mm. Capsule 6–8 × 4.5–5 mm; seeds 0.1–0.2 mm, minutely foveolate and sulcate. Fl. May–Oct, fr. Jul–Dec.

Forests; 100–1000 m. Guangxi, Yunnan [Laos, N Myanmar, N Thailand, N Vietnam].

### 83. *SCYPHIPHORA* C. F. Gaertner, Suppl. Carp. 91. 1806.

瓶花木属 ping hua mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or small trees, unarmed, rather succulent, sometimes with stilt roots; young growth usually mucilaginous or resinous. Raphides presumably absent. Leaves opposite, decussate, without domatia, notably leathery, with petioles articulate; stipules persistent, united around stem, rounded to truncate, entire, enclosing well-developed colleter. Inflorescence axillary, congested-cymose with axes often articulate and regularly dichotomous, pedunculate, bracteate with bracts small and fused in pairs, apparently caducous. Flowers sessile or pedicellate, bisexual, monomorphic. Calyx limb cupuliform, subtruncate or (4 or) 5-denticulate. Corolla white or pink, salverform with tube somewhat expanded in throat, pubescent inside; lobes (4 or) 5, convolute in bud. Stamens (4 or) 5, inserted in corolla just below throat, partially to fully exerted; filaments short; anthers dorsifixed, bifid at base. Ovary 2-celled, ovules 2 in each cell, axile and attached in middle of septum with 1 erect and 1 pendulous; stigmas 2, exerted. Fruit drupaceous (or indehiscent depending on interpretation), ellipsoid-oblong to ellipsoid, often weakly curved, fleshy becoming corky, (6–) 8-ridged or -winged, with calyx limb persistent; pyrene 1, 2-celled, with 2 seeds in each cell, ellipsoid and longitudinally ridged or winged; seeds medium-sized, subcylindrical; testa membranous; endosperm reduced; cotyledons oblong; radicle long.

One species: coastal China, Madagascar, Philippines, Thailand, Vietnam, and Pacific region east to Caroline Islands, New Caledonia, and Australia.

This unusual species was studied in some detail by Puff and Rohrhofer (Opera Bot. Belg. 6: 143–172. 1993), who reported that the flowers have an “ixoroid” pollination mechanism, in which the flowers are protandrous and deposit the pollen on the outside of the stigmas and the style for dispersal. The presence or absence of raphides seems not to have been specifically noted; their absence is presumed here based on the classification by many authors of this genus in Gardenieae.

W. C. Chen (in FRPS 71(1): 368. 1999) described the funiculi of the ovules as connate, but this condition has not been otherwise reported and contradicts the work of Puff and Rohrhofer (loc. cit.).

**1. *Scyphiphora hydrophyllacea*** C. F. Gaertner, Suppl. Carp. 91. 1806.

瓶花木 ping hua mu

Shrubs or small trees, 1–4(–6) m tall, turning black or dark brown when dry; branches weakly flattened to angled or terete, glabrous to puberulent, with nodes sometimes thickened, sometimes with reduced internodes and congested nodes. Petiole 0.5–1.5 cm, glabrous; leaf blade drying leathery, obovate to broadly elliptic, 2.5–7.5 × 1.5–4.5 cm, glabrous on both surfaces, adaxially usually shiny, base cuneate to obtuse, apex

rounded; secondary veins not visible or 4–6 pairs; stipules 1.5–3 mm, margins often sparsely to densely ciliate. Inflorescence 1.5–3 × 2–2.5 cm; peduncle 0.5–1 cm. Flowers sessile or pedicellate, pedicels or subtending inflorescence axes to 2 mm. Calyx glabrous to puberulent; ovary portion cylindrical-ellipsoid, 3–4 mm; limb 1–1.5 mm, truncate to denticulate. Corolla glabrous outside; tube 4–5 mm; lobes ovate-ligulate, ca. 2 mm, obtuse. Drupe 8–11 × 3–5 mm, glabrous. Fl. Jul–Nov, fr. Aug–Dec.

Foreshore mud at seashores; near sea level. Hainan [Philippines, Thailand, Vietnam; SE Asia to Pacific islands, Australia, Madagascar].

### 84. *SERISSA* Commerson ex Jussieu, Gen. Pl. 209. 1789.

白马骨属 bai ma gu shu

Chen Tao (陈涛); Charlotte M. Taylor

Small shrubs, usually much branched, unarmed, fetid when bruised, usually with short shoots. Raphides present. Leaves opposite but often crowded and apparently verticillate, decussate, without domatia; stipules persistent, interpetiolar and often fused to petioles, generally triangular to truncate, with 1–8 bristles. Inflorescences terminal on principal stems and/or terminal on axillary short shoots and apparently axillary, capitate and several flowered or reduced to 1 flower, sessile, bracteate. Flowers sessile or subsessile, bisexual, distylous. Calyx limb 4–6-lobed essentially to base. Corolla white to pink, funnelform or tubular-funnelform, inside villous in tube; lobes 4–6, valvate-induplicate in bud, with margins sometimes crisped. Stamens 4–6, inserted in upper part of corolla tube, included or exerted; filaments short to developed, anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, erect,

basal; stigma 2-lobed, included or exerted. Fruit drupaceous or tardily capsular, obconic to obovoid, leathery to apparently dry, tardily dehiscent septically then loculicidally across top, with calyx limb persistent and often enlarging and becoming spiny; pyrenes 2, 1-celled, each with 1 seed, oblong to obovoid, longitudinally densely ridged.

One or two species: China, Japan, Nepal, Vietnam; one or two species (one endemic) in China.

Puff et al. (Rubiaceae of Thailand, 232. 2005) reported that the fruit of *Serissa* are dehiscent through an apical operculum, releasing two 1-seeded pyrenes; the fruit of the Chinese specimens studied appear to split across the top and partly down the sides to release the obovoid striate pyrenes through the top or disk portion (i.e., the apical section inside the calyx limb), which may correspond to the dehiscence described by Puff et al. The leaf and flower size and pubescence appear to be widely variable, which probably has fueled the selection that has produced a wide range of cultivated forms. *Serissa* is widely cultivated in tropical and warm temperate regions for its foliage, both variegated and solid, and showy flowers, including frequently as bonsai plants. Normally the cultivated plants in regions outside the native range do not produce fruit. Puff et al. (loc. cit.) discussed and illustrated some of the numerous cultivated forms, which go under the English name "snowrose."

The number of species of *Serissa* is controversial. W. C. Ko (in FRPS 71(2): 159–162. 1999) and Puff et al. (loc. cit.) recognized two species, others (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 20 Aug 2007; D. Lorence, Fl. Mesoamericana, in prep.) recognize only one species. In general, more robust plants have been included in *S. serissoides*. W. C. Ko's treatment is presented here for reference, with the description of *S. japonica* augmented with characters from specimens; however, some specimens are not conclusively assignable to one of these species.

- 1a. Leaf blade drying stiffly papery to leathery, ovate to oblanceolate, elliptic, elliptic-oblong, or lanceolate, 0.6–2.2 × 0.3–0.6 mm, apex acute to obtuse or acuminate; flowers solitary to several; corolla tube longer than calyx lobes ..... 1. *S. japonica*  
 1b. Leaf blade drying thinly papery, obovate or oblanceolate, 1.5–4 × 0.7–1.3 cm, apex acute or subacute; flowers solitary or usually several; corolla tube as long as calyx lobes ..... 2. *S. serissoides*

**1. *Serissa japonica*** (Thunberg) Thunberg, Nov. Gen. Pl. 132. 1798.

六月雪 liu yue xue

*Lycium japonicum* Thunberg, Nova Acta Regiae Soc. Sci. Upsal. 3: 207. 1780; *L. foetidum* Linnaeus f.; *Serissa foetida* (Linnaeus f.) Lamarck.

Small shrubs, 60–90 cm tall, presumably evergreen; branches weakly flattened to terete, puberulent to villosulous or hirtellous in interpetiolar lines to sometimes uniformly puberulent throughout. Leaves subsessile or with petiole to 2 mm, glabrous or puberulent to villosulous; blade drying leathery to stiffly papery, ovate to oblanceolate, elliptic, elliptic-oblong, or lanceolate, 0.6–2.2 × 0.3–0.6 cm, both surfaces glabrous to hispidulous or villosulous on principal veins to throughout, often shiny adaxially, base obtuse to acute, apex acute to obtuse or acuminate; secondary veins 2–4 pairs; stipules 0.5–2 mm, puberulent to villosulous, truncate to triangular, with bristles 0.5–4 mm. Flowers solitary to several; bracts narrowly triangular to spatulate, 1–6 mm, glabrous to villosulous, acute, margins entire to ciliate or hispidulous. Calyx glabrous to puberulent or hirtellous; ovary portion obconic, 1–1.5 mm; limb lobed essentially to base; lobes narrowly triangular to lanceolate or linear, 1–5 mm, entire to ciliate or hispid. Corolla outside glabrous to puberulent or villosulous; tube 4–8 mm; lobes narrowly triangular to ovate, 2–2.5 mm. Drupes 2–3 mm; pyrenes 2–2.5 mm. Fl. Apr–Oct, fr. Jun–Nov.

• Streamsides or broad-leaved forests on hills; 100–1600 m. Anhui, Fujian, Guangdong, Guangxi, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [widely cultivated elsewhere].

The Fl. Taiwan (ed. 2, 4: 324–325. 1998) treated one species of *Serissa*, which was called *S. serissoides* but which keys out to *S. japonica* in the classification of W. C. Ko (in FRPS 71(2): 160. 1999); that report is accordingly listed here based on this re-identification.

**2. *Serissa serissoides*** (Candolle) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 1916: 646. 1917.

白马骨 bai ma gu

*Democritea serissoides* Candolle, Prodr. 4: 540. 1830; *Leptodermis nervosa* Hutchinson; *Serissa democritea* Baillon, nom. illeg. superfl.

Small shrubs, to 1 m tall; branches stout, subterete, gray, pilosulous to glabrescent or puberulent. Leaves usually in clusters, subsessile; blade drying thinly papery, obovate or oblanceolate, 1.5–4 × 0.7–1.3 cm, glabrous except sparsely pubescent abaxially, base acute, apex acute or subacute; secondary veins 2 or 3 pairs; stipules with lobes subulate, ca. 2 mm, broad at base, sparsely pubescent. Flowers solitary to usually several; bracts membranous, elliptic, ca. 6 mm, long acuminate, sparsely ciliate. Calyx glabrescent; ovary portion obconic, ca. 1 mm; limb lobed essentially to base; lobes 5, lanceolate-subulate, ca. 4 mm, sharply acute, ciliate. Corolla outside glabrous; tube ca. 4 mm; lobes 5, oblong-lanceolate, ca. 2.5 mm. Fruit not seen. Fl. Apr–Jun.

Wastelands, lawns. Anhui, Fujian, Guangdong, Guangxi, Hubei, Jiangsu, Jiangxi, Taiwan, Zhejiang [Japan].

W. C. Ko (in FRPS 71(2): 162. 1999) reported this species also from Japan, but the Fl. Japan (3a: 228–229. 1993) did not recognize it.

## 85. *SINOADINA* Ridsdale, Blumea 24: 351. 1979.

鸡仔木属 ji zai mu shu

Chen Tao (陈涛); Charlotte M. Taylor

Trees, unarmed; buds rounded. Raphides absent. Leaves opposite, decussate, usually with domatia; stipules caducous, interpeti-

olar, broadly triangular in outline, deeply bifid. Inflorescences terminal and in axils of uppermost leaves, capitate with 7–11 globose heads in a cymose arrangement, many flowered, pedunculate with peduncles occasionally articulate though usually ebracteate in upper half, bracteate; bracteoles filiform to filiform-clavate. Flowers sessile, bisexual, monomorphic. Calyx limb 5-lobed; lobes obtuse. Corolla yellow, salverform to slenderly funnelform, pubescent inside; lobes 5, thinly imbricate in bud. Stamens 5, inserted in upper part of corolla tube, partially exserted; filaments short; anthers basifixed. Ovary 2-celled, ovules 4–12 in each cell on axile placentas attached in upper third of septum; stigma obovoid, exserted. Fruiting heads globose. Fruit capsular, obconic, septicidally dehiscent into 2 valves from base to apex with valves separating along sides or from base to apex and away from persistent septum, sometimes later splitting loculicidally into 2 more valves, stiffly cartilaginous, with septum persistent or tardily deciduous, with calyx limb persistent on septum; seeds several, medium-sized, fusiform to spatulate, slightly to rather strongly flattened, winged at both ends.

One species: China, Japan, Myanmar, Thailand.

Ridsdale (loc. cit.) described the arrangement of the corolla lobes in bud as “valvate but subimbricate at the apex”; on the specimens studied these appear to be imbricate with the margins very thinly overlapping, a condition sometimes called “subimbricate” or “thinly imbricate” elsewhere in this treatment (e.g., *Timonius*). Ridsdale described the seeds as “trigonal to tricornute, slightly bilaterally compressed, not winged,” but the seeds on the specimens studied are flattened and shortly winged at the ends (e.g., *Fang 8106*, MO; *Tsui 756*, MO).

**1. *Sinoadina racemosa*** (Siebold & Zuccarini) Ridsdale, *Blumea* 24: 352. 1979.

鸡仔木 *ji zai mu*

*Nauclea racemosa* Siebold & Zuccarini, *Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss.* 4: 178. 1846; *Adina asperula* Handel-Mazzetti; *A. mollifolia* Hutchinson; *A. racemosa* (Siebold & Zuccarini) Miquel; *Cornus esquirolii* H. Léveillé; *N. taiwaniana* Hayata; *N. transversa* Hayata.

Semi- to fully deciduous trees, 4–12 m tall; trunk bark gray; branches glabrous. Petiole (1–)3–6(–8) cm, glabrous or puberulent; leaf blade drying thinly leathery, ovate, ovate-oblong, or elliptic, (4–)9–15(–25) × (3–)5–10(–18) cm, adaxially shiny and glabrous or infrequently sparsely hirtellous, abaxially glabrous to pilosulous, base cordate to obtuse, sometimes slightly inequilateral, apex acute to acuminate; secondary veins 6–12 pairs, sometimes with foveolate or to pilosulous domatia; stipules (5–)10–15 × 2–5 mm, puberulent to glabrous, lobes

suborbicular. Inflorescence densely puberulent; peduncles 1–3 cm; branched portion 5–10 × 5–10 cm, branched to 1 order; flowering heads 4–8 mm in diam. across calyces, 14–18 mm in diam. across corollas; bracteoles ca. 1 mm. Calyx villosulous; ovary portion ellipsoid-obcuneate, 0.7–1 mm, surrounded at base by a ring of trichomes 0.5–1 mm; limb deeply lobed, lobes spatulate, ca. 0.5 mm, at apex rounded and thickened. Corolla outside densely woolly puberulent; tube (3–)4–5 mm; lobes spatulate to deltoid, 0.5–1 mm, acute to obtuse. Stigma fusiform, 0.3–0.4 mm, exserted for 4–6 mm. Fruiting head 11–15 mm in diam. Capsules obovoid-cuneate, 5–7 mm, sparsely hirtellous; seeds 2.5–3.5 × 0.5–1 mm, often bifid at apex. Fl. and fr. May–Dec.

Sunny watersides, forests; 300–1000(–1500) m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Myanmar, Thailand].

The synonym *Cornus esquirolii* was first cited for this species by Lauener and Ferguson (Notes Roy. Bot. Gard. Edinburgh 32: 103. 1972), based on a type from Guizhou, China.

## 86. SPERMACOCE Linnaeus, Sp. Pl. 1: 102. 1753.

丰花草属 *feng hua cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Bigelovia* Sprengel (1824), not Smith (1819), nor Sprengel (1820), nor *Bigelovia* Rafinesque (1817), nor Candolle (1836, nom. cons.); *Borreria* G. Meyer (1818, nom. cons.), not *Borreria* Acharius (1810) [Fungi].

Herbs, annual or perennial, subshrubs, or low shrubs [rarely dioecious], unarmed. Raphides present. Leaves opposite, sometimes borne on very short axillary stems and these plus long-stem leaves appearing whorled or fascicled, without domatia; stipules persistent, fused to petiole bases or leaves, sheath truncate to broadly rounded or broadly triangular, usually thinly textured, with (1 or)2–11 bristles to multi-fimbriate, bristles occasionally glandular at apex. Inflorescences terminal and/or axillary, capitate or glomerulate, several to many flowered, sessile, bracteate, often partially enclosed in an expanded stipule sheath; bracts usually filiform-laciniate or stipuliform. Flowers sessile or subsessile, bisexual, monomorphic [or rarely distylous or unisexual]. Calyx limb deeply to completely 2- or 4[–8]-lobed, lobes sometimes unequal in pairs. Corolla white sometimes flushed with blue or pink [to sometimes pink, red, blue, or violet], salverform to funnelform, inside variously glabrous throughout, pubescent in throat or throughout, or usually with a ring of pubescence at stamen insertion; lobes 4, valvate in bud [and infrequently with abaxial horns or appendages]. Stamens 4, inserted in corolla throat to near base of tube, included or exserted; filaments short or developed; anthers dorsifixed. Ovary 2-celled, ovules 1 in each cell, axile near middle of septum; stigma capitate or 2-lobed with lobes short to linear, included or exserted. Fruit capsular, ellipsoid to subglobose, septicidally then loculicidally dehiscent with valves remaining joined at base [or sometimes separating completely or remaining connected at apex or partially schizocarpous with 1 valve loculicidal and 1 valve indehiscent], papery to thickly textured, with calyx limb persistent; seeds medium-sized, ellipsoid to subglobose, with ventral (i.e., adaxial) groove, with testa thin, smooth to variously ornamented including minutely pitted to rugose, ruminate, and/or reticulate; endosperm corneous or fleshy; cotyledons leaflike; hypocotyl terete, basiscopic.

About 250–300 species: widespread in tropical to warm temperate regions worldwide with several species widely naturalized; seven species (four introduced) in China.

These species were treated in the genus *Borreria* by W. C. Ko (in FRPS 71(2): 205–210. 1999); *B. shandongensis* as treated by Ko is here considered a synonym of *Diodia teres*. *Borreria* has traditionally been separated from *Spermacoce* based on fruit dehiscence, with both of the fruit valves dehiscent in *Borreria* vs. one dehiscent and one indehiscent in *Spermacoce* (vs. both indehiscent in *Diodia*), but based on pantropical surveys of this group and molecular data the majority of authors today include *Borreria* in *Spermacoce* (Verdcourt, Fl. Trop. E. Africa, Rub. (Pt. 1), 339–374. 1976; Deb & Dutta, J. Econ. Taxon. Bot. 5(5): 1037–1063. 1984; Chaw & Peng, J. Taiwan Mus. 40(1): 71–83. 1987; Dessein, Syst. Stud. Spermaceae (Ph.D. Diss.), University of Leuven, Belgium, 1–403. 2003). The treatment here follows recent neotropical studies as to the separation of and names used for the adventive neotropical species (Burger & Taylor, Fieldiana, Bot., n.s., 33: 1–333. 1993; C. D. Adams, Flora Mesoamericana, in prep.). In particular, seed coat sculpture or texture is informative at the species level, though it must be observed at high magnification (Dessein, loc. cit.); Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 15–24. 1989) illustrated seed coats of many Chinese species. Pollen is also informative in this group (e.g., Dessein et al., Australian J. Bot. 18: 367–382. 2005) but is incompletely studied.

- 1a. Corolla relatively small, with tube plus lobes 0.5–1 mm, with corolla tube shorter than,  $\pm$  equal to, or slightly longer than calyx lobes; calyx lobes 2 or 4; mature fruit 0.6–1.1  $\times$  0.3–1 mm.
  - 2a. Stem angles narrowly winged; leaf blade ovate or elliptic-oblong, 4–15 mm wide; seed coat apparently covered by numerous fine horizontal striations or ridges ..... 3. *S. exilis*
  - 2b. Stems smooth to angled, angles without wings; leaf blade narrowly elliptic-oblong to elliptic, 1–10 mm wide; seed coat with coarse rounded pits arranged in longitudinal (i.e., vertical) rows ..... 5. *S. prostrata*
- 1b. Corollas larger, with tube alone 0.5–10 mm and longer than calyx lobes; calyx lobes 4; mature fruit 1.5  $\times$  1–3.5 mm.
  - 3a. Fruit 1–2  $\times$  1–1.5 mm; leaves linear-oblong or narrowly elliptic, 2.5–16 mm wide; corolla tubes 0.5–1.5 mm.
    - 4a. Leaves linear-oblong, 2.5–6 mm wide; seeds appearing smooth ..... 6. *S. pusilla*
    - 4b. Leaves narrowly elliptic to lanceolate, 4–16 mm wide; seeds transversely ruminate-rugose with irregular deep grooves ..... 7. *S. remota*
  - 3b. Fruit 2.2–5  $\times$  1.5–3.5 mm; leaves elliptic, ovate-oblong, oblong-ellipsoid, obovate, or spatulate, 3–40 mm wide.
    - 5a. Leaf blade elliptic or ovate-oblong, usually widest near middle, 12–75  $\times$  6–40 mm; plants often drying yellowish green; corolla tube 2–3 mm ..... 1. *S. alata*
    - 5b. Leaf blade oblong-elliptic, obovate, or spatulate, usually widest above middle, 10–30  $\times$  3–18 mm; plants usually drying dull green to grayish; corolla tube 2.5–10 mm.
      - 6a. Mature seeds 2–2.5 mm, oblong to elliptic-oblong in outline, brown; corolla tube slender, 6.5–10 mm ..... 2. *S. articularis*
      - 6b. Mature seeds 2.2–3 mm, elliptic to elliptic-oblong in outline, black; corolla tube funnelform, 2.5–4.5 mm ..... 4. *S. hispida*

# **1. *Spermacoce alata* Aublet, Hist. Pl. Guiane 1: 55. 1775.**

阔叶丰花草 kuo ye feng hua cao

*Borreria alata* (Aublet) Candolle; *B. latifolia* (Aublet) K. Schumann; *Spermacoce latifolia* Aublet

Herbs, perennial, erect to weak or clambering, sometimes fleshy, usually drying yellowish green, to 1 m; stems 4-angled, hispidulous or pilosulous and sometimes also hirsute, angles rounded to acute or very narrowly winged, wings entire. Leaves sessile to shortly petiolate; petiole to 4 mm, pilosulous or hirtellous; blade drying papery, elliptic or ovate-oblong, 12–75  $\times$  6–40 mm, both surfaces sparsely to densely hispidulous to pilosulous, base cuneate to obtuse then long decurrent, apex acute or obtuse; secondary veins 5 or 6 pairs; stipules hirtellous to hispidulous, sheath 1–1.5 mm, with 5–9 bristles or narrowly triangular lobes 1–7 mm, ciliate. Inflorescences axillary and infrequently apparently also terminal, 6–15 mm in diam., few to several flowered, notably hispidulous to pilosulous; bracts filiform, 0.5–4 mm. Calyx moderately to densely hirtellous or pilosulous; hypanthium portion ellipsoid to obovoid, ca. 0.5 mm; lobes 4, lanceolate to elliptic or triangular, 1–2 mm. Corolla white tinged with blue to pale purple, funnelform, outside pilosulous to hirtellous; tube 2–3 mm, pubescent in throat; lobes triangular, 1–1.5 mm. Capsules ellipsoid to subglobose, 3–3.5  $\times$  2–3 mm, densely hirtellous and often also hirsute on upper portion, densely puberulent to strigillose on sides, stiffly papery

to cartilaginous, septicidal from apex with valves usually remaining connected at base, then both valves loculicidal through septum; seeds pale brown or dark brown, ellipsoid, ca. 2  $\times$  1 mm, obtuse at both ends, shiny or dull, surface with numerous tiny pits not organized into rows. Fl. and fr. May–Nov.

Naturalized in disturbed ground and wastelands; below 100–800 m. Fujian, Guangdong, Hainan, Taiwan, Zhejiang [apparently native to the Neotropics but exact origin unknown; Antilles, Central America, North America (Mexico, Florida), widespread in tropical South America; naturalized in Africa, S and SE Asia, Australia, Madagascar, and perhaps North America].

The seeds of this species were illustrated by Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 20, f. 25–27. 1989). This species is considered an invasive weed in the area of Guangzhou in Guangdong Province. W. C. Ko (in FRPS 71(2): 207. 1999) described the fruit as septicidal to base at maturity, septum not caducous, or septum of one valve caducous, but there seems to be a confusion here and this description is not accurate for this species.

The names *Spermacoce alata* and *S. latifolia* (or *Borreria alata* and *B. latifolia*) have been treated as distinct species by many authors but synonymized by others, variously under each of these names. There now appears to be only one species here, which takes the name *S. alata*. Aublet's names were published simultaneously; although the names *B. latifolia* and *S. latifolia* have been more often used, these species were apparently first synonymized by Hara and Gould (Enum. Fl. Pl. Nepal, 199–209. 1979) under the name *B. alata*.

## 2. *Spermacoce articularis* Linnaeus f., Suppl. Pl. 119. 1782.

长管糙叶丰花草 chang guan cao ye feng hua cao

*Borreria articularis* (Linnaeus f.) F. N. Williams; *Spermacoce flexuosa* Loureiro.

Herbs, perennial, or subshrubs, prostrate to weakly ascending, perhaps to 50 cm tall; stems subterete to quadrate, glabrescent on sides, angles sharp to winged with wings to 0.1 mm wide, ciliolate to ciliate. Leaves sessile or subsessile; blade drying papery to leathery, oblong-elliptic, obovate, or spatulate, 8–15(–25) × 3–10 mm, both surfaces scaberulous-hispidulous and sometimes also hirtellous or hirsute, base cuneate to obtuse, margins scaberulous and often revolute, apex obtuse or rounded; secondary veins 2 or 3 pairs or not visible; stipules densely puberulent, sheath 1–2 mm, with 5–7 bristles 0.5–2(–6) mm. Inflorescences axillary, 5–8 mm in diam., with 1–6 flowers per axil; bracts linear or infrequently stipuliform, 1–5 mm. Calyx puberulent to hirtellous or scaberulous; hypanthium portion ellipsoid, 0.8–1 mm; lobes 4, linear to narrowly triangular, 1–1.5 mm, ciliolate or ciliate. Corolla perhaps pink to white, very slenderly funnelform to salverform, glabrous outside; tube (6.5–)9–10 mm, glabrous in throat; lobes triangular, 1–2 mm. Capsules ellipsoid to subglobose, sometimes slightly flattened perpendicular to septum, 2.2–2.5 × 1.5–2.5 mm, puberulent to hirtellous, pilosulous, and/or hispidulous, papery to cartilaginous, septicidal from apex with valves usually remaining connected at base, then both valves loculicidal through septum; seeds brown, oblong to elliptic-oblong in outline, 2–2.5 mm, obtuse at both ends, shiny, surface minutely granular or dimpled. Fl. and fr. May–Oct.

On open sandy lands at lower elevations. Fujian, Guangdong (Nanhai Zhudao), Taiwan (introduced and naturalized) [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Vietnam; Africa, Australia].

The seeds of this species (as circumscribed here) were illustrated by Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 19, f. 17–18. 1989).

This name is here used differently than in many previous floras in this region; the commonly collected plants treated by Chaw and Peng (J. Taiwan Mus. 40(1): 71–83. 1987) and W. C. Ko (in FRPS 71(2): 206–207. 1999) as *Spermacoce articularis* are here treated as *S. hispida*, which is the older name. Overall, there is confusion and/or disagreement about the application of these two names as well as the number of specimens that should be separated among these plants, which have been studied only based on regional floristic work rather than a systematic review of this species group across its entire range. Deb and Dutta (J. Econ. Taxon. Bot. 5(5): 1046–1048. 1984) synonymized *S. hispida* and *S. articularis* and recognized a single species, for which they described the corolla tube as “3–1.7 mm ... shorter than the corolla lobes” while illustrating correspondingly a corolla with the tube 4–6 mm and several times longer than the corolla lobes. Sivarajan and Nair (Taxon 35: 363–369. 1986), followed by Ridsdale (in Dassanayake, Revis. Handb. Fl. Ceylon 12: 332–341. 1998) and Mill (Fl. Bhutan 2(2): 817–820. 1999), recognized two species in this group; however, a number of individual Chinese plants have some characters of each of these so their distinctions are problematic in our region. Two distinct groups of plants are separable in our region using the characters listed in the key to species above, and the protologues of these two names each correspond to one of these groups; the treatment here generally follows the annotations of Fosberg (in herb.).

## 3. *Spermacoce exilis* (L. O. Williams) C. D. Adams, Fieldiana, Bot., n.s., 33: 316. 1993.

二萼丰花草 er e feng hua cao

*Borreria exilis* L. O. Williams, Phytologia 28: 227. 1974, based on *B. gracilis* L. O. Williams, Phytologia 26: 487. 1973, not Scheele (1844), nor *Spermacoce gracilis* Ruiz & Pavon (1798); *B. repens* Candolle; *S. decandollei* Deb & R. M. Dutta, nom. illeg. superfl.; *S. mauritiana* Gideon; *S. repens* (Candolle) Fosberg & D. A. Powell (1980), not Willdenow ex Chamisso & Schlechtendal (1828), nor Sessé & Mociño (1893), nor Larrañaga (1923).

Herbs, annual to perhaps perennial, slender, creeping to weakly ascending, to 30 cm tall; stems 4-angled, puberulent to glabrescent, angles winged, wings 0.1–0.5 mm wide, ciliate or ciliolate. Leaves subsessile to shortly petiolate; petiole to 1.5 mm, puberulent to glabrescent; blade drying membranous, ovate or elliptic-oblong, 0.7–30 × 4–15 mm, sparsely puberulent to glabrous throughout or pilose to hispid along midrib abaxially, base obtuse to cuneate, apex acute to obtuse; secondary veins 2 or 3 pairs; stipules pilosulous or hirtellous to glabrescent, sheath 0.5–1 mm, with 5–10 bristles 0.5–2 mm, often glandular. Inflorescences terminal and in uppermost leaf axils, 3–6 mm in diam., several to many flowered; bracts numerous, filiform, 0.5–1.5 mm. Calyx hirtellous to glabrescent; hypanthium portion obovoid, ca. 0.3 mm; lobes 2, linear-lanceolate to triangular, 0.4–0.9 mm. Corolla white, rotate to shortly tubular, 0.5–0.6 mm, outside glabrous, bearded in throat; lobes spatulate triangular, ± as long as tube. Capsules ellipsoid, weakly to strongly flattened at right angles to septum, 1–1.1 × 0.8–1 mm, glabrescent, membranous and sometimes somewhat hyaline, septicidal from apex then both valves loculicidal through septum or sometimes fragmenting; seeds brownish yellow, ellipsoid, ca. 0.8 × 0.4 mm, obtuse at both ends, shiny, surface apparently with numerous fine horizontal striations or ridges (at 10×; but actually with minute transverse pits, visible at 40×). Fl. and fr. almost year-round.

Naturalized in disturbed humid sites at low elevations. Hainan, Hong Kong, Taiwan [apparently native to the Neotropics but exact origin unknown; India, Indonesia, Nepal, Sri Lanka, Vietnam; Africa, Antilles, Australia, Central America, Indian Ocean islands (Mauritius), North America (Mexico), Pacific islands, N South America].

The seeds of this species were illustrated in detail by Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 20, f. 28–30. 1989, as *Spermacoce mauritiana*). The taxonomy and circumscription of this adventive species here follows Burger and Taylor (Fieldiana, Bot., n.s., 33: 316. 1993). The illustration presented by Deb and Dutta (J. Econ. Taxon. Bot. 5(5): 1045, f. 2. 1984, as *S. decandollei*) seems to be based on a mixed collection of *S. exilis* and *S. prostrata* according to the circumscription of these species here. Both *S. exilis* and *S. prostrata* were formerly included in a broadly circumscribed, morphologically heterogeneous “*Spermacoce ocymoides* Burm. f.” Several authors have concluded that this last name applies to a species found only in SE Asia and was incorrectly applied to American and adventive plants (Dessein, Syst. Stud. Spermacoceae (Ph.D. Diss.), University of Leuven, Belgium, 1–403. 2003, and references cited there); presumably the species treated by Bakhuizen f. in the Fl. Java is “true” *S. ocymoides*.

The description of *Spermacoce exilis* here includes observations from specimens from outside China; this species has probably been introduced to China more than once, thus it seems useful to include the variation found in adjacent regions that may yet be found in China.

#### 4. *Spermacoce hispida* Linnaeus, Sp. Pl. 1: 102. 1753.

糙叶丰花草 cao ye feng hua cao

*Borreria hispida* (Linnaeus) K. Schumann.

Herbs, annual or perennial, or subshrubs, prostrate to perhaps weakly ascending, apparently often fleshy, to 50 cm tall; stems subterete to usually markedly quadrate, glabrous to puberulent or pilosulous on sides, angles cartilaginous to winged, wings to 0.1 mm wide, ciliolate, hispidulous, or ciliate. Leaves sessile to shortly petiolate; petiole to 4 mm, hirtellous throughout or ciliolate in lines; blade drying papery to leathery, oblong-elliptic, obovate, or spatulate, 10–30(–40) × 5–15(–18) mm, both surfaces hirtellous to scaberulous, hispidulous, and/or hirsute, base cuneate to obtuse and usually long decurrent, margin scaberulous or ciliolate and often revolute, apex acute, obtuse, or rounded; secondary veins 2 or 3(or 4) pairs or not visible; stipules moderately to densely puberulent, hirtellous, and/or pilosulous often in lines, sheath 1–3 mm, with 5–7 bristles 1–5 mm. Inflorescences axillary, 5–15 mm in diam., with 1–6 flowers per axil; bracts linear or infrequently stipuliform, 1–5 mm. Calyx puberulent to hirtellous or scaberulous; hypanthium portion ellipsoid, 0.8–1 mm; lobes 4, linear-lanceolate to narrowly triangular, 1–1.5 mm, ciliolate or ciliate. Corolla pink, purple, or white, funnelform, outside glabrous or hispidulous to pilosulous on upper part; tube 2.5–4.5 mm, glabrous in throat; lobes elliptic-oblong, lanceolate, or triangular, 1–1.8 mm. Capsules ellipsoid to subglobose, sometimes weakly flattened perpendicular to septum, 2.5–5 × 2.5–3.5 mm, puberulent, hirtellous, pilosulous, and/or hispidulous, papery to cartilaginous, septicidal from apex with valves usually remaining connected at base then both valves loculicidal through septum, with calyx lobes sometimes enlarging, up to 2.2 mm; seeds black, elliptic to elliptic-oblong in outline, 2.2–3 mm, obtuse at both ends, shiny to dull, surface minutely granular or dimpled. Fl. and fr. Mar–Dec.

On open sandy lands at lower elevations; sea level to 100 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [India, Indonesia, Malaysia, Philippines, Sri Lanka, Vietnam; Australia].

This name is applied here to most of the plants treated by W. C. Ko (in FRPS 71(2): 206–207. 1999) as "*Borreria articularis*"; see the comments about these two species above, under *Spermacoce articularis*. The seeds of this species (as circumscribed here) were illustrated by Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 19, f. 22–24. 1989). The leaf measurements included above in parentheses are taken from Wang & Li W05246 (Taiwan, MO!), which is an exceptionally robust plant.

#### 5. *Spermacoce prostrata* Aublet, Hist. Pl. Guiane 1: 58. 1775.

匍匐丰花草 pu fu feng hua cao

*Borreria prostrata* (Aublet) Miquel.

Herbs, annual or probably perennial, slender, weakly ascending to erect at least at ends of stems, to 65 cm tall; stems rounded to subquadrate, smooth to sharply angled and/or longitudinally sulcate, scaberulous to glabrescent. Leaves sessile; blade drying membranous, narrowly elliptic-oblong to elliptic, 10–30(–45) × 1–7(–10) mm, puberulent and/or scaberulous to glabrescent throughout or sometimes pilose along midrib abaxially,

base obtuse to cuneate, apex acute to obtuse; secondary veins 2–5 pairs; stipules puberulent, hirtellous, or glabrescent, sheath 0.5–1 mm, with 5–9 bristles 0.5–2 mm, often glandular. Inflorescences terminal and in uppermost leaf axils, several to many flowered, 3–4 mm in diam.; bracts numerous, filiform, 0.5–1 mm. Calyx glabrescent; hypanthium portion obovoid, ca. 0.3 mm; lobes 2 or 4, narrowly triangular, 0.3–0.7 mm. Corolla white, rotate to shortly tubular, 0.7–1 mm, outside glabrous, pubescent in throat; lobes spatulate-triangular, ± as long as tube. Capsules ellipsoid, weakly to strongly flattened at right angles to septum, 0.6–0.9 × 0.3–0.4 mm, glabrescent, membranous and sometimes somewhat hyaline, septicidal from apex, then both valves loculicidal through septum or sometimes fragmenting; seeds brownish yellow, ellipsoid, ca. 0.5 × 0.2 mm, obtuse at both ends, with coarse rounded pits arranged in longitudinal (i.e., vertical) rows. Fl. and fr. almost year-round.

Naturalized in disturbed wet sites at low elevations. Hainan, Hong Kong, Taiwan [apparently native to the Neotropics but exact origin unknown; India, Indonesia, Sri Lanka; Antilles, Central America, Indian Ocean islands (Mauritius), North America (Mexico), Pacific islands, N South America].

This species has been widely confused with and/or combined with *Spermacoce exilis*, and has sometimes been misidentified as *S. ocyroides*; see the discussion under *S. exilis*, above.

#### 6. *Spermacoce pusilla* Wallich in Roxburgh, Fl. Ind. 1: 379. 1820.

丰花草 feng hua cao

*Borreria pusilla* (Wallich) Candolle.

Herbs, apparently annual, slender, erect, to 60 cm tall; stems subterete to 4-angled, glabrous to densely scaberulous at least along angles or ridges. Leaves subsessile; blade drying papery to leathery, linear-oblong, 12–50 × 2.5–6 mm, adaxially densely scaberulous to hispidulous, abaxially glabrous or often pilosulous, hirtellous, or hispidulous along midrib, base generally straight (i.e., not tapering), margins often revolute at least when dry, apex acute to acuminate; secondary veins 2 or 3 pairs or not visible; stipules densely pilosulous or scaberulous often with unusual clavate trichomes, sheath 1–2.5 mm, with 5–7 bristles 2–6.5 mm. Inflorescences terminal and axillary at most stem nodes, 5–12 mm in diam., several to many flowered; bracts filiform, 1–4 mm. Calyx glabrescent to densely puberulent or hirtellous; hypanthium portion turbinate, ca. 0.5 mm; lobes 4, linear-lanceolate, 1–1.5 mm. Corolla funnelform, white tinged red on upper parts, outside glabrous; tube 1.2–1.5 mm, glabrous in throat; lobes linear-lanceolate to triangular, 0.8–1.5 mm, sometimes pubescent inside near tips. Capsules sometimes shortly stipitate, oblong or subobovate to ellipsoid, usually weakly flattened perpendicular to septum, 1–2 × 1–1.5 mm, glabrescent at base, glabrescent to densely hirtellous near apex, septicidal from apex with valves often remaining connected at base, then both valves loculicidal through septum and often partially splitting abaxially; seeds dark brown, narrowly oblong in outline, 1.3–2.2 × ca. 0.5 mm, obtuse at both ends, shiny, smooth. Fl. and fr. Aug–Dec.

Grasslands and grassy slopes at lower elevations; 100–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Tai-

wan, Yunnan, Zhejiang [Bhutan, India, ?Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; introduced in tropical Africa].

This species was discussed and well illustrated for Taiwan by Chaw and Peng (J. Taiwan Mus. 40(2): 57–59. 1987); its seeds were illustrated in detail by Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 18, f. 10–11. 1989).

These plants were treated by W. C. Ko (in FRPS 71(2): 208. 1999) as *Spermacoce stricta* Linnaeus f. (*Borreria stricta* (Linnaeus f.) G. Meyer), following previous usage by various authors (see discussion in Chaw & Peng, loc. cit.), but as detailed by Sivarajan and Nair (Taxon 35: 363–369. 1986) the identity of the name *S. stricta* is not at all clear and very likely actually applies to a species of *Hedyotis*. W. C. Ko (loc. cit.) described the seeds of this species as transversely striate/grooved and with one end mucronate, another end obtuse; however, the seeds are smooth with both ends obtuse to rounded on all specimens studied, and as described by Dessein (Syst. Stud. Spermacoceae (Ph.D. Diss.), University of Leuven, Belgium, 1–403. 2003).

Sivarajan and Nair (loc. cit.) separated the Indian plants treated in "*Spermacoce stricta*" into two species, *S. pusilla* and a newly described species, *S. ramanii* Sivarajan & R. V. Nair. They gave the range of *S. ramanii* only as India, although they considered several additional names synonymous, with a consequent tacit expansion of its range to Thailand, New Guinea, and Java. Dessein (loc. cit.) discussed the separation of these and concluded that there appear to be two species in India but only one variable species in Africa; he found the contrasting character states in all possible combinations in Africa and did not adopt the name *S. ramanii* for any African plants. The Chinese plants seen appear to comprise one well-delimited species and are here all treated as *S. pusilla*; however, as with the African plants, several of the features that Sivarajan and Nair used to separate *S. ramanii*, which are largely vegetative characters, are found on some Chinese plants in various combinations with other features. The name *S. ramanii* is, therefore, not synonymized nor used here for any Chinese plants; it has been cited for China by the Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; <http://www.kew.org/wcsp/rubiaceae/>; accessed on 15 Sep 2010) but without documentation of the report.

**7. *Spermacoce remota* Lamarck, Tabl. Encycl. 1: 273. 1792.**

## 87. SPERMADICTYON Roxburgh, Pl. Coromandel 3: 32. 1815.

香叶木属 *xiang ye mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Hamiltonia* Roxburgh.

Shrubs, erect or clambering, unarmed, fetid when bruised. Raphides present. Leaves opposite, decussate, without domatia; stipules persistent, interpetiolar or shortly united around stem, triangular. Inflorescences terminal, cymose, paniculate, or corymbose, many flowered, pedunculate, bracteate. Flowers subsessile or sessile, bisexual, distylous. Calyx limb deeply 5-lobed. Corolla white, blue, pink, or violet, slenderly funnellform with tube prolonged, variously glabrous or pubescent inside; lobes 5, valvate in bud. Stamens 5, inserted in corolla throat, included in long-styled form, exserted in short-styled form; filaments short to developed; anthers apparently basifixed. Ovary 5-celled, ovules 1 in each cell, erect, basal, anatropous; stigma 5-lobed, included in short-styled flowers, exserted in long-styled flowers. Fruit drupaceous becoming capsular or perhaps schizocarpous, oblong-ellipsoid, dry, with valves or perhaps mericarps separating septicidally from apex, with calyx limb persistent; pyrenes or perhaps mericarps 5, 1-celled, each with 1 seed, ellipsoid; seeds medium-sized, ellipsoid-oblong or triangular; testa reticulate; embryo straight; radicle basiscopic.

One species: Bangladesh, Bhutan, India, Nepal, Pakistan; cultivated more widely, including in China.

W. C. Ko (in FRPS 71(2): 119. 1999) estimated six species of *Spermadictyon*, but all other authors seen report only one species. Ko described the fruit as having a septum disappearing early and the seeds as having a loose aril, but the meaning of these is not entirely clear and does not correspond to morphology described elsewhere.

光叶丰花草 *guang ye feng hua cao*

*Borreria assurgens* (Ruiz & Pavon) Grisebach; *B. remota* (Lamarck) Bacigalupo & E. L. Cabral; *Spermacoce assurgens* Ruiz & Pavon.

Herbs, perennial, or subshrubs, ascending to erect, to 65 cm tall; stems subterete to subquadrate, sulcate and/or ridged, glabrous or ciliolate on angles. Leaves sessile to petiolate; petiole to 3 mm, glabrescent; blade drying papery, narrowly elliptic to lanceolate, 10–45 × 4–16 mm, puberulent to glabrescent, base acute to cuneate, apex acute; secondary veins 2 or 3 pairs; stipules puberulent or hirtellous to glabrescent, sheath 1–3 mm, with 5–7 bristles 0.5–2 mm. Inflorescences terminal and in uppermost leaf axils, 5–12 mm in diam., many flowered; bracts numerous, filiform, 0.5–1 mm. Calyx puberulent or hirtellous to glabrescent; hypanthium portion obovoid, ca. 0.5 mm; lobes 4, narrowly triangular to linear, 0.8–1 mm. Corolla white, funnel-form, outside glabrous or puberulent on lobes; tube 0.5–1.5 mm, pubescent in throat; lobes triangular, 1–1.5 mm. Capsules ellipsoid, weakly to strongly flattened at right angles to septum, 1.8–2 × 1–1.2 mm, hirtellous or puberulent, papery, septicidal from apex with valves usually remaining connected at base, then both valves loculicidal through septum and often splitting abaxially; seeds brownish yellow, ellipsoid, 1.5–1.8 × 0.8–1 mm, obtuse at both ends, somewhat shiny, transversely ruminant-rugose with irregular deep grooves. Fl. and fr. Jun–Jan.

Naturalized in disturbed wet sites; below 100–300 m. Guangdong, Taiwan [apparently native to the Neotropics; India, Indonesia, Singapore, Sri Lanka, Thailand, Vietnam; Antilles, Australia, Central America, Indian Ocean islands (Mauritius), North America (Mexico), Pacific islands, N South America].

This widely naturalized species was reported from Taiwan by Chaw and Peng (J. Taiwan Mus. 40(1): 71–83. 1987), who noted that it has been widely misidentified as "*Borreria laevis*," but that name applies to a distinct Asian species of restricted range. The seeds of this species were illustrated by Chaw and Sivarajan (Bot. Bull. Acad. Sin., n.s., 30: 20, f. 34–36. 1989, as *Spermacoce assurgens*).

1. *Spermadictyon suaveolens* Roxburgh, Pl. Coromandel 3: 32. 1815.

香花木 *xiang hua mu*

*Hamiltonia suaveolens* (Roxburgh) Roxburgh.

Subshrubs, 1–3 m tall, perhaps rather fleshy; branches somewhat flattened to quadrangular or subterete, tomentulose to glabrescent. Petiole 12–18 mm, pilosulous or tomentulose to glabrescent; leaf blade drying papery, elliptic-lanceolate to elliptic or ovate, 13–20 × 4–6.5 cm, adaxially glabrous or pilosulous to puberulent to tomentulose, abaxially tomentulose to villosulous with pubescence denser on principal veins, base acute to cuneate or rounded, apex acute to obtuse; secondary veins 10–16 pairs; stipules triangular to broadly triangular, 2–4 mm, tomentulose to glabrous, obtuse to subacute. Inflorescences 5–25 cm, tomentulose to villosulous; peduncles 3–5 cm;

bracts ovate to triangular or oblanceolate, 1–4 mm. Calyx densely pilosulous; ovary portion cylindrical to ellipsoid, ca. 1 mm; limb lobed essentially to base; lobes linear-lanceolate, 1.2–2 mm, acute. Corolla blue or white, outside densely tomentulose to villosulous; tube 8–12 mm; lobes ovate to triangular, 1.5–3 mm, acute. Fruit ellipsoid to ovoid, 3–4 mm, densely pilosulous.

Cultivated in gardens and perhaps naturalized. Xizang [Bangladesh, Bhutan, India, Nepal, Pakistan; cultivated more widely].

Raizada and Bennet (Indian Forester 108(2): 302–303. 1982) recognized two varieties of this species, *Spermadictyon suaveolens* var. *suaveolens* with “pure white” flowers and *S. suaveolens* var. *azureum* (Wallich) Bennet & Raizada, based on *S. azureum* Wallich, with “azure-blue flowers.” Other authors have not separated these color forms taxonomically but regard the color difference as due only to pigmented vs. albino flowers, a distinction generally not recognized taxonomically any more and not recognized here.

## 88. SPIRADICLIS Blume, Bijdr. 975. 1826–1827.

螺序草属 *luo xu cao shu*

Chen Tao (陈涛); Charlotte M. Taylor

Herbs, annual or perennial, or subshrubs, unarmed. Raphides present. Leaves opposite, sometimes clustered and appearing whorled, rosulate, or pseudovercillate, isophyllous to anisophyllous, without domatia; stipules persistent to caducous, interpetiolar, triangular, entire to 2(–5)-lobed. Inflorescences terminal and/or pseudoaxillary, cymose to paniculiform with axes slender and dichasial or often scorpioid, several to many flowered, pedunculate, bracteate or bracts reduced. Flowers sessile to pedicellate, bisexual, usually if not always distylous. Calyx with ovary portion usually 5-ridged or -winged, limb 5-lobed. Corolla white, pink, purple, or red, campanulate, funnelform, urceolate, or tubular, inside usually pubescent in throat and with pubescent ring near middle; lobes 5, in bud valvate or induplicate-valvate, often winged or keeled dorsally, sometimes notably pinnatinerved. Stamens 5, inserted below middle of corolla tube and included in long-styled flowers, inserted in throat or middle of corolla tube and partially exerted in short-styled flowers; filaments short to developed; anthers dorsifixed. Ovary 2-celled, ovules numerous in each cell on peltate axile placentas attached to middle of septum; stigmas 2-lobed, included to shortly exerted in long-styled flowers, included and positioned near middle of corolla tube in short-styled flowers. Fruit capsular, subglobose, often 5-ridged to -winged, with apical portion prolonged into beak, dehiscing loculicidally and often also simultaneously or subsequently septicidal from top, dividing partially to completely into 2 or 4 valves with walls usually persistent, papery to stiff, with calyx limb persistent, sometimes elongating; seeds numerous, small, angled; testa reticulate or alveolate; embryo minute; endosperm fleshy.

At least 40 species: Bhutan, China, India, Indonesia, Myanmar, Vietnam; 35 species (31 endemic, one of unconfirmed occurrence) in China.

Robbrecht (Opera Bot. Belg. 1: 1–271. 1988; Opera Bot. Belg. 6: 1–200. 1993) accepted earlier conclusions that *Spiradiclis* is related to *Ophiorrhiza*; a more recent study based on molecular data suggests that the situation may be more complex and calls into question the separation of these genera (Rydin et al., Pl. Syst. Evol. 278: 101–120. 2009). H. S. Lo (in FRPS 71(1): 86. 1999) described the corolla lobes as valvate in bud, but they were described as induplicate-valvate by Bakhuizen f. (Fl. Java 2: 289. 1965). This genus does not appear to be well known at all. It has only been studied regionally, in particular by H. S. Lo et al. (Acta Bot. Austro Sin. 1: 27–36. 1983), H. S. Lo (Bull. Bot. Res., Harbin 6(4): 31–53. 1986), Deb and Rout (Candollea 44: 225–229. 1989), H. S. Lo (Bull. Bot. Res., Harbin 18: 275–283. 1998), and R. J. Wang (Novon 12: 420–423. 2002). Ma et al. (J. Trop. Subtrop. Bot. 13(3): 264–270. 2005) studied seed morphology of sixteen *Spiradiclis* species and found partial correlation with the infrageneric classification of Lo.

H. S. Lo (loc. cit. 1998: 275–276) recognized two subgenera, distinguished as follows:

*Spiradiclis* subg. *Spiradiclis*: ellipsoid to linear-oblong capsules that are 2–4 × as long as wide and have straight valves, including eight (or possibly nine or ten) species in China;

*Spiradiclis* subg. *Sinospiradiclis* H. S. Lo: subglobose capsules that are ± as long as wide and have the valves ultimately twisted, including the remaining Chinese species.

One subsequently described species, *Spiradiclis chuniana* R. J. Wang, was not classified to subgenus when it was published because the fruit were unknown. The key here follows that of H. S. Lo in FRPS (71(1): 86–88. 1999), apparently intended as a schematic outline of the genus classification, with some changes: here the full range of variation that is given in the descriptions has been added to the key leads, and a few species have been moved to different sections within the key based on Lo's descriptions. This key does not fully distinguish all the species; however, it cannot be improved on with the information now available and is here presented to summarize in English the existing information on Chinese *Spiradiclis* and to highlight problematic areas of its taxonomy.

- 1a. Capsules narrowly ellipsoid, ellipsoid, oblanceoloid, narrowly oblong, or linear-oblong,  $2-4 \times$  as long as wide, with valves becoming twisted (dehiscence unknown in *S. baishaiensis*, *S. laxiflora*, *S. longzhouensis*) (*S. subg. Spiradiclis*).
- 2a. Capsules linear-oblong, oblanceoloid, or narrowly oblong,  $2-4 \times$  as long as wide, glabrous or puberulent.
- 3a. Stems and leaves glabrous; petioles 3–4.5 cm; stipule unlobed ..... 23. *S. "microcarpa"*
- 3b. Stems and abaxial leaf veins glabrescent, scaberulous, puberulent, villosulous, or strigillose; petioles 0.2–1 cm; stipules deeply 2-lobed.
- 4a. Corolla tube 2–2.5 mm; corolla lobes apparently perhaps keeled dorsally; fruit 5–6 mm, with 2 valves or these later partly splitting ..... 4. *S. caespitosa*
- 4b. Corolla tube 3–4 mm; corolla lobes smooth dorsally; fruit 2.5–4.5 mm with 4 valves.
- 5a. Capsules 2.5–4 mm; stipules persistent ..... 1. *S. arunachalensis*
- 5b. Capsules 4–4.5 mm; stipules caducous ..... 9. *S. cylindrica*
- 2b. Capsules narrowly ellipsoid or ellipsoid, ca.  $2 \times$  as long as wide, glabrous, pilosulous, or villosulous.
- 6a. Leaves tomentose or pilosulous at least abaxially; capsules glabrous to pilosulous or villous.
- 7a. Peduncle 5–9 cm; calyx lobes 3–4 mm, longer than fruit; capsules glabrous ..... 2. *S. baishaiensis*
- 7b. Peduncle 0.1–0.5 cm; calyx lobes ca. 1 mm, shorter than fruit; capsules villosulous ..... 10. *S. emeiensis*
- 6b. Leaves glabrous; capsules glabrous.
- 8a. Stems with 2 lines of dense hispidulous hairs ..... 22. *S. malipoensis*
- 8b. Stems glabrous or sparsely evenly pubescent.
- 9a. Leaves 10–15 cm, with secondary veins 9–11 pairs ..... 16. *S. laxiflora*
- 9b. Leaves 15–21 cm, with secondary veins 16–23 pairs ..... 20. *S. longzhouensis*
- 1b. Capsules subglobose, ellipsoid, to ovoid, or subglobose-obconic,  $\pm$  as long as wide, valves remaining straight (fruit unknown in *S. chuniana*, *S. corymbosa*, *S. ferruginea*, *S. fusca*, *S. longipedunculata*, *S. napoensis*, *S. rubescens*, *S. spathulata*, *S. xizangensis*; fruit dehiscence unknown in *S. hainanensis*, *S. longibracteata*, *S. oblanceolata*, *S. villosa*) (*S. subg. Sinospiradiclis*).
- 10a. Leaves cordate, cordulate, subtruncate, or broadly obtuse at base.
- 11a. Leaves 0.6–1.8 cm; plants creeping.
- 12a. Calyx lobes 2–4 mm, in fruit 2 or  $3 \times$  as long as capsule ..... 13. *S. guangdongensis*
- 12b. Calyx lobes 1.2–1.5 mm, in fruit  $\pm$  equal to or shorter than capsule ..... 14. *S. hainanensis*
- 11b. Leaves 1.5–13 cm, at least some more than 1.8 cm; plants erect or creeping.
- 13a. Corolla 20–21.5 mm; leaves 1.5–4 cm; plants creeping ..... 33. *S. umbelliformis*
- 13b. Corolla 6–9 mm; leaves 3–13 cm; plants ascending or acaulescent.
- 14a. Plants with leaves distributed along developed stems; leaves  $3-6.5 \times 1.6-3$  cm, broadly obtuse to truncate at base ..... 5. *S. chuniana*
- 14b. Plants acaulescent or with short stems, with leaves often clustered at base of plant; leaves  $5-13 \times 2-5.5$  cm, cordate or cordulate at base ..... 7. *S. cordata*
- 10b. Leaves acute, cuneate, obtuse, or rounded at base.
- 15a. Corolla with tube 13.5–23 mm.
- 16a. Calyx lobes 1–1.5 mm,  $\pm$  as long as or shorter than corolla "tube" (i.e., hypanthium portion together with unlobed basal part of calyx limb).
- 17a. Stems developed with leaves borne at developed internodes ..... 30. *S. scabrida*
- 17b. Stems short or hardly developed, with leaves clustered at base ..... 31. *S. spathulata*
- 16b. Calyx lobes 1.6–10 mm, longer than corolla "tube."
- 18a. Leaves glabrous on both surfaces; flowers dark red ..... 6. *S. coccinea*
- 18b. Leaves pubescent (hirsute, pilose, strigose, hispidulous, hirtellous) on one or both surfaces and/or ciliate marginally; flowers red, bluish purple, white, purplish red, purplish white, or pink (flowers unknown in *S. xizangensis*).
- 19a. Corolla tube 19–22 mm.
- 20a. Calyx lobes generally equal in size; leaves adaxially densely hispidulous-strigose; corolla bluish purple, tube 19–21 mm ..... 28. *S. purpureocaerulea*
- 20b. Calyx lobes unequal in size; leaves adaxially sparsely puberulent or glabrous; corolla red or purplish red, tube 21–22 mm.
- 21a. Secondary leaf veins 18–29 pairs; calyx lobes 3–10 mm; corolla tube ca. 22 mm ..... 18. *S. longibracteata*
- 21b. Secondary leaf veins 9–11 pairs; calyx lobes 3.5–4.5 mm; corolla tube ca. 21 mm ..... 29. *S. rubescens*
- 19b. Corolla tube 12–18 mm (only known in bud in *S. napoensis*).
- 22a. Calyx lobes unequal in length, one distinctly longer and/or wider than others; corolla tubes glabrescent or uniformly pubescent over broad areas inside.

- 23a. Corolla pubescent inside; leaf secondary veins 8–15 pairs ..... 11. *S. ferruginea*  
 23b. Corolla glabrescent inside; leaf secondary veins ca. 7 pairs ..... 35. *S. xizangensis*  
 22b. Calyx lobes equal or subequal in size; corolla tubes with 1 or 2 discrete white villous rings of pubescence inside.  
 24a. Leaves rounded, obtuse, or acute at apex, with 18–29 pairs of secondary veins; corolla sparsely purplish red pubescent outside; stipules broadly ovate ..... 18. *S. longibracteata*  
 24b. Leaves acuminate at apex, with 6–10 pairs of secondary veins; corolla glabrous or with 5 lines of pubescence outside; stipules subulate to linear.  
 25a. Leaves lanceolate, ovate, subelliptic, or subelliptic-oblong, yellowish brown on lower surface when dry; stipules and bracteoles 2–3 mm; corolla with 5 lines of pubescence outside, lobes narrowly winged on dorsal surface ..... 15. *S. howii*  
 25b. Leaves narrowly ovate to broadly ovate, pale on lower surface when dry; stipules 2–8 mm and bracteoles 6–10 mm; corolla glabrous outside, lobes smooth on dorsal surface ..... 25. *S. napoensis*  
 15b. Corolla shorter, tube 2–9 mm (flowers unknown in *S. bifida*, *S. villosa*; only buds known in *S. microphylla*).  
 26a. Stems and inflorescences glabrous.  
 27a. Leaves narrowly elliptic-oblong or oblanceolate, 3.5–4.5 × as long as wide; stipules long triangular; stems with developed internodes ..... 26. *S. oblanceolata*  
 27b. Leaves obovate, broadly obovate, oblong-elliptic, oblong-lanceolate, or subelliptic, 1.5–3 × as long as wide; stipules triangular, triangular-orbicular, suborbicular, or long triangular; stem internodes developed to reduced.  
 28a. Stipules suborbicular or triangular-orbicular, cuspidate and 2-lobed; stem internodes developed ..... 19. *S. longipedunculata*  
 28b. Stipules triangular to long triangular, at apex acuminate; stem internodes developed or reduced.  
 29a. Leaves 1.5–3.5 cm wide, with 10–13 pairs of secondary veins; petioles 0.5–1.5 cm; corolla tube ca. 9 mm ..... 12. *S. fusca*  
 29b. Leaves 3–4.5 cm wide, with 7–9 pairs of secondary veins; petioles 1–4 cm; corolla tube ca. 5 mm ..... 21. *S. luochengensis*  
 26b. Stems and inflorescences pubescent.  
 30a. Stems short, with leaves crowded at base of plant.  
 31a. Flowers subsessile; corolla pubescent inside ..... 17. *S. loana*  
 31b. Flowers on pedicels 1–5 mm; corolla glabrous inside ..... 32. *S. tomentosa*  
 30b. Stems prolonged, erect to prostrate, with leaves separated by developed internodes.  
 32a. Calyx and capsules glabrous or subglabrous; leaves 10–21 cm, with 15–19 pairs of secondary veins ..... 3. *S. bifida*  
 32b. Calyx and capsules pubescent; leaves 1–25 cm, with 4–17 pairs of secondary veins.  
 33a. Capsules villous; calyx lobes ca. 4 mm ..... 34. *S. villosa*  
 33b. Capsules puberulent, pilosulous, pilose, or hispidulous; calyx lobes 0.3–1.5 mm.  
 34a. Leaves 6.5–14 cm, with 11–17 pairs of secondary veins; corolla tube 7.5–9 mm ..... 8. *S. corymbosa*  
 34b. Leaves 1–5 cm, with 4–9 pairs of secondary veins; corolla tube ca. 2 mm (only known in bud in *S. microphylla*).  
 35a. Leaves 1–3 × 0.5–4 cm, with 4–7 pairs of secondary veins; fruit with 4 valves ..... 24. *S. microphylla*  
 35b. Leaves 3–5 × 1.5–3 cm, with ca. 9 pairs of secondary veins; fruit valves 2, sometimes tardily splitting into 4 ..... 27. *S. petrophila*

1. *Spiradiclis arunachalensis* Deb & Rout, Candollea 44: 225. 1989.

藏南螺序草 zang nan luo xu cao

*Spiradiclis caespitosa* Blume f. *subimmersa* H. S. Lo.

Herbs, perennial, usually prostrate and rooting on basal

nodes; stems glabrous to densely villosulous. Petiole 0.2–1 cm; leaf blade drying papery, oblanceolate to lanceolate-elliptic, 1.5–7.5 × 0.3–1.8 cm, adaxially glabrescent to scaberulous or strigillose marginally and on principal veins, abaxially strigillose to puberulent along principal veins and glabrescent on lamina, base cuneate to acute, apex acute; secondary veins 6–11

pairs; stipules persistent, deeply 2-lobed, lobes narrowly triangular, 4–10 mm, strigillose to glabrescent, acute. Inflorescences dichasially branched 1 or 2 times, strigillose or puberulent; peduncles 2–6 cm; axes scorpioid; bracts linear-lanceolate, 1.5–3 mm. Flowers subsessile. Calyx glabrous; hypanthium portion obconic to cylindrical, 1.7–2.2 mm; limb 0.6–1 mm, deeply lobed; lobes triangular to ovate. Corolla white, shortly tubular, outside puberulent to glabrous; tube 3–4 mm; lobes ca. 1 mm. Capsules narrowly oblong to narrowly oblanceoloid, 2.5–4 × 1.5–2 mm, glabrous, valves 4, becoming twisted. Fl. and fr. Sep.

Moist understories of forests, rice fields at forest margins. Guangxi, Guizhou, Yunnan [India].

See comments about the identity and circumscription of this species under *Spiradiclis caespitosa*.

**2. *Spiradiclis baishaiensis*** X. X. Chen & W. L. Sha, Bull. Bot. Res., Harbin 8(3): 107. 1988.

百色螺序草 bai se luo xu cao

Herbs, perennial, ascending, 20–50 cm tall; stems usually unbranched. Petiole 1.5–4 cm, yellow pilosulous or -villosulous; leaf blade drying papery, adaxially brown, abaxially straw-yellow, ovate-elliptic, obovate, or oblanceolate, 7–10 × 3–6 cm, adaxially glabrous, abaxially densely yellowish brown tomentose, base cuneate to acute and usually slightly inequilateral, apex acute or acuminate; secondary veins 11–23 pairs; stipules persistent, ovate-lanceolate, 9–13 × 4–6 mm, obtuse. Inflorescence cymose to paniculiform, glabrous, purplish red; peduncles 5–9 cm; branched portion 5–8 cm, dichasial; bracts linear-lanceolate, 8–15 × 1.5–2 mm; bracteoles linear, 3–5 mm; pedicels 3–4 mm. Calyx glabrous; hypanthium portion ovoid to ellipsoid, ca. 2.5 mm; limb lobed to base; lobes linear, 3–4 mm. Corolla purplish red, becoming brownish yellow when dry, tubular or tubular-funnelform, outside glabrous; tube 8–13 mm, inside pubescent near middle or bearded in throat; lobes ovate-oblong, ca. 2 mm. Capsules ellipsoid, ca. 3 × 1.5 mm. Fl. May.

• Forests. Guangxi.

In the protologue this species was said to be similar to *Spiradiclis oblanceolata*, although this species was classified in *S.* subg. *Spiradiclis* while *S. oblanceolata* was classified in *S.* subg. *Sinospiradiclis*. The protologue of *S. baishaiensis* apparently described short-styled flowers (cf. f. 3, f. 4, and description of style as half as long as corolla and anthers exerted); however, H. S. Lo (in FRPS 71(1): 106. 1999) reported this to be a description of a long-styled flower. The protologue described the corollas as pubescent near the middle inside, while H. S. Lo described the corollas as bearded in the throat.

**3. *Spiradiclis bifida*** Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 310. 1872.

大叶螺序草 da ye luo xu cao

Herbs, to 0.5 m tall, apparently perennial; stems ascending, ?villous. Petiole 1–3 cm, pubescent; leaf blade drying thinly papery, elliptic or elliptic-oblong, 10–21 × 3–6.5 cm, adaxially sparsely pilose to subglabrous, abaxially pubescent along veins, base obtuse then decurrent, apex acuminate or subcaudate; secondary veins 15–19 pairs; stipules subulate, caudate. Inflorescences paniculate, to 20 cm, ?villous; axes numerous, 1–2 cm, scorpioid; bracts minute. Flowers shorter than 5 mm. Capsules subglobose, ca. 2 mm in diam., valves 4.

Wet places in forests. S and SW Yunnan [NE India].

**4. *Spiradiclis caespitosa*** Blume, Bijdr. 975. 1826–1827.

螺序草 luo xu cao

Herbs, perennial, usually rooting at basal nodes but ascending in upper parts; stems puberulent to glabrescent. Petiole 0.3–1 cm; leaf blade drying papery, elliptic to elliptic-ovate, 1–6.5 × 1–3 cm, puberulent to glabrescent on both surfaces, base cuneate to obtuse, apex obtuse to acute; secondary veins 3–7 pairs; stipules deciduous or caducous, deeply 2-lobed, lobes narrowly triangular to linear, 4–5 mm, puberulent to glabrescent. Inflorescences cymose, puberulent to strigillose, unbranched or dichasially branched 1 time; peduncle 1–4.5 cm; axes scorpioid; bracts filiform. Flowers subsessile. Calyx glabrous to puberulent; hypanthium portion oblanceoloid to cylindrical, 1.5–2 mm; limb 0.5–1 mm, deeply lobed; lobes triangular. Corolla white, shortly tubular, outside glabrous; tube 2–2.5 mm; lobes 1–1.5 mm, dorsally keeled. Capsules linear-oblong to oblanceoloid, 5–6 × 1.5–1.7 mm, valves 2, becoming twisted, sometimes later partially splitting.

Moist shady sites, often along streams; near sea level to 1200 m. Perhaps present in China, no confirmed material seen [Indonesia (Java)].

This species is here circumscribed more narrowly and somewhat differently than done by H. S. Lo (in FRPS 71(1): 107–110. 1999); it has not yet been confirmed from China and is included here for comparison, based on the description of Bakhuizen f. (Fl. Java 2: 289. 1965) who studied plants in the type region. Authors outside China have separated the Himalayan plants with 4-valved capsules as *Spiradiclis cylindrica* (Deb & Rout, Candollea 44: 225–229. 1989; Springate & Wright, Fl. Bhutan 2(2): 772–774. 1999) and are followed here; H. S. Lo et al. (Acta Bot. Austro Sin. 1: 31. 1983) synonymized this name under *S. caespitosa* f. *cylindrica*.

H. S. Lo (Acta Bot. Austro Sin. 1: 31–32. 1983) described several forms of *Spiradiclis caespitosa*. In FRPS (H. S. Lo, loc. cit. 1999: 110), f. *subimmersa* was distinguished by its narrowly lanceolate to lanceolate leaves 3–7 × 0.7–1.5 cm. The plants included in f. *subimmersa* were subsequently treated as a species, *S. arunachalensis*, by Deb and Rout (loc. cit.: 225). These plants correspond to *S. cylindrica* as circumscribed here, rather than to *S. caespitosa* under which the varietal name was actually published. Most of the specimens studied and described by Deb and Rout were not seen by Lo, and similarly Lo's material was not seen by them. *Spiradiclis arunachalensis* is provisionally treated here pending further study.

**5. *Spiradiclis chuniana*** R. J. Wang, Novon 12: 423. 2002.

焕铺螺序草 huan yong luo xu cao

Herbs, annual, to 8 cm tall, mostly unbranched, perhaps ascending; stems densely villous. Petiole 1–3 cm, villous; leaf blade ovate, 3–6.5 × 1.6–3 cm, sparsely villous on both surfaces, base broadly obtuse to truncate and often oblique, apex rounded to obtuse then mucronate; secondary veins 10–12 pairs; stipules persistent, villous, 2–5-lobed, lobes linear, 5–10 mm. Inflorescences cymose, several flowered, villosulous; peduncle 2.5–6 cm; branched portion ca. 1.5 cm; axes mixed dichasial and scorpioid; bracts linear, 1.2–2 mm; pedicels to 5 mm. Flowers distylous, sessile to pedicellate. Calyx puberulent; hypanthium portion obconic to ellipsoid, ca. 1 mm; lobes narrowly triangular, ca. 1 mm. Corolla white, funnelform, puberulent outside; tube ca. 7.5 mm, inside with villous ring at middle and

sparsely pubescent above; lobes ca. 1.5 mm. Immature capsules apparently subglobose. Fl. Aug.

● Shady and wet places in forests on slopes of limestone hills; ca. 400 m. Guangxi (Nonggang).

This species was not classified to subgenus in the protologue because the mature fruit were unknown, and predicting the states of unknown characters is problematic in many Rubiaceae (e.g., Razafimandimbison & Taylor, *Novon* 10: 71–73. 2000).

**6. *Spiradiclis coccinea*** H. S. Lo, *Bull. Bot. Res.*, Harbin 6(4): 38. 1986.

红花螺序草 hong hua luo xu cao

Herbs, erect, ca. 40 cm tall, presumably perennial; stems grayish brown when dry, glabrous or subglabrous. Petiole 1–2 mm; leaf blade drying papery, adaxially grayish brown, abaxially grayish yellow, narrowly elliptic-oblong or elliptic-oblong, 4.5–9 × 1.3–3 cm, glabrous on both surfaces, base cuneate, apex obtuse to acute; secondary veins 6–9 pairs; stipules triangular, rapidly narrowed to subulate, long acuminate apex. Inflorescence cymose, ca. 1 cm, with more than 10 flowers; peduncle very short. Flowers distylous. Calyx glabrescent; hypanthium portion obconic, 1.2–1.5 mm; lobes narrowly lanceolate, 1.7–2 mm, with gland at each side of base inside. Corolla dark red, slenderly tubular-salverform, outside glabrous or puberulent; tube 15–18 mm, inside with pilose ring above stamens; lobes broadly ovate to suborbicular, 4.5–6 mm. Capsules subglobose, 4.5–5.5 mm in diam., valves 4. Fl. Aug.

● On rocks in dense forests. Guangxi (Longzhou).

**7. *Spiradiclis cordata*** H. S. Lo & W. L. Sha, *Acta Bot. Austro Sin.* 1: 34. 1983.

心叶螺序草 xin ye luo xu cao

Herbs, fleshy, low, apparently perennial, acaulescent or stems short, densely hirsute. Leaves often clustered at base of plant; petiole 1–7 cm, densely villosulous to hirsute; blade drying papery, pale to green, elliptic-ovate to elliptic-oblong, 5–13 × 2–5.5 cm, adaxially sparsely hispidulous, abaxially hispidulous to villous with pubescence denser along veins, base cordate to cordulate, apex obtuse to rounded; secondary veins 15–19 pairs; stipules deciduous, hispidulous to villous, deeply 2-lobed, lobes linear, 4–8 mm. Inflorescences cymose to paniculate, puberulent to strigillose; peduncles 6–16 cm; principal axes 4–9, 1–3 cm, mostly scorpioid; bracts linear or subulate, ca. 2 mm. Flowers subsessile. Calyx densely puberulent to pilosulous; hypanthium portion obconic, 0.5–0.8 mm; lobes triangular, ca. 0.8 mm. Corolla white, tubular-funnelform, outside puberulent to glabrescent; tube ca. 5 mm, villous above middle inside; lobes subtriangular, ca. 1 mm. Capsules brown, subglobose, ca. 1.8 mm in diam., valves 4, flat. Fl. Aug, fr. Aug–Nov.

● Rocks at roadsides; ca. 400 m. Guangxi.

**8. *Spiradiclis corymbosa*** H. S. Lo, *sp. nov.*

密花螺序草 mi hua luo xu cao

Type: China. Guangxi: Daxin, Taiping, 4 Jun 1977, *D. L. Chao* 2–64 (holotype, GXMI).

Validating Latin description: that of “*Spiradiclis corymbosa* W. L. Sha e [sic!] X. X. Chen” (H. S. Lo, *Bull. Bot. Res.*, Harbin 18: 276. 1998).

Herbs, 24–30 cm tall, perhaps perennial, unbranched, perhaps ascending; stems densely pubescent. Leaves in slightly unequal opposite pairs; petiole 0.5–2.5 cm, pubescent; blade drying papery, elliptic to long elliptic, 6.5–14 × 2–4.7 cm, both surfaces pilose along veins, base cuneate, apex acute; secondary veins 11–17 pairs; stipules long triangular, to 23 mm, ciliate, apex subulate. Inflorescences corymbose, densely many flowered, densely pubescent; peduncles 4.5–9 cm; axes usually scorpioid; bracts linear, 3–18 mm, ciliate; bracteoles linear, ca. 2 mm, ciliate; pedicels to 2 mm. Flowers sessile to pedicellate. Calyx pubescent; hypanthium portion turbinate, ca. 1.5 mm; lobes long triangular, ca. 1 mm, ciliate. Corolla red, pubescent inside and out; tube 7.5–9 mm; lobes ovate, 1.5–2 mm. Capsules unknown. Fl. Jun.

● Rocks in forests on limestone hills. Guangxi.

This name was previously published by H. S. Lo (loc. cit.) but not validly so because the type was not indicated in accordance with Art. 37.6 and 37.7 of the *Vienna Code*. This species as circumscribed here reportedly (H. S. Lo in *FRPS* 71(1): 100. 1999) comprises the Chinese plants previously treated as *Spiradiclis leptobotrya* (Drake) Pitard var. *longiflora* Merrill, in particular as treated under that name by H. S. Lo et al. (*Acta Bot. Austro Sin.* 1: 29. 1983).

**9. *Spiradiclis cylindrica*** Wallich ex J. D. Hooker, *Fl. Brit. India* 3: 76. 1880.

尖叶螺序草 jian ye luo xu cao

*Spiradiclis caespitosa* Blume f. *cylindrica* (Wallich ex J. D. Hooker) H. S. Lo.

Herbs, perennial, often prostrate and rooting on basal nodes, at apices ascending; stems densely villosulous. Petiole 0.3–1 cm; leaf blade drying papery, elliptic, narrowly elliptic, or lanceolate-elliptic, 2–8 × 1–4 cm, adaxially scaberulous to glabrescent, abaxially scaberulous, puberulent, or villosulous at least along veins, base obtuse to acute, apex acute; secondary veins 7–9 pairs; stipules caducous, strigillose to puberulent, 2–10 mm, deeply 2-lobed, lobes narrowly triangular to linear. Inflorescences cymose to paniculate, puberulent; peduncle 2–8 cm; principal axes dichasially branched 1 or 2 times, higher order axes scorpioid; bracts linear, 1–5 mm. Flowers subsessile. Calyx glabrous to puberulent; hypanthium portion obconic to oblanceoloid, 1.5–2 mm; limb ca. 1 mm, lobed nearly to base; lobes triangular. Corolla white, shortly tubular, outside glabrous; tube ca. 3.5 mm; lobes ca. 1 mm, smooth dorsally. Capsules linear-oblong to oblanceoloid, 4–4.5 × 1–1.7 mm, valves 4, becoming twisted.

Ravines in forests, rice fields at forest margins; 1200–1500 m. Guangxi, Guizhou, Xizang, Yunnan [Bhutan, Myanmar, N Vietnam].

See comments regarding the circumscription and recognition of this species under *Spiradiclis caespitosa*.

**10. *Spiradiclis emeiensis*** H. S. Lo, *Acta Bot. Austro Sin.* 1: 36. 1983.

峨嵋螺序草 e mei luo xu cao

Herbs, decumbent, rather fleshy, presumably perennial; stems densely pubescent. Petiole 1–4 cm, densely pubescent; leaf blade drying thinly papery, grayish green, ovate to elliptic, 4–9 × 2–4 cm, both surfaces sparsely pubescent or often densely

so along abaxial veins, base cuneate then often decurrent, apex acute to obtuse; secondary veins 9–12 pairs; stipules persistent, deltoid, acuminate. Inflorescence cymose to subcapitate, villous; peduncle 0.1–0.5 cm; branched portion 1–2 cm, with axes dichasial; bracteoles subulate, 1.5–2 mm. Flowers subsessile. Calyx pilosulous to villous; hypanthium portion ellipsoid-cylindrical, ca. 1.5 mm; limb deeply lobed; lobes triangular-lanceolate, ca. 1 mm. Corolla white, urceolate-tubular, white villous outside; tube 3.5–4 mm; lobes lanceolate to elliptic, 2–2.5 mm. Capsules narrowly ellipsoid, ca.  $6 \times 3$  mm, pilosulous to villous, valves 4, becoming slightly twisted. Fl. Jun, fr. Aug.

- Dense forests. Sichuan, Yunnan.

This species was described based on fruiting material; later H. S. Lo (Guihaia 11: 102. 1991) provided a detailed description of the inflorescences and flowers, which apparently represent the short-styled form of a distylous species.

- 1a. Inflorescence 1–2 cm, subsessile; capsules villous ..... 10a. var. *emeiensis*
- 1b. Inflorescence ca. 3.5 cm; peduncles ca. 0.5 cm; capsules pilosulous ..... 10b. var. *yunnanensis*

#### 10a. *Spiradiclis emeiensis* var. *emeiensis*

峨嵋螺序草(原变种) *e mei lu xu cao* (yuan bian zhong)

Inflorescence 1–2 cm, subsessile. Capsules villous.

- Dense forests. Sichuan (Emei Shan).

#### 10b. *Spiradiclis emeiensis* var. *yunnanensis* H. S. Lo, Guihaia 11: 102. 1991.

河口螺序草 *he kou lu xu cao*

Inflorescence ca. 3.5 cm; peduncles ca. 0.5 cm. Capsule pilosulous.

- Dense forests. Yunnan (Hekou).

#### 11. *Spiradiclis ferruginea* D. Fang & D. H. Qin, Bull. Bot. Res., Harbin 13: 334. 1993.

锈茎螺序草 *xiu jing lu xu cao*

Herbs, prostrate to ascending, 3–20 cm tall, presumably perennial; stems densely ferruginous pubescent. Petiole 0.5–5 cm, densely ferruginous pubescent; leaf blade drying papery, ovate, ovate-elliptic, or rarely elliptic,  $3\text{--}12 \times 1.5\text{--}5$  cm and slightly anisophyllous, both surfaces densely pubescent, base rounded and sometimes inequilateral, apex acuminate or obtuse; secondary veins 8–15 pairs; stipules ovate-lanceolate, 8–10 mm, sparsely pubescent, ciliate. Inflorescence cymose, 7–10-flowered, densely pubescent; peduncle 3–6 cm; bracteoles lanceolate-linear, 5–7 mm; pedicels 1–7 mm. Flowers distylous, pedicellate. Calyx pubescent; hypanthium portion turbinate, ca. 1 mm; lobes narrowly lanceolate, unequal, one lobe ca. 5 mm, others ca. 4 mm, ciliate, with a gland in each sinus. Corolla pale purplish red, tubular-funnelform, outside and inside pubescent; tube ca. 16 mm; lobes ovate-triangular, ca. 3 mm. Capsules unknown. Fl. Mar.

- On calcareous rocks in forests; ca. 1200 m. Guangxi (Napo).

#### 12. *Spiradiclis fusca* H. S. Lo, Guihaia 11: 100. 1991.

两广螺序草 *liang guang lu xu cao*

Herbs, 30–80 cm tall, perhaps perennial, perhaps ascending; stems glabrous, when dry brownish yellow. Petiole 0.5–1.5 cm; leaf blade drying thinly papery, adaxially grayish brown, abaxially brownish yellow, oblong-lanceolate to sub-elliptic,  $4\text{--}9 \times 1.5\text{--}3.5$  cm, adaxially glabrous, abaxially pilose on principal veins, base cuneate and somewhat decurrent, apex acuminate or subacute; secondary veins 11–13 pairs; stipules triangular, 6–7 mm, long acuminate, usually 2-parted. Inflorescences paniculiform, many flowered, together with peduncles 7–10 cm, glabrous; bracteoles subulate or linear, 2–3 mm; pedicels short. Calyx glabrous; hypanthium portion obconic, ca. 1 mm; lobes sub lanceolate, ca. 1.5 mm. Corolla white or pale purple, funnelform, glabrous outside; tube ca. 9 mm; lobes subtriangular, ca. 3 mm, apically rostrate-incurved. Capsules unknown. Fl. Mar.

- Limestone hills. Guangdong (Lianxian), Guangxi (Guilin).

The characters given in the protologue, in particular the proportional length of the calyx lobes to the corolla, do not seem to correspond to the figure of this species presented by H. S. Lo in FRPS (71(1): 102, t. 22, f. 6–10. 1999). This species was keyed by Lo in FRPS (loc. cit.: 87) as having pubescent stems and inflorescences, but the description (loc. cit.: 99–100) differed from that and so the species is here included in a different section of the key.

#### 13. *Spiradiclis guangdongensis* H. S. Lo, Acta Bot. Yunnan. 9: 299. 1987.

广东螺序草 *guang dong lu xu cao*

Herbs, creeping, perhaps perennial, ascending at apices; stems sparsely to densely pubescent. Petiole 2–6 mm, pubescent; leaf blade drying papery, leaden to pale gray, cordiform-rounded to broadly ovate,  $0.7\text{--}1.5\text{--}1.8 \times 0.5\text{--}1.2$  cm, adaxially sparsely hirsute, abaxially usually glabrous or subglabrous, base cordulate to broadly obtuse, apex subacute; secondary veins 3–5 pairs; stipules deeply 2-lobed, glabrescent, lobes linear-subulate, 2–3 mm. Inflorescence 1–3-flowered, puberulent to pilosulous; peduncles short; bracteoles linear, ca. 1.7 mm; pedicels 1–2 mm. Flowers distylous, pedicellate. Calyx hispidulous to glabrescent; hypanthium portion obconic, ca. 1 mm; lobes oblong-lanceolate, ca. 2 mm, with gland in each sinus. Corolla white, slenderly funnelform, subglabrous outside; tube ca. 11 mm, in throat densely villous; lobes subovate, ca. 4 mm, sparsely pinnatinerved. Capsules subglobose-obconic, ca. 1.4 mm, persistent calyx lobes 3–4 mm, valves 4, straight. Fl. early spring.

- Dense forests, forest margins. Guangdong, Guangxi (Hechi).

As noted by H. S. Lo in the protologue, this species is very similar to *Ophiorrhiza exigua* and, in fact, was confused with it in the original description of that species.

#### 14. *Spiradiclis hainanensis* H. S. Lo, Acta Bot. Yunnan. 9: 301. 1987.

海南螺序草 *hai nan lu xu cao*

Herbs, creeping, perhaps perennial, ascending at apices; stems densely villosulous. Petiole 0.1–0.5 mm, densely villosulous; leaf blade drying thinly papery, adaxially grayish black,

abaxially pale gray, cordiform-orbicular to ovate, 0.6–1.3 × 0.6–0.9 cm, both surfaces hispidulous at least on principal veins to glabrescent, base cordulate to subtruncate, apex obtuse; secondary veins 3 or 4 pairs; stipules deciduous, narrowly triangular, 1.5–2.5 mm glabrescent. Inflorescences cymose, 2- or 3-flowered, glabrescent, dichasial; peduncle 6–7 mm. Flowers subsessile. Calyx densely villosulous (Hainan plants) to glabrescent (Yunnan plants); hypanthium portion subglobose to oblanceoloid, ca. 1.5 mm; lobes narrowly lanceolate, 1.2–1.5 mm. Corolla white, funnelform, outside glabrous; tube ca. 8 mm; lobes lanceolate, 1–1.5 mm. Immature capsules ellipsoid-ovoid, ca. 2 mm, dehiscence unknown. Fl. Jul, young fr. Oct.

• Dense evergreen forests; 2100–2600 m. Hainan (Sanya), Yunnan.

The description of the flowers and stipules here as well as the extension of the geographic range into Yunnan are taken from two specimens provisionally identified here as *Spiradiclis hainanensis*, Li Heng 12449 and 12511.

**15. *Spiradiclis howii*** H. S. Lo, Bull. Bot. Res., Harbin 6(4): 41. 1986.

宽昭螺序草 kuan zhao luo xu cao

Herbs, ascending, perennial, or subshrubs; stems subglabrous to densely pilose. Petiole 0.6–1.5 cm, densely pubescent; leaf blade drying papery, adaxially grayish green, abaxially yellowish brown, lanceolate, ovate, subelliptic, or subelliptic-oblong, 2.5–6.5(–9) × 1–2(–3) cm, adaxially strigose-hirsute, below villosulous along principal veins, base obtuse to sometimes subrounded, apex acuminate and usually subfalcate; secondary veins 6–8(–10) pairs; stipules subulate-linear, 2–3 mm, acuminate. Inflorescence cymose, many flowered, densely pubescent; peduncle 1–2.5 cm; bracteoles linear-lanceolate, 2–2.5 mm; pedicels 1–2.5 mm. Flowers distylous, pedicellate. Calyx pilosulous; hypanthium portion subobconic, 0.7–0.8 mm; limb deeply lobed; lobes narrowly lanceolate, rigid, 3–5 mm, equal or slightly unequal. Corolla white becoming golden yellow when dry, subtubular, outside with 5 hispidulous or hirsutulous lines; tube 13.5–15.5 mm, inside with villous ring near middle and pubescent above and through throat; lobes triangular-ovate, ca. 1.5 mm, apically thickened-rostrate, dorsally narrowly winged. Capsules subglobose, 3.5–4 mm in diam., pilosulous, valves 4. Fl. Sep.

• Rocks in forests; 1400–1500 m. Yunnan.

**16. *Spiradiclis laxiflora*** W. L. Sha & X. X. Chen, Acta Bot. Austro Sin. 1: 35. 1983.

疏花螺序草 shu hua luo xu cao

Herbs, perennial, erect or ascending, 10–25 cm tall; stems glabrous. Petiole 3.5–5 cm, glabrous; leaf blade drying papery, adaxially green, abaxially pale, elliptic or obovate-elliptic, 10–15 × 3–5 cm, both surfaces glabrous, base acute and decurrent, apex acute to acuminate; secondary veins 9–11 pairs; stipules ovate-triangular, ca. 1 cm, 2-lobed, lobes aristate-acuminate. Inflorescences and flowers not seen. Inflorescence paniculate, ca. 25 cm; peduncle ca. 7 cm; axes dichasially branched 1–3 times then scorpioid; bracteoles lanceolate or linear-lanceolate, 5–17 mm. Capsules ellipsoid, ca. 3 × 1.5 mm, glabrous. Fr. Jun.

• Sparse forests on limestone hills. Guangxi (Longzhou).

**17. *Spiradiclis loana*** R. J. Wang, Novon 12: 420. 2002.

献瑞螺序草 xian rui luo xu cao

Herbs, erect, to 15 cm tall, acaulescent with leaves crowded at base; stems pubescent. Petiole 1–4.5 cm, pubescent; leaf blade oblanceolate, elliptic, or obovate, 6–12 × 1.2–3 cm, adaxially pilose to hispid, abaxially glabrous and pubescent, base acute to cuneate, apex acute to obtuse; secondary veins ca. 10 pairs; stipules persistent, triangular to deeply 2-lobed, segments 5–10 mm, pubescent. Inflorescences cymose, many flowered, pubescent; peduncle 6–10 cm; bracts linear, ca. 1 mm. Flowers distylous, subsessile. Calyx with hypanthium portion obconic, ca. 1 mm; lobes triangular, ca. 1 mm, acute. Corolla white, tubular-funnelform, puberulent outside; tube 5–10 mm, inside with villous ring at middle and sparsely strigillose above; lobes triangular, 1–1.2 mm, acute. Capsules subglobose, ca. 2 mm in diam., valves 4. Fl. Jul–Sep, fr. Aug–Oct.

• Forests on limestone mountains; 200–300 m. Guangxi.

**18. *Spiradiclis longibracteata*** S. Y. Liu & S. J. Wei, Acta Phytotax. Sin. 32: 362. 1994.

长苞螺序草 chang bao luo xu cao

Herbs, presumably perennial, decumbent in lower part and ascending above, sometimes subacaulescent with leaves clustered at base; stems densely villous. Petiole 6–22 mm; leaf blade obovate-lanceolate or oblanceolate, 4–18 × 1–6 cm, adaxially sparsely pubescent, abaxially densely pilose along veins, base acute, apex rounded, obtuse, or acute; secondary veins 18–22(–29) pairs; stipules persistent, broadly ovate, 2- or 4-lobed. Inflorescence cymose, densely many flowered, pubescent; peduncles 7–15 cm; bracts linear-lanceolate, 10–15 mm. Flowers distylous. Calyx pubescent; hypanthium portion ca. 1.5 mm; lobes generally equal and 2–2.5 mm in long-styled form, unequal and 3–10 mm in short-styled form. Corolla purplish red, sparsely purplish red pubescent outside; tube 16–18 mm in long-styled form, ca. 22 mm in short-styled form, inside with villous ring near middle and another at base; lobes ovate. Capsules globose, 2.5–3 mm, pilose. Fl. Apr, fr. Aug–Oct.

• Wet places in forests. Guangxi.

The markedly differing sizes and forms of the calyx and corollas between the long-styled and short-styled flowers are notable.

**19. *Spiradiclis longipedunculata*** W. L. Sha & X. X. Chen, Acta Bot. Austro Sin. 1: 35. 1983.

长梗螺序草 chang geng luo xu cao

Herbs, unbranched, ascending, presumably perennial; stems glabrous. Petiole 3–6 cm, glabrous; leaf blade drying papery, adaxially dark green, and abaxially yellowish brown, obovate or oblong-elliptic, 9–16 × 4–7.5 cm, glabrous on both surfaces, base cuneate, apex acute; secondary veins 1–13 pairs; stipules suborbicular or triangular-orbicular, 8–15 × 5–10 mm, glabrous, cuspidate and 2-lobed, lobes 4–8 mm. Inflorescences cymose-paniculate, ca. 34 cm, many flowered, glabrous; peduncles 15–22 cm; bracts linear, ca. 4 mm. Calyx glabrous; hypanthium portion ovoid, ca. 1.5 mm; lobes ca. 0.3 mm. Corolla pale yellow, tubular, outside glabrous; tube ca. 4 mm, bearded in throat. Capsules unknown. Fl. Apr.

• Guangxi (Daxin).

**20. *Spiradiclis longzhouensis*** H. S. Lo, Guihaia 11: 99. 1991.

龙州螺序草 long zhou luo xu cao

Shrubs or perhaps subshrubs, robust; stems glabrous or sparsely pubescent. Leaves clustered on upper parts of stems; petiole 3–4.5 cm, turning black when dry; blade drying papery, olive-green, abaxially pale, elliptic or elliptic-oblong, 15–21 × 4–8.5 cm, glabrous, base usually decurrent, apex abruptly acuminate; secondary veins 16–23 pairs; stipules subovate, ca. 10 mm, parallel veined. Inflorescence and flowers not seen. Infructescence ca. 15 cm, lax; bracteoles linear, 3–5 mm; pedicels 5–10 mm. Capsules ellipsoid, ca. 3.5 × 1.7 mm, glabrous, persistent calyx lobes linear, 2–2.5 mm. Fr. Apr.

- On rocks in dense forests. Guangxi (Longzhou).

**21. *Spiradiclis luochengensis*** H. S. Lo & W. L. Sha, Acta Bot. Austro Sin. 1: 34. 1983.

桂北螺序草 gui bei luo xu cao

Herbs, 20 cm or taller, presumably perennial, sometimes subcaulescent with leaves grouped at base; stems glabrous. Petiole 1–4 cm, glabrous, reddish brown when dry; leaf blade drying papery, broadly obovate, 5–11 × 3–4.5 cm, both surfaces glabrous, base obtuse then decurrent, apex acute, obtuse, or rounded; secondary veins 7–9 pairs; stipules long triangular, glabrous, acuminate. Inflorescences cymose, many branched, many flowered, glabrous; peduncles slender, 7–10 cm; pedicels short. Calyx purple, glabrous; hypanthium portion ca. 0.5 mm; lobes triangular-ovate, ca. 1 mm. Corolla white becoming orange when dry, tubular-funnelform, outside glabrous; tube ca. 5 mm; lobes lanceolate-oblong, 2–2.5 mm. Capsules ovoid-globose, ca. 3 mm, valves 4. Fl. and fr. Apr–Jun.

- Shady places at streamsides. Guangxi.

**22. *Spiradiclis malipoensis*** H. S. Lo, Guihaia 11: 98. 1991.

滇南螺序草 dian nan luo xu cao

Herbs, presumably perennial, 20–25 cm tall, decumbent and rooting at base but ascending in upper parts; stems with 2 lines of dense hispidulous hairs. Petiole 0.5–1 cm, glabrous; leaf blade drying papery, olive-green, lanceolate-oblong or ovate-elliptic, 4.5–8 × 1.5–3.5 cm, glabrous, base cuneate to obtuse and shortly decurrent, apex obtuse then abruptly acuminate; secondary veins 10 or 11 pairs; stipules lanceolate-linear or linear, 5–8 mm, acuminate. Inflorescences and flowers not seen. Infructescences cymose, 2.5–3 cm, glabrescent; peduncle ca. 1 cm; pedicels 3–4 mm. Capsules white, ellipsoid, 5.5–6 mm, glabrous, valves 4, becoming slightly twisted. Fr. Nov–Dec.

- Dense forests; ca. 1100 m. Yunnan (Malipo).

**23. *Spiradiclis "microcarpa"*** H. S. Lo, Bull. Bot. Res., Harbin 18: 276. 1998.

小果螺序草 xiao guo luo xu cao

Herbs, apparently ascending, presumably perennial, often turning yellow when dry; stems glabrous. Petiole 3–4.5 cm, glabrous; leaf blade drying papery, adaxially leaden gray, obovate or elliptic-obovate, 5–8 × 3–4 cm, both surfaces glabrous, base obtuse then decurrent, apex obtuse to acute; secondary veins 6

or 7 pairs; stipules persistent, triangular to lanceolate, ca. 4 mm, glabrous, obtuse to acute. Inflorescences and flowers not seen. Infructescence paniculate, glabrous, branched dichasially to several orders; peduncle ca. 10 cm; branched portion ca. 4 cm; bracts narrowly triangular, 2–5 mm. Capsules subsessile, linear-oblong to oblanceoloid, ca. 2 × 0.5–0.6 mm, glabrous or puberulent, valves 4, becoming twisted. Fr. Jul.

- Shady places on limestone hills; ca. 100 m. Guangxi (Daxin).

The name *Spiradiclis "microcarpa"* was not validly published by H. S. Lo (loc. cit.) because what should have been the indication of type merely cited "Guangxi: Daxin, circ. 100 m alt[.], non collelector [sic!] s. n." without using the word "holotype" or "type" or an equivalent and without specifying the herbarium in which the type was conserved (*Vienna Code*, Art. 37.6 and 37.7). It has not been possible to locate a specimen from the gathering cited by Lo.

**24. *Spiradiclis microphylla*** H. S. Lo, Acta Bot. Austro Sin. 1: 34. 1983.

小叶螺序草 xiao ye luo xu cao

Herbs, ascending, presumably perennial; stems pubescent. Petiole 0.4–1 cm, pubescent; leaf blade drying thinly papery, brown, ovate, 1–3 × 0.5–1.4 cm, glabrous or pilose on both surfaces, base obtuse then decurrent, apex obtuse to acute; secondary veins 4–7 pairs; stipules subulate-lanceolate, acuminate or caudate-acuminate. Inflorescences cymose, several flowered, with axes scorpioid; peduncles 2–5 cm; bracts lanceolate or subulate-lanceolate, 1–2 mm. Calyx pilose to puberulent; hypanthium portion ca. 0.8 mm; limb deeply lobed; lobes ca. 0.7 mm. Corolla white, shortly tubular, ca. 2.5 mm; lobes ovate-triangular, carinate on dorsal surface. Capsules subglobose, valves 4. Fl. Sep–Oct.

- Sparse forests. Jiangxi (Longnan).

This species was keyed by H. S. Lo (in FRPS 71(1): 88. 1999) based on its glabrous stems and inflorescences, but the description (loc. cit.: 101) reported it as pubescent. The key here is adjusted accordingly.

**25. *Spiradiclis napoensis*** D. Fang & Z. M. Xie, Acta Phytotax. Sin. 40: 154. 2002.

那坡螺序草 na po luo xu cao

Herbs, ca. 65 cm tall, presumably perennial, procumbent at base, ascending above; stems moderately to densely curved pubescent. Leaves somewhat anisophyllous and clustered near top of stem; petiole 0.7–2 cm, densely curved pubescent; blade drying thinly papery to submembranous, adaxially dark green, abaxially pale, narrowly ovate to broadly ovate, 4–7 × 1.5–3.5 cm, adaxially pilosulous to glabrescent, abaxially glabrescent or curved pubescent along principal veins, base rounded to obtuse then decurrent, apex acuminate; secondary veins 8–10 pairs; stipules linear-subulate, 2–8 mm, glabrous, 2-lobed, lobes ca. 1 mm. Inflorescences cymose, 8–10-flowered, densely curved pubescent; peduncles 0.3–0.5 cm; axes 1–4 mm, puberulent; bracteoles linear, 6–10 mm, glabrous. Flowers distylous. Calyx puberulent to glabrescent; hypanthium portion ellipsoid, ca. 2 mm; limb deeply lobed; lobes narrowly triangular, ca. 2.5 mm, with a gland in each sinus. Corolla in bud white tinged with pink, subtubular, glabrous outside; tube ca. 12 mm, inside villous in throat; lobes subovate, ca. 5 mm, acute. Capsules unknown. Fl. Apr–May.

• Forests in valleys of limestone hills; ca. 1000 m. Guangxi (Napo).

Details of the long-styled and short-styled flowers are given in the protologue.

**26. *Spiradiclis oblanceolata*** W. L. Sha & X. X. Chen, Acta Bot. Austro Sin. 1: 35. 1983.

长叶螺序草 chang ye luo xu cao

Herbs, erect, unbranched, 13–25 cm tall, presumably perennial; stems glabrous. Petiole 3–5 cm, glabrous; leaf blade drying papery, oblanceolate or narrowly elliptic-oblong, 7–17 × 2–4 cm, glabrous on both surfaces, base cuneate, apex acute; secondary veins 9–12 pairs; stipules long triangular, ca. 8 mm, glabrous, 2-lobed, lobes ca. 3 mm. Inflorescences paniculate, many flowered, ca. 20 cm, glabrous; peduncles 9–11 cm; bracts linear, ca. 3 mm. Calyx with hypanthium portion ovoid, ca. 2 mm. Corolla white, outside glabrous; tube ca. 5 mm, bearded in throat. Capsules ovoid, ca. 2 mm, glabrous. Fl. and fr. Apr–Jun.

• Rocks in forests. Guangxi.

**27. *Spiradiclis petrophila*** H. S. Lo, Acta Bot. Austro Sin. 1: 33. 1983.

石生螺序草 shi sheng luo xu cao

Herbs, to 30 cm tall, apparently perennial, often procumbent at base, ascending above; stems densely pilosulous to tomentulose. Petiole 0.5–1.5 cm, densely pilosulous to tomentulose; leaf blade drying papery, ovate-elliptic to elliptic, 3–5 × 1.5–3 cm, densely tomentulose to pilosulous on both surfaces, base cuneate then decurrent, usually slightly inequilateral, apex acute; secondary veins ca. 9 pairs; stipules caducous, triangular, 1.5–2 mm, puberulent to glabrescent, acute and sometimes erose. Inflorescences paniculate, many flowered, densely pilosulous to tomentulose; peduncles slender, 3.5–6.5 cm; axes distally scorpoid, 1–1.5 cm; bracts narrowly triangular, 0.3–0.8 mm. Flowers sessile or subsessile, distylous. Calyx densely puberulent to hispidulous; hypanthium portion ellipsoid to obconic, ca. 0.8 mm; lobes triangular, ca. 0.3 mm. Corolla white, tubular, outside puberulent to glabrescent; tube ca. 2 mm; lobes triangular, ca. 1 mm, dorsally keeled, apically rostrate-inflexed. Capsules subglobose to obovoid, ca. 2 mm, somewhat flattened laterally, valves 2 then tardily splitting into 4. Fl. Sep, fr. Dec.

• On limestone rocks and dripping cliffs. Guangdong (Yangchun).

**28. *Spiradiclis purpureocerulea*** H. S. Lo, Bull. Bot. Res., Harbin 6(4): 39. 1986.

紫花螺序草 zi hua luo xu cao

Herbs, presumably perennial; stems densely brown pubescent. Leaves subsessile; blade drying papery, adaxially black, abaxially pale, ovate, 3–6.5 × 1.5–3 cm, adaxially densely strigose-hispidulous, abaxially densely pubescent, base rounded or obtuse, apex obtuse; secondary veins 7–10 pairs; stipules subulate, 2–3 mm, pubescent, caudate-acuminate. Inflorescence congested-cymose, 1.5–3 cm, densely pubescent; peduncles short. Calyx pubescent; hypanthium portion obconic-globose, ca. 2 mm; lobes narrowly lanceolate, 4–4.5 mm, acuminate. Corolla bluish purple, slenderly salverform; tube 19–21 mm; lobes sub-

ovate, ca. 6 mm, obtuse. Capsules subglobose, 4–4.5 mm in diam., pubescent, valves 4. Fl. Aug.

• On rocks at roadsides. Guangxi (Longzhou).

**29. *Spiradiclis rubescens*** H. S. Lo, Guihaia 11: 101. 1991.

红叶螺序草 hong ye luo xu cao

Herbs, apparently ascending, low, ca. 6 cm tall, perhaps annual; stems subglabrous, drying purplish black. Leaf blade drying papery, purplish red, elliptic-oblong or oblong-ovate, 4–6 × 2–2.3 cm, glabrous on both surfaces, base obtuse, margins ciliate, apex acute to obtuse; secondary veins 9–11 pairs; stipules triangular to broadly ovate, 4–5 mm, caudate-acuminate. Inflorescence cymose, 3–5-flowered; bracteoles linear, 4–6 mm, sparsely ciliate; pedicels short. Calyx glabrous; hypanthium portion obovoid, ca. 2 mm; lobes narrowly lanceolate, unequal, larger 4–4.5 mm, smaller ca. 3.5 mm, acuminate, ciliate, with gland in each sinus. Corolla red, slenderly salverform-funnel-form, outside glabrous, strongly 5-ribbed; tube ca. 21 mm; lobes ovate, ca. 3.5 mm. Capsules unknown. Fl. Jun.

• On rocks in shady places. Guangxi (Tiandong).

This species is noted for its reddened color when dry.

**30. *Spiradiclis scabrida*** D. Fang & D. H. Qin, Bull. Bot. Res., Harbin 13: 333. 1993.

糙边螺序草 cao bian luo xu cao

Herbs, perhaps perennial, 40–50 cm tall, rooting near base, apices apparently ascending; stems pubescent to glabrescent. Leaves often slightly anisophyllous; petiole 0.2–0.5 cm, glabrous or usually pubescent; blade drying papery, adaxially olive-green, abaxially yellowish green, ovate, narrowly ovate, or lanceolate, 2–9 × 1–3.3 cm, glabrous or occasionally sparsely strigillose or scabridulous at least on principal veins, base obtuse, apex acuminate; secondary veins 6–9 pairs; stipules caducous to persistent, subtriangular, 0.7–1 mm, subglabrous, acute. Inflorescence corymbose-cymose, 3–24-flowered, pubescent, puberulent, or glabrescent; peduncle 0.6–2.7 cm; bracteoles linear, 2–5 mm; pedicels to 2 mm. Flowers sessile to pedicellate. Calyx puberulent; hypanthium portion obovate, 1–1.5 mm; limb deeply lobed; lobes ovate-lanceolate, 1–1.5 mm, slightly unequal, with gland in each sinus. Corolla white sometimes flushed with pink or purple, slenderly salverform-funnelform, glabrous inside and outside; tube 25–26 mm; lobes ovate, ca. 3.5 mm. Capsules subglobose, 3–4 mm in diam., glabrescent, valves 4. Fl. Dec, fr. Mar–Apr.

• On rocks in forests; 800–1200 m. Guangxi (Napo).

**31. *Spiradiclis spatulata*** X. X. Chen & C. C. Huang, Guihaia 13: 3. 1993.

匙叶螺序草 chi ye luo xu cao

Herbs, low, erect, perhaps perennial, usually reduced or acaulescent with leaves clustered at base. Petiole 5–8 mm; leaf blade drying papery, adaxially olive-green, abaxially pale, spatulate or obovate-oblanceolate, 8–13 × 2–4.5 cm, adaxially sparsely pubescent, abaxially densely pubescent at least along principal veins, base acute to cuneate and usually decurrent,

apex obtuse to rounded; secondary veins 15–25 pairs; stipules lanceolate-linear or linear, 7–9 mm, densely villosulous. Inflorescences cymose, 10- to many flowered, pubescent; peduncle 7–12 cm; bracteoles linear-lanceolate, 3–4 mm; pedicels 2–3 mm. Calyx pubescent; hypanthium obconic, 1.5–2 mm; limb deeply lobed; lobes narrowly lanceolate, 1–1.3 mm. Corolla purplish red, slenderly salverform, puberulent outside; tube 15–25 mm, inside with villous ring at middle; lobes subovate, 4–6 mm. Capsules unknown. Fl. May.

- On rocks in shady places. Guangxi (Ningming).

**32. *Spiradiclis tomentosa*** D. Fang & D. H. Qin, Bull. Bot. Res., Harbin 13: 330. 1993.

粘毛螺序草 nian mao luo xu cao

Herbs, erect, 3–23 cm tall, presumably perennial, acaulescent with leaves clustered at base; stems densely gray-viscid multicellular tomentose. Leaves slightly anisophyllous; petiole 0.5–4.5 cm, densely tomentose; blade drying thinly papery, oblanceolate, obovate, or rarely elliptic, 3.5–14 × 1.5–5 cm, both surfaces densely tomentose, base acute, apex cuspidate to rounded; secondary veins 7–10 pairs; stipules persistent, triangular, 8–22 mm, tomentose, narrowed to subulate acuminate apex. Inflorescences paniculiform, 8- to many flowered, tomentose; peduncles 4.5–18 cm; bracts linear, 3–7 mm; pedicels 1–5 mm. Calyx tomentose; hypanthium portion turbinate, ca. 1 mm; lobes linear, 1.5–2 mm. Corolla white, subfunneliform, outside sparsely pubescent; tube 6–8 mm, glabrous inside; lobes ovate, 2–3 mm. Capsules subglobose, ca. 2 mm in diam., valves 4, persistent calyx lobes 3.5–4 mm. Fl. Apr, fr. Jun.

- Limestone caverns; ca. 500 m. Guangxi (Fengshan).

H. S. Lo (in FRPS 71(1): 99. 1999) described the leaves as cuspidate at apex, but the corresponding figure (p. 103, t. 23, f. 7) showed the leaves to be apically rounded.

**33. *Spiradiclis umbelliformis*** H. S. Lo, Bull. Bot. Res., Harbin 6(4): 36. 1986.

伞花螺序草 san hua luo xu cao

Herbs, perhaps perennial, creeping or with upper parts perhaps ascending; stems densely reddish brown multicellular villosulous. Petiole 1–3 cm, reddish brown villosulous; leaf blade drying papery, adaxially olive-green, abaxially pale, ovate-orbicular, 1.5–4 × 1–3 cm, adaxially glabrescent, abaxially pilosulous to pilose at least along principal veins, base cordulate to truncate and usually decurrent, apex obtuse to rounded; secondary veins 4–6 pairs; stipules persistent, pilosulous to glabrescent, deeply 2-parted, lobes linear, to 10 mm. Inflorescences cymose, umbelliform to subcapitate, 4–10-flowered, puberulent, pilosulous, or villosulous; peduncles 2–7 cm; bracts narrowly triangular. Flowers subsessile, distylous. Calyx subgla-

brous; hypanthium portion turbinate to subglobose, ca. 1.5 mm; lobes ovate-triangular, ca. 0.6 mm, usually with gland in sinus. Corolla white to pale purplish red, funneliform to tubular-funneliform, glabrous outside; tube 17–18 mm, with villous ring above base inside; lobes ovate, ca. 6 mm. Capsules subglobose, 3–3.5 mm in diam., glabrescent, valves 4, flat. Fl. Apr.

- Rock crevices in forests, on limestone. Guangdong (Ruyuan), Guangxi.

**34. *Spiradiclis villosa*** X. X. Chen & W. L. Sha, Bull. Bot. Res., Harbin 11(3): 17. 1991.

毛螺序草 mao luo xu cao

Herbs, 30–50 cm tall, perennial, procumbent and rooting below, perhaps upper parts ascending; stems densely dark brown villous. Petiole 3.5–7 cm, densely villous; leaf blade drying membranous, oblong-elliptic or obovate-elliptic, 10–25 × 3–8 cm, adaxially dark brown pubescent, abaxially densely brown villous, base cuneate or acute, apex acute or shortly acuminate; secondary veins 14–16 pairs; stipules 2-lobed, densely dark brown villous, lobes lacinate, 15–30 mm. Inflorescences and flowers not seen. Infructescences cymose-paniculate, many flowered, densely dark brown villous; peduncles to 27 cm. Young capsules ovoid, ca. 2 mm, villous, with calyx lobes ca. 4 mm, dehiscence unknown. Young fr. Jul.

- On rocks in forests. Guangxi (Longzhou).

H. S. Lo (in FRPS 71(1): 101. 1999) described the stipules as to 30 mm, a relatively large size.

**35. *Spiradiclis xizangensis*** H. S. Lo, Bull. Bot. Res., Harbin 6(4): 43. 1986.

西藏螺序草 xi zang luo xu cao

Herbs, perhaps perennial, procumbent near base, ascending in upper parts; stems densely pubescent, drying purplish brown. Petiole 1–2 cm, densely pubescent; leaf blade drying thinly papery, leaden gray with veins dark purple abaxially, ovate, 3.5–6 × 1.5–3.2 cm, adaxially glabrescent except pubescent along midrib, abaxially pubescent along principal veins, base obtuse or subrounded, apex acute or slightly obtuse; secondary veins ca. 7 pairs; stipules sublanceolate, 2–2.5 mm, subglabrous, often reflexed. Inflorescence cymose, 4–6-flowered; peduncle ca. 1 cm; bracteoles linear-lanceolate, ca. 7 mm; pedicels 2–5 mm. Calyx densely pubescent; hypanthium portion subellipsoid, ca. 1.8 mm; lobes narrowly lanceolate, unequal, larger one ca. 2 mm, smaller ones ca. 1.6 mm. Corolla slenderly salverform-subfunneliform, outside pubescent; tube ca. 17 mm, glabrescent inside; lobes triangular, ca. 3 mm. Capsules unknown. Fl. May.

- Dense forests; 1800–2100 m. Xizang (Mêdog).

## 89. TARENNA Gaertner, Fruct. Sem. Pl. 1: 139. 1788.

乌口树属 wu kou shu shu

Chen Tao (陈涛); Charlotte M. Taylor

*Chomelia* Linnaeus (1758), not Jacquin (1760, nom. cons.); *Cupi* Adanson; *Webera* Schreber.

Shrubs or trees, unarmed, often drying blackened. Raphides absent. Leaves opposite, sometimes with domatia; stipules persis-

tent or occasionally tardily deciduous, interpetiolar or united around stem, triangular, often aristate. Inflorescences terminal, sometimes displaced to pseudoaxillary by subsequent growth, cymose to corymbiform, few to many flowered, sessile or pedunculate, bracteate or bracts reduced. Flowers pedicellate or sessile, bisexual, monomorphic, often fragrant. Calyx limb 5-lobed. Corolla white, pale green, or yellow, funnelform or salverform, inside glabrous or pubescent in throat; lobes 5, convolute in bud, usually strongly reflexed at anthesis. Stamens 5, inserted in corolla throat, exserted; filaments short or reduced; anthers dorsifixed. Ovary 2-celled, ovules 1 to numerous in each cell on axile placentas; stigma fusiform or linear, sulcate or striate, shortly 2-lobed at apex, exserted. Fruit baccate, leathery or thinly fleshy, globose to ellipsoid, black or perhaps sometimes white, with calyx limb deciduous; seeds several, medium-sized, plano-convex or concavo-concave, testa membranous, leathery, or crustaceous; endosperm fleshy or corneous; embryo small; cotyledon small, leaflike.

About 370 species: tropical and subtropical Africa, Asia, Madagascar, and Pacific islands; 18 species (12 endemic) in China.

The name *Chomelia* Linnaeus (1758) was applied to these plants for many years; however, the later homonym *Chomelia* Jacquin (1760), which applies to a wholly neotropical genus, is now conserved against the Linnaean name, so the Old World plants formerly known under *Chomelia* are now correctly known under *Tarenna*.

Most of the characters that distinguish species of *Tarenna* are found in the corollas and calyx limb, thus specimens of *Tarenna* are often difficult to identify when they only have fruit from which the calyx limb has fallen. The genus was not well known in China until the work of W. C. Chen (Acta Phytotax. Sin. 22: 139–174. 1984). *Tarenna* apparently has secondary pollen presentation. W. C. Chen (in FRPS 71(1): 370. 1999) described the stipules as caducous, but the specimens seen all have persistent or tardily deciduous stipules. The key here closely follows that of W. C. Chen in FRPS (loc. cit. 1999: 370–372), with its emphasis on pubescence characters and number of ovules per locule, for reference. Chen (loc. cit. 1999: 370–384) considered the form (i.e., raised vs. flat vs. impressed) of the leaf midrib adaxially to be consistent within a species, but specimens studied show variation within species and overlapping among most species.

- 1a. Flowers with pedicels 18–30 mm ..... 14. *T. sinica*
- 1b. Flowers subsessile or with pedicels to 13 mm.
  - 2a. Calyx lobes subulate, 3–5 mm ..... 7. *T. lanceolata*
  - 2b. Calyx lobes triangular to narrowly triangular, 2 mm or shorter.
    - 3a. Ovary with ovules 1 per cell; fruit with seeds 1 or 2 ..... 2. *T. attenuata*
    - 3b. Ovary with ovules 2 to many per cell; fruit with seeds 1 to many.
      - 4a. Corolla tube longer than corolla lobes.
        - 5a. Corolla villosulous to pilosulous outside; leaf blade densely villosulous to pilosulous ..... 17. *T. yunnanensis*
        - 5b. Corolla glabrous outside; leaf blade glabrous or sparsely puberulent, strigillose, or hirtellous abaxially.
          - 6a. Calyx lobes triangular-lanceolate, ca. 1.5 mm, strigillose; leaf blade abaxially glabrous or sparsely pilosulous or strigillose ..... 1. *T. acutisepala*
          - 6b. Calyx lobes triangular to broadly triangular, 0.5–1.5 mm, glabrous; leaf blade abaxially glabrous or sparsely puberulent or strigillose.
            - 7a. Leaves with secondary veins 12–14 pairs ..... 5. *T. foonchewii*
            - 7b. Leaves with secondary veins 6–9 pairs.
              - 8a. Ovary with ovules 6–9 per cell; calyx with hypanthium portion sparsely puberulent to hispidulous, lobes 0.8–1.5 mm; leaf blade drying papery or membranous, with secondary veins 6 or 7 pairs ..... 3. *T. austrosinensis*
              - 8b. Ovary with ovules ca. 17 per cell; calyx with hypanthium portion glabrous, lobes 0.5–0.8 mm; leaf blade drying leathery, with secondary veins 7–9 pairs ..... 12. *T. polysperma*
  - 4b. Corolla tube as long as or shorter than corolla lobes.
    - 9a. Leaf blade glabrous on both surfaces.
      - 10a. Branches becoming yellowish white or grayish white with age, sometimes resinous at apex; stipules deciduous usually through fragmentation ..... 4. *T. depauperata*
      - 10b. Branches green to brown or ashy gray, not evidently resinous at apex; stipules persistent or deciduous through fragmentation.
        - 11a. Leaf secondary veins 3–10 pairs; petioles 0.8–2 cm; inflorescences 4–9 × 4–9 cm; leaf blade 4.5–15 × 1.5–6 cm.
          - 12a. Corolla tube 2–2.5 mm ..... 2. *T. attenuata*
          - 12b. Corolla tube 5–7 mm ..... 8. *T. lancilimba*
        - 11b. Leaf secondary veins 7–13 pairs; petioles 1–3.5 cm; inflorescences 4–15 × 6–20 cm; leaf blade 13–25 × 5–12 cm.
          - 13a. Leaf secondary veins 8–13 pairs; calyx mealy puberulent; inflorescences subglabrous or puberulent, ca. 15 × 20 cm; ovary with 4 ovules per cell ..... 9. *T. laticorymbosa*
          - 13b. Leaf secondary veins 7 or 8 pairs [or 6 in Japan]; calyx glabrous; inflorescences glabrous, 4–10 × 6–15 cm; ovary with 2 ovules per cell ..... 18. *T. zeylanica*
    - 9b. Leaves abaxially strigillose, hirtellous, hispidulous, pilosulous, or villosulous.

- 14a. Leaves pubescent adaxially, at least on midrib.  
 15a. Corolla glabrous outside; fruit with seeds 1–6 ..... 13. *T. pubinervis*  
 15b. Corolla strigillose or hirtellous outside; fruit with seeds ca. 30.  
 16a. Corolla tube 5–7 mm, lobes 11–12 mm, much longer than tube; leaf  
 secondary veins widely spaced, 6–8 pairs ..... 10. *T. laui*  
 16b. Corolla tube 3–4 mm, lobes 4–5 mm, slightly longer than or nearly as  
 long as tube; leaf secondary veins well spaced to closely set, 5–12 pairs ..... 11. *T. mollissima*  
 14b. Leaves glabrous or glabrescent adaxially.  
 17a. Corolla tube pubescent outside; leaf blade lanceolate or lanceolate-oblong,  
 12–29 × 4.5–10.5 cm, abaxially pubescent along principal veins ..... 16. *T. wangii*  
 17b. Corolla tube glabrous outside; leaf blade narrowly elliptic, obovate, lanceolate,  
 or oblong-obovate, 6–16 × 1.5–7 cm, abaxially subglabrous to scabrous,  
 puberulent, or strigillose on blade and veins.  
 18a. Ovary with ovules 5 or 6 per cell; pedicels rather slender, 5–10 mm; fruit  
 ellipsoid; leaf blade abaxially sparsely strigillose ..... 6. *T. gracilipes*  
 18b. Ovary with ovules 2 per cell; pedicels rather thick, 4–7 mm; fruit subglobose;  
 leaf blade scattered subpapillose-pubescent, scabrous, or subglabrous ..... 15. *T. tsangii*

**1. *Tarenna acutisepala*** F. C. How ex W. C. Chen, Acta Phytotax. Sin. 24: 477. 1986.

尖萼乌口树 *jian e wu kou shu*

Shrubs, 1–2.5 m tall; branches hispidulous or hirtellous becoming glabrescent, gray to reddish brown. Petiole 5–22 mm, hispidulous; leaf blade drying papery or subleathery, elliptic-oblong, lanceolate, oblong-ovate, or subovate, 4–19.5 × 1.5–5.6 cm, adaxially glabrous or sometimes sparsely puberulent along midrib or sparsely strigillose throughout, abaxially strigillose to hirtellous or sometimes glabrous, base cuneate, obtuse, or acute, apex acuminate or acute; secondary veins 5–7 pairs; stipules persistent, shortly united around stem, triangular, narrowly triangular, or lanceolate, 4–7 mm, hispidulous to glabrescent, acute. Inflorescence corymbiform to congested-cymose, 2.5–3 × 3–4 cm, several to many flowered, strigillose, pedunculate; peduncle 0.5–1 cm; bracts lanceolate to triangular, 1.5–2 mm; pedicels 0.5–3 mm. Flowers subsessile to pedicellate. Calyx strigillose; hypanthium portion ellipsoid to ovoid, 1–1.5 mm; limb 1.5–2 mm, deeply lobed; lobes triangular-lanceolate, apex acute. Corolla pale yellow, glabrous outside; tube ca. 10 mm, villosulous inside upper part and throat; lobes narrowly elliptic, ca. 4 mm. Ovules 16–20 per cell. Berries subglobose, 5–7 mm in diam., strigillose or glabrous; seeds 9–31. Fl. Apr–Sep, fr. May–Nov.

• Forests or thickets at streamsides in valleys or on mountain slopes; 500–1600 m. Fujian, Guangdong, Guangxi, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan.

**2. *Tarenna attenuata*** (J. D. Hooker) Hutchinson in Sargent, Pl. Wilson. 3: 411. 1916.

假桂乌口树 *jia gui wu kou shu*

*Webera attenuata* J. D. Hooker, Fl. Brit. India 3: 104. 1880;  
*Ixora attenuata* (J. D. Hooker) Kuntze; *Tarenna sylvestris* Hutchinson.

Shrubs or trees, 1–8 m tall; branches glabrous, flattened, becoming ash gray to brown with age. Petiole 0.5–1.5 cm, glabrous; leaf blade drying papery or thinly leathery, blackish brown, and somewhat shiny adaxially, oblong-lanceolate, ob-

long-obovate, lanceolate, or obovate, 4.5–15 × 1.5–6 cm, both surfaces glabrous, base cuneate or acute, margins sometimes thinly revolute, apex acuminate or abruptly shortly acuminate; secondary veins 5–10 pairs, sometimes with pilosulous domatia; stipules persistent, shortly united around stem, narrowly triangular, 4–9 mm, glabrous, acuminate to cuspidate. Inflorescences congested-cymose, pyramidal to corymbiform, 2.5–5 × 4–6 cm, many flowered, puberulent to glabrescent, pedunculate; peduncle 0.3–1 cm; bracts narrowly triangular to subulate, 1–5 mm, acute; pedicels 0.5–5 mm. Flowers subsessile to pedicellate in dichotomous cymules. Calyx glabrous; hypanthium portion subglobose to ellipsoid, 1.5–2 mm; limb 1–2 mm, lobed for 1/4–1/2; lobes triangular, acute. Corolla white or pale yellow, outside glabrous; tube 2–2.5 mm, villosulous at throat; lobes narrowly oblong to spatulate, 5–8 mm, acute to obtuse. Ovules 1 per cell. Berries subglobose, 5–7 mm in diam., glabrous; seeds 2. Fl. Apr–Nov, fr. May–Jan.

Forests or thickets at streamsides, on hills or mountains, or in fields; near sea level to 1200 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Thailand, Vietnam].

**3. *Tarenna austrosinensis*** Chun & F. C. How ex W. C. Chen, Acta Phytotax. Sin. 22: 145. 1984.

华南乌口树 *hua nan wu kou shu*

Shrubs, ca. 2 m tall; branches terete to flattened, glabrous, becoming pale gray. Petiole 5–15 mm, glabrous; leaf blade drying papery or membranous, blackish brown, elliptic-oblong or oblong-lanceolate, 5–15 × 2–4.5 cm, glabrous on both surfaces or puberulent to strigillose abaxially, base cuneate to acute, apex acuminate; secondary veins 6 or 7 pairs, without domatia; stipules generally deciduous leaving truncate persistent base, ovate to triangular, 3–5 mm, glabrous, acuminate. Inflorescences corymbiform to cymose, ca. 3 cm, few flowered, strigillose; peduncle 4–5 mm; bracts linear to triangular, 1–3 mm, acute; pedicels 3–7 mm. Flowers pedicellate. Calyx with hypanthium portion cupular to ellipsoid, 1–1.5 mm, sparsely puberulent to hispidulous; limb 2–3 mm, glabrous, lobed for ca. 1/2; lobes triangular, apex acute. Corolla pale green, outside glabrous; tube ca. 7 mm, villosulous inside and at throat; lobes

ovate, 3–4 mm, apex acute. Ovules 6–9 per cell. Berries globose, 5–6 mm in diam.; seeds 6–14. Fl. Apr–May, fr. Aug–Sep.

• Forests on mountains; 800–1300 m. Guangdong (Xinyi), Guangxi (Jinxu), Hunan (Yizhang).

**4. *Tarenna depauperata*** Hutchinson in Sargent, Pl. Wilson. 3: 411. 1916.

白皮乌口树 bai pi wu kou shu

Shrubs or small trees, 1–6 m tall; branches glabrous, blackened becoming yellowish white or grayish white with age. Petiole 4–18 mm, glabrous; leaf blade drying papery or leathery, dark brown or sometimes yellowish brown abaxially, and somewhat shiny adaxially, elliptic-obovate, elliptic, or subovate, 4–15 × 2–6.5 cm, both surfaces glabrous, base cuneate or acute, apex shortly acuminate often abruptly acuminate with tip often slightly obtuse; secondary veins 5–11 pairs, without domatia; stipules deciduous usually through fragmentation, shortly united around stem, triangular-ovate, 1.5–3 mm, glabrous, resinous, acute. Inflorescences corymbiform to pyramidal, 2.5–3 × 3–5 cm, few to many flowered, puberulent, hirtellous, or glabrescent, subsessile to pedunculate; peduncle to 1 cm; bracts triangular, 0.3–1.5 mm; pedicels 0–3 mm. Flowers mixed sessile and pedicellate (or perhaps borne on expanded axes) in dichotomous cymes. Calyx glabrous, puberulent, or pilosulous; hypanthium portion cupuliform to ellipsoid, ca. 1 mm; limb ca. 1 mm, lobed for 1/2–3/4; lobes ovate or triangular, ciliolate, acute to rounded. Corolla white, outside glabrous; tube 3–4 mm, villous inside and at throat; lobes narrowly oblong to spatulate, ca. 5 mm, acute to obtuse. Ovules 1–3 per cell. Berries globose, 6–8 mm in diam., shiny, glabrescent; seeds 1 or 2. Fl. Apr–Nov, fr. Apr–Jan.

Forests or thickets at streamsides, on hills, or on mountain slopes; 200–1700 m. Guangdong, Guangxi, Guizhou, Jiangsu, Yunnan [Vietnam].

**5. *Tarenna foonchewii*** (W. C. Ko) Tao Chen, *comb. nov.*

宽昭龙船花 kuan zhao long chuan hua

Basionym: *Ixora foonchewii* W. C. Ko, *Guihaia* 19: 102. 1999.

Small trees, to 3 m tall; branches glabrous. Petiole 12–17 mm, glabrous; leaf blade drying papery and olive-brown, elliptic, 15–18 × 5–9 cm, glabrous, base obtuse, apex cuspidate or shortly acuminate; secondary veins 12 or 13 pairs; stipules persistent, broadly triangular, 12–14 mm, glabrous, long acuminate to aristate. Inflorescence cymose, ca. 7 × 5.5 cm, many flowered; peduncle ca. 3 cm, sometimes subtended by or bearing reduced leaves or leaflike bracts; bracts linear, 3–4 mm; pedicels ca. 1 mm. Flowers pedicellate. Calyx glabrous; hypanthium cupuliform, ca. 2 mm; limb deeply lobed; lobes triangular, ca. 1 mm. Corolla outside glabrous; tube ca. 13 mm; lobes narrowly ligulate to narrowly elliptic, ca. 5 × 3 mm, obtuse. Fruit unknown. Fl. Apr.

• Roadsides. Yunnan.

Based on the description of this species as having 5 corolla lobes, fully exerted anthers, and subcapitate stigmas, as well as its general aspect, this species seems better placed in *Tarenna* than *Ixora*. The proto-

logue did not describe the number of ovules per ovary locule, which is not a significant character in *Ixora* and probably thus was not checked.

**6. *Tarenna gracilipes*** (Hayata) Ohwi, *Repert. Spec. Nov. Regni Veg.* 36: 57. 1934.

薄叶玉心花 bao ye yu xin hua

*Chomelia gracilipes* Hayata, *Icon. Pl. Formosan.* 9: 57. 1920; *C. lancifolia* Hayata; *Tarenna hayataiana* Kanehira; *T. lancifolia* (Hayata) Kanehira & Sasaki.

Shrubs, to 3 m tall; branches slender, strigillose becoming glabrescent and brown with age. Petiole 0.5–1.5 cm, strigillose; leaf blade drying papery, obovate, lanceolate, or narrowly elliptic, 6.5–15 × 2–4.5 cm, glabrous adaxially, sparsely strigillose abaxially at least along veins, base cuneate to acute, apex acute to acuminate; secondary veins 6 or 7 pairs, without domatia; stipules persistent, shortly united around stem, triangular, 1.5–3 mm, strigillose to glabrescent, acute to cuspidate. Inflorescences corymbose, 3–6 × 3–10 cm, trichotomous, strigillose, subsessile to pedunculate; peduncle to 1 cm; bracts narrowly triangular, 0.2–2 mm, acute; pedicels slender, 5–10 mm. Flowers pedicellate. Calyx glabrous to strigillose; hypanthium portion ellipsoid, 1–1.5 mm; limb 1–1.5 mm, lobed for 1/4–1/2; lobes broadly triangular, acute. Corolla white, glabrous outside; tube 4–6 mm, villous at throat; lobes narrowly spatulate-oblong, 9–10 mm, obtuse. Ovules 5 or 6 per cell. Berries ellipsoid, 5–8 mm in diam., glabrous. Fl. May, Jul, fr. Dec.

Forests on mountains; 100–500 m. Taiwan [Japan].

The specimens studied are from the elevations given; W. C. Chen (in *FRPS* 71(1): 378. 1999) gave the elevational range of this species as up to 2500 m.

**7. *Tarenna lanceolata*** Chun & F. C. How ex W. C. Chen, *Acta Phytotax. Sin.* 22: 139. 1984.

广西乌口树 guang xi wu kou shu

Shrubs, 0.5–3 m tall; branches densely strigillose becoming glabrescent, often brownish red. Petiole 0.3–1.8 cm, densely strigillose; leaf blade drying papery, lanceolate to oblanceolate, 5–32.5 × 1–5 cm, adaxially sparsely scabrous or strigillose on lamina and densely strigillose on principal veins, abaxially strigillose to pilosulous with pubescence denser on principal veins, base acute or cuneate, apex long acuminate; secondary veins 7–10 pairs, apparently without domatia; stipules generally persistent becoming brown and hardened, partially fused around stem, lanceolate to triangular or ovate, 3–4 mm, strigillose or glabrescent on margins, acute to cuspidate. Inflorescences corymbiform and often nodding, ca. 2 × 3 cm, several to many flowered, densely strigillose, sessile or pedunculate; peduncle to 5 mm; bracts linear to narrowly lanceolate, 2–10 mm; pedicels 1–3 mm. Flowers pedicellate. Calyx in bud with hypanthium portion ellipsoid to ovoid, 1.5–2 mm, densely pilosulous to puberulent; limb lobed nearly to base, densely strigillose; lobes linear to narrowly lanceolate, 3–5 mm, sometimes unequal on an individual flower. Corolla in bud densely strigillose outside. Berries subglobose, 3–6 mm in diam., puberulent, strigillose, or glabrescent; seeds 8–32. Fl. buds Oct, fr. May–Nov.

● Forests or thickets in valleys; 700–1600 m. Guangxi, Guizhou, Hunan (Dongkou).

W. C. Chen (in FRPS 71(1): 372. 1999) described the stipules as 6–10 mm, but the specimens studied (including several paratypes) all have stipules 3–4 mm.

**8. *Tarenna lancilimba*** W. C. Chen, Acta Phytotax. Sin. 22: 141. 1984.

披针叶乌口树 *pi zhen ye wu kou shu*

*Tarenna attenuata* (Voigt) Hutchinson var. *puberula* Chun & F. C. How ex W. C. Ko, Fl. Hainan. 3: 584. 1974.

Shrubs or trees, 2–10(–15) m tall; branches slightly compressed, glabrous or mealy pubescent, becoming brown with age. Petiole 0.8–2 cm, glabrous; leaf blade drying thinly leathery, dark brown or yellowish abaxially, lanceolate, elliptic, or obovate-oblong, 5–15 × 1.5–5 cm, both surfaces glabrous, base cuneate then shortly decurrent, apex shortly acuminate; secondary veins 3–5 pairs, without domatia; stipules generally persistent, shortly united around stem, triangular, 1.5–3 mm, glabrous, acute to cuspidate. Inflorescence corymbose, trichotomous, 4–9 × 4–9 cm, many flowered, subglabrous or mealy pubescent, subsessile; bracts triangular, 0.5–1.5 mm, ciliate; pedicels 3–6 mm. Flowers pedicellate. Calyx glabrous or puberulent; hypanthium portion cupuliform, 1–1.5 mm; limb 1–1.5 mm, lobed for ca. 1/2; lobes triangular to spatulate, ciliate. Corolla white, outside glabrous, sparsely to densely villous at throat and onto lobes; tube 5–7 mm; lobes ligulate-linear, 5–6 mm, obtuse. Ovules 2 per cell. Berry globose, 5–6 mm in diam., glabrescent; seeds 2–4. Fl. Apr–Jun, fr. Jun–Jan.

Forests or thickets on hills; 100–1000 m. Guangxi (Shangsi), Hainan [Vietnam].

**9. *Tarenna laticorymbosa*** Chun & F. C. How ex W. C. Chen, Acta Phytotax. Sin. 22: 141. 1984.

宽序乌口树 *kuan xu wu kou shu*

Shrubs, height not noted; branches glabrous. Petiole 2.5–3.5 cm, glabrous; leaf blade drying membranous or papery and grayish black, elliptic-oblong or obovate-oblong, 18.5–25 × 6–10 cm, glabrous on both surfaces, base cuneate, apex acuminate or obtuse then mucronate; secondary veins 8–13 pairs; stipules ovate-triangular, glabrous. Inflorescence corymbose with axes spreading, ca. 15 × 20 cm, subglabrous or puberulent; pedicels 3–8 mm. Flowers pedicellate. Calyx mealy puberulent; hypanthium portion obconical; limb denticulate. Corolla glabrous outside, pilosulous in throat and onto bases of lobes; tube ca. 6.5 mm; lobes narrowly linear-oblong, ca. 7 mm, rounded. Ovules 4 per cell. Fruit unknown. Fl. May.

● Yunnan (Hekou).

**10. *Tarenna laui*** Merrill, Lingnan Sci. J. 14: 59. 1935.

崖州乌口树 *ya zhou wu kou shu*

Shrubs, 2–3 m tall; branches densely grayish yellow hispidulous or strigillose becoming glabrescent with age. Petiole 6–23 mm, densely strigillose; leaf blade drying papery and dark yellowish brown or blackish brown, oblong-elliptic or oblong-

lanceolate, 5–15 × 1.5–6 cm, sparsely hispidulous to strigillose adaxially, sparsely to densely hispidulous or strigillose abaxially, base cuneate or acute, apex acuminate; secondary veins 6–8 pairs; stipules generally persistent, shortly united around stem, broadly triangular, 1.5–3, densely strigillose, acute. Inflorescences cymose to corymbose and somewhat lax, 6–10 cm, densely grayish yellow strigillose, pedunculate; peduncle ca. 1 cm; bracts triangular, 1–3 mm; pedicels 2–13 mm. Flowers pedicellate. Calyx densely strigillose; hypanthium portion cylindrical, ellipsoid, or urceolate, 2–2.5 mm; limb 1–2 mm, lobed for ca. 1/2; lobes ovate-triangular to triangular, apex acute. Corolla white, outside densely strigillose; tube 5–7 mm, villous in throat; lobes narrowly lanceolate to spatulate, 11–12 mm, acute to obtuse. Ovules ca. 15 per cell. Berry subglobose, 5–6 mm in diam., strigillose. Fl. May–Jul, fr. Jul–Feb.

● Forests on mountains; ca. 700 m. Hainan (Sanya).

**11. *Tarenna mollissima*** (Hooker & Arnott) B. L. Robinson, Proc. Amer. Acad. Arts 45: 405. 1910.

白花苦灯笼 *bai hua ku deng long*

*Cupia mollissima* Hooker & Arnott, Bot. Beechey Voy. 192. 1833; *Mussaenda kuliangensis* F. P. Metcalf; *Stylocoryna mollissima* (Hooker & Arnott) Walpers; *Tarenna incana* Diels.

Shrubs or small trees, 1–6 m tall; branches densely gray or brown pilosulous or tomentulose, becoming glabrescent when old. Petiole 0.4–2.5 cm, densely pilosulous or tomentulose; leaf blade drying papery and blackish brown, lanceolate, oblong-lanceolate, or ovate-elliptic, 4.5–22.5 × 1–10 cm, adaxially moderately to densely hispidulous to pilosulous, abaxially densely pilosulous, tomentulose, or villosulous, base cuneate, acute, or obtuse, apex acuminate or long acuminate; secondary veins 5–12 pairs, apparently without domatia; stipules generally persistent, interpetiolar or shortly united around stem, ovate to triangular, 5–8 mm, densely strigillose to pilosulous, acute to cuspidate. Inflorescences corymbose, 4–8 cm, many flowered, densely pilosulous to tomentulose, sessile and subtended by a pair of somewhat reduced leaves; bracts linear, 1–3 mm; pedicels 3–6 mm. Flowers pedicellate. Calyx densely tomentulose to pilosulous; hypanthium portion ellipsoid to subglobose, 1.5–2 mm; limb 1–1.8 mm, lobed shallowly to deeply; lobes triangular to spatulate, rounded to acute. Corolla white, outside densely strigillose to hirtellous; tube 3–4 mm, densely villous at throat; lobes narrowly oblong, 4–5 mm, obtuse to rounded. Ovules ca. 15 per cell. Berry subglobose, 5–7 mm in diam., pilosulous, villosulous, or sometimes glabrescent; seeds 7–30. Fl. May–Jul, fr. May–Jan.

Forests or thickets at streamsides, on hills, or on mountains; 200–1100 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Yunnan, Zhejiang [Vietnam].

W. C. Chen (in FRPS 71(1): 377. 1999) described the corollas as ca. 1.2 cm, but this length has not been seen on the numerous specimens studied.

**12. *Tarenna polysperma*** Chun & F. C. How ex W. C. Chen, Acta Phytotax. Sin. 22: 144. 1984.

多籽乌口树 *duo zi wu kou shu*

Shrubs or trees, 1.5–14 m tall; branches slightly compressed, glabrous, becoming brown when old. Petiole 5–15 mm, glabrous; leaf blade drying leathery and olive-greenish brown, oblong-lanceolate or elliptic, 5–10.5 × 1.5–3.8 cm, glabrous on both surfaces, base cuneate, apex shortly acuminate or abruptly acute; secondary veins 7–9 pairs, without domatia; stipules deciduous usually through fragmentation often leaving a persistent truncate base, interpetiolar, triangular to narrowly triangular, 3–4 mm, glabrous, acute. Inflorescences corymbose and trichotomous, 3–5 × 4–6 cm, 6–10-flowered, puberulent to glabrescent, subsessile to pedunculate; peduncle to 1 cm; bracts filiform, 1–2 mm, ciliate; pedicel 3.5–6.5 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion turbinate, ca. 1 mm; limb 1–1.5 mm, lobed for ca. 1/2; lobes broadly triangular. Corolla white, glabrous outside; tube ca. 8 mm, villous at throat; lobes ovate to elliptic, ca. 4.5 mm, obtuse. Ovules ca. 17 per cell. Berry globose, ca. 7 mm in diam., glabrous; seeds 14–27. Fl. Mar–Apr, fr. May–Oct.

• Forests on mountains; 900–1000 m. Guangdong.

The protologue and W. C. Chen in FRPS (71(1): 382. 1999) described the secondary leaf veins as 7–9 pairs, but the paratypes seen all have 5 or 6 pairs, which has complicated herbarium identifications of this species.

**13. *Tarenna pubinervis*** Hutchinson in Sargent, Pl. Wilson. 3: 411. 1916.

滇南乌口树 dian nan wu kou shu

Shrubs or small trees, 0.5–6 m tall; branches puberulent to pilosulous, becoming gray with age. Petiole 5–25 mm, strigillose to hirtellous; leaf blade drying papery or membranous, blackish brown, oblong-elliptic, oblong-lanceolate, lanceolate, or oblanceolate, 6–22 × 2–7.8 cm, strigillose to hirtellous on both surfaces with pubescence denser on principal veins, base acute to attenuate, apex caudate-acuminate or acuminate; secondary veins 7–10 pairs, apparently without domatia; stipules generally persistent and becoming yellowed and hardened, interpetiolar or shortly united around stem, triangular to ovate, 3–9 mm, pilosulous to strigillose becoming glabrescent, long acuminate to aristate or cuspidate. Inflorescences cymose, ca. 3 × 3.5 cm, few flowered, densely strigillose, subsessile; bracts linear, 1.5–2 mm; pedicels 1–2.5 mm. Flowers pedicellate. Calyx glabrous or sparsely pubescent; hypanthium portion obconic, 1–1.5 mm; limb lobed for ca. 1/2; lobes lanceolate, 1–1.75 mm, ciliate. Corolla pale green, glabrous outside; tube 4–5 mm, villosulous inside; lobes narrowly oblong, 5–6 mm, obtuse. Ovules ca. 3 per cell. Berry subglobose to ellipsoid, 5–10 mm in diam., puberulent to glabrescent; seeds 1–6. Fl. Mar–May, fr. Jun–Jan.

• Forests in valleys; 700–2700 m. Guangxi, Sichuan, Yunnan.

**14. *Tarenna sinica*** W. C. Chen, Acta Phytotax. Sin. 22: 146. 1984.

长梗乌口树 chang geng wu kou shu

Shrubs, ca. 1.5 m tall; branches hispid. Petiole 0.5–1.5 cm, hispid; leaf blade drying papery and blackish brown, narrowly elliptic or elliptic-lanceolate, 6–12 × 2–4 cm, both surfaces

sparsely strigose except densely hispid-hirsute along principal lateral veins, base cuneate, apex acuminate; secondary veins 6–8 pairs; stipules persistent becoming hardened and straw-yellow, subtriangular, ca. 2 mm, hispidulous, acute. Inflorescences corymbiform, ca. 5 cm, few flowered, hispidulous, pedunculate; peduncle 0.5–0.7 cm; bracts lanceolate, ca. 2 mm; pedicels 18–30 mm. Flowers pedicellate. Calyx hispidulous; hypanthium portion ellipsoid, ca. 1.5 mm; limb lobed for ca. 1/2; lobes triangular, ca. 0.7 mm, acute. Corolla white, ca. 12 mm, hispidulous outside; tube densely villosulous inside and at throat; lobes linear-lanceolate, longer than corolla tube. Ovules 1 per cell. Berry unknown. Fl. Jun.

• Forests on mountain slopes. Guangxi (Jingxi).

**15. *Tarenna tsangii*** Merrill, Lingnan Sci. J. 11: 59. 1932.

海南乌口树 hai nan wu kou shu

*Tarenna tsangii* f. *elliptica* Chun & F. C. How ex W. C. Ko.

Shrubs or trees, 1–6 m tall; branches flattened, shortly pilosulous, becoming brown or grayish brown with age. Petiole 5–15 mm, pilosulous; leaf blade drying papery and blackish brown, oblong-obovate or lanceolate, 5–26 × 1.5–7 cm, adaxially glabrous, abaxially scabrous and sparsely puberulent to subglabrous with pubescence denser along principal veins, base cuneate, apex acuminate or shortly acuminate; secondary veins 4–7 pairs; stipules triangular, 4–5 mm, acuminate or apiculate. Inflorescence corymbose, 4–7 × ca. 6 cm, many flowered, gray strigillose, pedunculate; pedicels 4–7 mm. Flowers pedicellate. Calyx pilosulous; hypanthium portion cylindrical-urceolate, ca. 1.5 mm; limb ca. 1.5 mm, lobed for up to 1/3. Corolla white, glabrous outside; tube 8–9 mm, pilosulous inside; lobes narrowly oblong, ca. 10 mm. Ovary with 2 ovules per cell. Berry subglobose, 5–7 mm in diam., glabrous; seeds 4. Fl. May–Jul, fr. Jul–Jan.

• Forests on hills; 100–800 m. Guangdong (Maoming), S Guangxi, Hainan.

Plants from Hainan (Lingshui) with leaf blade elliptic or ovate-elliptic and 5–8 × 3–6 cm that fruit in Dec were described as *Tarenna tsangii* f. *elliptica*. These features, however, do not clearly distinguish the two groups of plants in Hainan, so this name is here synonymized.

**16. *Tarenna wangii*** Chun & F. C. How ex W. C. Chen, Acta Phytotax. Sin. 22: 143. 1984.

长叶乌口树 chang ye wu kou shu

Shrubs, 2–5 m tall; branches gray, glabrous. Petiole 1–3 cm, subglabrous or puberulent; leaf blade drying papery or membranous and brownish black, lanceolate or lanceolate-oblong, 12–29 × 4.5–10.5 cm, glabrous on both surfaces or abaxially strigillose along principal veins, base attenuate, apex acuminate or shortly acuminate; secondary veins 9–11 pairs; stipules ovate-triangular, 3–4 mm. Inflorescences corymbose, ca. 5 × 5 cm, strigillose; pedicels 3–4 mm. Flowers pedicellate. Calyx pilosulous; hypanthium portion obconical; limb subtruncate or denticulate. Corolla white, villous inside and onto lobes; tube ca. 5 mm; lobes linear-oblong. Ovules 4 per cell. Berry subglobose, 8–10 mm in diam.; seeds 2 or 3. Fl. Jun, fr. Aug–Nov.

- Forests on hills; 900–1000 m. Yunnan.

**17. *Tarenna yunnanensis*** F. C. How ex W. C. Chen, *Acta Phytotax. Sin.* 22: 142. 1984.

云南乌口树 *yun nan wu kou shu*

Shrubs or trees, to 3 m tall; branches densely yellowish brown villosulous to tomentulose. Petiole 0.5–2.3 cm, densely villosulous to tomentulose; leaf blade drying papery, elliptic, obovate, elliptic-oblong, or oblanceolate-oblong, 11–32 × 3.5–12 cm, adaxially subglabrous or sparsely hispidulous with pubescence denser along principal veins, abaxially densely villosulous to pilosulous, base cuneate, obtuse, or acute, apex abruptly shortly acuminate; secondary veins 8–12 pairs, apparently without domatia; stipules generally persistent, shortly united around stem, broadly triangular, 2.5–4 mm, densely villosulous, acute to cuspidate. Inflorescences cymose to corymbiform, 4–9 × 4–7 cm, many flowered, densely pilosulous, pedunculate; peduncle 1–3.5 cm; bracts linear to narrowly triangular, 1–4 mm; pedicels 2–9 mm. Flowers pedicellate. Calyx densely pilosulous; hypanthium portion cupulate, ca. 1 mm; limb 1–1.5 mm, lobed shallowly or for up to 1/2; lobes triangular. Corolla outside moderately to densely yellowish brown villosulous to pilosulous; tube 5–6.5 mm, sparsely pilosulous at throat; lobes narrowly oblong to spatulate, 4–4.5 mm, obtuse. Ovules 3–5 per cell. Berry subglobose, ca. 5 mm in diam., yellowish brown villous. Fl. Apr–Jun, fr. Jun.

- Forests or thickets in valleys or at streamsides; 100–200 m. Yunnan.

**18. *Tarenna zeylanica*** Gaertner, *Fruct. Sem. Pl.* 1: 139. 1788.

锡兰玉心花 *xi lan yu xin hua*

*Chomelia kotoensis* Hayata; *Tarenna kotoensis* (Hayata) Masamune.

Shrubs, evergreen, to 2.5 m tall; branches glabrous, compressed to subquadrangular, green sometimes turning brown. Petiole 1–2.5 cm, glabrous; leaf blade drying papery, oblong-ovate to oblong-obovate, elliptic, or elliptic-oblong, 13–22 × 5–12 cm, glabrous on both surfaces, base cuneate to obtuse, apex shortly cuspidate or acute; secondary veins 7 or 8 pairs, with pilosulous domatia; stipules generally deciduous through fragmentation often leaving persistent base, shortly united around stem, triangular, 3–11 mm, glabrous, acute to acuminate. Inflorescences corymbiform to broadly pyramidal, 4–10 × 6–15 cm, many flowered, glabrous, subsessile to pedunculate; peduncle to 1 cm; bracts linear to narrowly triangular, 1–3 mm, acute; pedicels 3–8 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion ellipsoid to cupular, 1–1.5 mm; limb 1–1.5 mm, lobed for ca. 1/2; lobes triangular. Corolla white, glabrous outside; tube ca. 5 mm, villous in throat; lobes narrowly oblong to spatulate, 7–12 mm, obtuse. Ovules 2 per cell. Berry globose, ca. 10 mm in diam., glabrous; seeds 2–4. Fl. Feb, Apr, fr. Sep, Dec.

Forests; below 100–600 m. Taiwan [Japan, Sri Lanka].

W. C. Chen (in FRPS 71(1): 373. 1999) described the petioles as up to 5 cm, but no petioles at all similar to this have been seen on specimens studied.

## 90. TARENNOIDEA Tirvengadam & Sastre, *Mauritius Inst. Bull.* 8(4): 90. 1979.

岭罗脉属 *ling luo mai shu*

Chen Tao (陈涛); Charlotte M. Taylor

Trees, unarmed. Raphides absent. Leaves opposite, usually with domatia; stipules caducous, interpetiolar or shortly united around stem, triangular to ovate. Inflorescences terminal or sometimes pseudoaxillary or appearing leaf-opposed due to anisophyly with 1 leaf caducous at subtending node, compound-cymose, several to many flowered, pedunculate or sessile and tripartite, bracteate. Flowers pedicellate, bisexual, monomorphic. Calyx limb campanulate, truncate to 5-dentate. Corolla yellow to white, salverform, inside villosulous in throat; lobes 5, convolute in bud, reflexed at anthesis. Stamens 5, inserted in corolla throat, exserted; filaments short; anthers dorsifixed. Ovary 2-celled, ovules 1 or usually 2–6 in each cell on axile placentas; stigma fusiform to cylindrical, exserted. Fruit black, baccate, subglobose, leathery or fleshy, with calyx limb deciduous; seeds 2–8, medium-sized, ellipsoid to subglobose.

Two species: S and SE Asia; one species in China.

**1. *Tarennoidea wallichii*** (J. D. Hooker) Tirvengadam & Sastre, *Mauritius Inst. Bull.* 8(4): 90. 1979.

岭罗麦 *ling luo mai*

*Randia wallichii* J. D. Hooker, *Fl. Brit. India* 3: 113. 1880; *Aidia wallichii* (J. D. Hooker) T. Yamazaki; *Tarenna incerta* Koorders & Valetton; *T. pallida* (Franchet ex Brandis) Hutchinson; *Webera cavaleriei* H. Léveillé; *W. pallida* Franchet ex Brandis.

Trees, 3–20 m tall; branches rather stout, compressed to angled, glabrous, with thin epidermis wrinkled and cracked, coppery brown to reddish purple-brown, deciduous leaving

stems wrinkled to smooth. Petiole 1–3 cm, glabrous; leaf blade drying leathery and often paler below, elliptic-oblong, oblanceolate-oblong, or elliptic-lanceolate, 7–30 × 2.9–9 cm, adaxially shiny and glabrous, abaxially puberulent to glabrous, base cuneate to acute, margins often thinly revolute, apex obtuse to acuminate with tip often ultimately obtuse; secondary veins 5–13 pairs, in abaxial axils with foveolate and/or pilosulous domatia; stipules 4–10 mm, glabrous, acute to acuminate. Inflorescences 4–12 × 8–13 cm, densely hirtellous or pilosulous to tomentulose; bracts lanceolate to spatulate, 1–3 mm, acute to rounded; pedicels 1–5 mm. Calyx with ovary portion obconic, ca. 1 mm, densely puberulent to tomentulose; limb 1–2.5 mm, puberulent or tomentulose to glabrescent, with lobes linear to

narrowly triangular, 0.5–0.7 mm, acute. Corolla yellow or white, outside glabrous [to sericeous], inside pilosulous in throat with pubescence sometimes extending onto lobes; tube 3–4 × ca. 1.5 mm; lobes spatulate-oblong, 3–4 mm, obtuse to rounded. Fruiting pedicels to 10 mm. Berry ovoid to subglobose, 7–18 mm in diam., glabrous; seeds ca. 5 mm. Fl. Mar–Jun, fr. Jul–Feb.

Forests or thickets at streamsides in valleys or on hills or mountains; 400–2200 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan

[Bangladesh, Bhutan, Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

Puff et al. (Rubiaceae of Thailand, 70. 2005) noted that the growth form or architecture of this species is strongly sympodial: “approached a Terminalian branching pattern.” The flowers on our specimens appear to be strongly dichogamous, with the anthers fully developed and apparently dehiscent while the stigmas are still enclosed in the corolla tube; then after the anthers have released all their pollen the styles apparently elongate and the stigmas become fully exerted from the corolla.

## 91. *THELIGONUM* Linnaeus, Sp. Pl. 2: 993. 1753.

假繁缕属 *jia fan lü shu*

Chen Jiarui (陈家瑞 *Chen Chia-jui*); A. Michele Funston

*Cynocrambe* Gagnebin.

Herbs, annual or perennial, monoecious. Stems somewhat succulent. Raphides present. Leaves petiolate, somewhat succulent, lower ones opposite, upper ones apparently alternate due to anisophylly, entire; stipules interpetiolar, membranous, united at base to petioles. Flowers unisexual, rarely bisexual, axillary in upper nodes, small 1–3 flowered cymes, bracts reduced. Staminate flowers sessile; calyx limb reduced; perianth (equivalent to corolla) deeply lobed, lobes 2–5, valvate, spreading or reflexed at anthesis, 3–5 parallel nerves; stamens (2–)6–30, sometimes united basally in groups, anthers linear, dorsifixed at anthesis, free slender filaments, pistillode reduced. Pistillate flowers subsessile; calyx limb reduced; perianth (equivalent to corolla) tubular, oblique, upper part an elongate constricted mouth, 2–4 denticulate-lobed; staminodes reduced; ovary 1-celled; style simple, exerted; ovule solitary, basal. Fruit a nutlike drupe, compressed; seed U-shaped; endosperm fleshy.

Four species: E Asia, Atlantic Ocean islands, Mediterranean region; three species (two endemic) in China.

Traditionally, Theligonaceae have been treated as a monogeneric family of controversial relationship: Rubiales (Cronquist), Myrtales (Engler), Caryophyllales (Dalla Torre & Harms). However, recent reliable molecular data place it within a highly derived group of Rubiaceae (along with *Galium*, *Hedyotis*, and *Rubia*; Pl. Syst. Evol. 225: 43–75. 2000).

- 1a. Stamens 5–7; stem often ca. 10 cm ..... 1. *T. formosanum*  
 1b. Stamens ca. 20; stem 15–50 cm.  
     2a. Annual herbs; leaf blades 2–5 × 1.5–3 cm; stamens more than 20 ..... 3. *T. macranthum*  
     2b. Perennial herbs; leaf blades 0.7–3 × 0.7–1.5 cm; stamens 20–25 or 16–20 ..... 2. *T. japonicum*

**1. *Theligonum formosanum*** (Ohwi) Ohwi & T. S. Liu, Fl. Taiwan 3: 904. 1977.

台湾假繁缕 *tai wan jia fan lü*

*Cynocrambe formosana* Ohwi, Acta Phytotax. Geobot. 2: 157. 1933.

Herbs, perennial, small, becoming black when dry. Stem erect, 10–15 cm, branched from base, creeping below, somewhat hairy. Leaf blade broadly ovate, 1.2–2 × 1–1.5 cm, pilose adaxially, puberulent on veins abaxially, base subcordate, subtruncate, or rounded, decurrent to petiole, apex acute; petiole 0.5–1.2 cm; stipules membranous, connate, deltoid-ovate, 2–3 mm, ciliate. Flowers white, unisexual. Staminate flowers: perianth membranous, 3-parted, lobes oblanceolate, 2.5–3 mm, obtuse, reflexed, 3–5-veined; stamens 5–7. Pistillate flowers smaller; perianth 2-lobed, lobes obtuse. Fruit obliquely obovoid, ca. 4 mm, hairy. Fl. Mar–Jul, fr. Jun–Aug.

• Wet places in forests and along mountain trails; ca. 2700 m. Taiwan (Pingdong).

**2. *Theligonum japonicum*** Ôkubo & Makino, Bot. Mag. (Tokyo) 3: 5 [5]. 1889.

日本假繁缕 *ri ben jia fan lü*

*Cynocrambe japonica* (Ôkubo & Makino) Makino.

Herbs, perennial, fetid. Stem erect or ascending, 15–36 cm, branched often from base, creeping below, pubescent above. Leaf blade ovate or elliptic, 0.7–3 × 1–1.5 cm, pubescent on both surfaces, base rounded or broadly cuneate, apex acute, lateral veins 3 each side; petiole 0.3–1.5 cm; stipules membranous, connate, ovate or deltoid-ovate, 2–3 mm, ciliate. Flowers unisexual. Staminate flowers: perianth membranous, 3-parted, lobes oblanceolate, 2.5–3 mm, obtuse, reflexed, 3–5-veined; stamens 20–25 or 16–20, pendulous. Pistillate flowers: minute; perianth 3- or 4-toothed. Fruit obliquely ovoid, ca. 5 mm, hairy. Fl. Mar–Jun, fr. Jun–Aug.

Wet places in valleys, by streams; 900–1200 m. Anhui, Shaanxi, Zhejiang [Japan].

**3. *Theligonum macranthum*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 71. 1887.

假繁缕 *jia fan lü*

*Cynocrambe macrantha* (Franchet) Poulsen.

Herbs, annual, fetid. Stem erect, 30–50 cm, ferruginous pubescent. Leaves herbaceous; leaf blade broadly ovate, ovate-lanceolate, or suboblong, 2–5 × 1–3 cm, sparsely pubescent on both surfaces, glabrescent, base subcuneate or subrounded, somewhat decurrent to petiole, apex acuminate; petiole 0.5–

1.8 cm; stipules membranous, connate, ovate or deltoid-ovate, 4–6 mm, ciliate. Flowers unisexual. Staminate flowers: perianth membranous, 2-lobed, tube ca. 2 mm, lobes 3–5 mm, lanceolate, apex obtuse, reflexed, 5–7-veined; stamens more than 20.

Pistillate flowers: smaller; perianth 2-lobed, apex obtuse. Fruit ovoid, ca. 5 mm. Fl. Apr–Jul, fr. Jun–Aug.

• Wet places in forests; 1800–2400 m. W Hubei, Sichuan, Zhejiang.

## 92. TIMONIUS Candolle, Prodr. 4: 461. 1830, nom. cons.

海茜树属 *hai qian shu*

Chen Tao (陈涛); Charlotte M. Taylor

Trees or shrubs, dioecious [or sometimes polygamo-dioecious], unarmed, terrestrial [or sometimes epiphytic]. Raphides absent. Leaves opposite or verticillate, usually with domatia, notably leathery [to papery or succulent]; tertiary venation finely lineolate [or sometimes not visible]; stipules caducous, interpetiolar [or calyptate], triangular. Inflorescences axillary, cymose with axes dichotomous to scorpioid, few to several flowered with pistillate usually fewer flowered than staminate, pedunculate, bracteate or bracts reduced; bracteoles sometimes fused in pairs. Flowers sessile, unisexual. Calyx limb cupular, truncate to 4- or 5-lobed. Corolla white to pale yellow, funnelform or tubular-funnelform with pistillate frequently shorter and broader in diam. than staminate, outside densely strigose to sericeous, inside glabrous, leathery; lobes 4(–10), thinly imbricate in bud (i.e., “subimbricate” of Darwin 1993, with margins thinly overlapping; see comment below). Stamens 4(–10), inserted in corolla throat, exserted; filaments short; anthers dorsifixed, at base 2-lobed. Ovary many celled, ovules 1 in each cell, pendulous from apical placentas; disk hirsute; style 4–12-parted with segments linear, often unequal; stigmas 4–12 (i.e., 1 on each style arm), papillose, included or exserted. Fruit red or black, drupaceous, thinly fleshy, ovoid, subglobose, or oblate (i.e., depressed globose), often 4- or 5-ridged when dry, with calyx limb persistent; pyrenes several to numerous [to 350 or more], 1-celled with 1 seed, narrowly oblong to cylindrical, bony; seeds cylindrical, straight or curved; testa membranous; endosperm scanty or absent; embryo straight or curved; cotyledons minute, flattened; radicle elongate, terete, ascending.

About 150–180 species: tropical SE Asia and the Pacific islands; one species in China.

Darwin (Allertonia 7(1): 1–39. 1993) noted that although the corolla lobes have been commonly described as valvate in *Timonius*, in fact, they are “subimbricate” with the margins only thinly overlapping; this arrangement is here called “thinly imbricate.” A notable characteristic of *Timonius* within the Rubiaceae is the multiplication of ovules, or often entire files of ovules, as well as the number of cells in the ovary, from the 2 cells that are typical of most Rubiaceae, to far past the 5–9 cells found in *Guettarda*. Darwin (loc. cit.; Syst. Bot. Monogr. 42: 1–86. 1994) has monographed part but far from all of this large genus.

### 1. *Timonius arboreus* Elmer, Leafl. Philipp. Bot. 1: 72. 1906 [“*arborea*”].

海茜树 *hai qian shu*

Trees 5–12 m tall; branches angled or flattened, rather stout, glabrous or glabrescent, often markedly sylleptic from nodes below leaves with markedly elongated lowermost internode, with scars of petioles often enlarged. Leaves opposite or usually whorls of 3; petiole stout, 1–5 mm, glabrous; blade drying stiffly papery, elliptic, elliptic-oblong, or broadly elliptic, 8.4–17 × 3–7.5 cm, adaxially glabrous, abaxially moderately to sparsely strigillose, base cuneate to acute and often tapered, apex acuminate; secondary veins 5–7 pairs, usually with densely pilosulous domatia; stipules caducous often leaving a ring of persistent trichomes 0.5–1 mm, triangular to lanceolate, 5–7 mm, abaxially moderately strigose, adaxially densely sericeous, acute to acuminate. Inflorescences strigose to glabrous, staminate 3–7-flowered, pistillate 1-flowered; peduncles 0.5–3 cm; bracts lanceolate to triangular, 0.5–2 mm, usually fused in pairs. Flowers subtended at immediate base by 2 to several persistent bracteoles 0.5–1 mm, these sometimes shortly fused in pairs. Calyx sparsely strigillose to glabrous; ovary portion subglobose, 2.5–3.5 mm in diam.; limb tubular, 1–2 mm, truncate or undulate to 5- or 6-denticulate. Corolla outside densely velutinous-strigillose to sericeous; tube 4–7 mm, glabrous inside; lobes 6–8, narrowly triangular, 4–7 mm, acute. Drupes subglobose to oblate, 8–10 × 10–14 mm, glabrescent, color not noted; pyrenes 50 or more, subcylindrical, 6–7 × 2–2.5 mm. Fl. Apr, Nov, fr. Apr–Jun.

Nate 3–7-flowered, pistillate 1-flowered; peduncles 0.5–3 cm; bracts lanceolate to triangular, 0.5–2 mm, usually fused in pairs. Flowers subtended at immediate base by 2 to several persistent bracteoles 0.5–1 mm, these sometimes shortly fused in pairs. Calyx sparsely strigillose to glabrous; ovary portion subglobose, 2.5–3.5 mm in diam.; limb tubular, 1–2 mm, truncate or undulate to 5- or 6-denticulate. Corolla outside densely velutinous-strigillose to sericeous; tube 4–7 mm, glabrous inside; lobes 6–8, narrowly triangular, 4–7 mm, acute. Drupes subglobose to oblate, 8–10 × 10–14 mm, glabrescent, color not noted; pyrenes 50 or more, subcylindrical, 6–7 × 2–2.5 mm. Fl. Apr, Nov, fr. Apr–Jun.

Near sea level to 400 m. Taiwan [Philippines].

The pubescence of the lower leaf surface is nearly colorless and arranged along the higher order veins; thus, it is often difficult to see, even with good magnification, and has been overlooked by some authors.

## 93. TRAILLIAEDOX W. W. Smith & Forrest, Notes Roy. Bot. Gard. Edinburgh 10: 74. 1917.

丁茜属 *ding qian shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs, low, erect, unarmed or with spinescent branches; branches at base with a pair of reduced, usually deciduous leaves and a persistent stipule. Raphides apparently absent. Leaves opposite, sometimes fasciculate on unexpanded axillary stems and appearing whorled, subsessile, without domatia; stipules deciduous, interpetiolar or fused to petiole bases, 2-lobed, lobes gland-tipped. Inflorescences terminal, pseudoaxillary, or terminal on paired lateral short shoots and appearing axillary, congested-cymose to umbelliform or fasciculate, few to many flowered, often nodding, sessile to pedunculate; bracts reduced or occasionally leaflike. Flowers pedi-

cellate, bisexual, apparently monomorphic. Calyx limb 5-lobed essentially to base. Corolla white, pink, or pale yellow, salverform to funnellform, glabrous inside; lobes 5, convolute in bud. Stamens 5, inserted in corolla throat, exserted; filaments short; anthers dorsifixed near base. Ovary 2-celled, ovules 1 in each cell, pendulous from apex; style curved; stigma clavate to ellipsoid and 2-lobed for a third to half its length, exserted. Fruit schizocarpous, dry, oblanceoloid, with calyx limb persistent; mericarps 2, indehiscent, each with 1 seed, ellipsoid, crustaceous; seeds medium-sized, ellipsoid; testa leathery; endosperm absent; embryo linear-oblanceolate.

- One species: China.

The presence or absence of raphides has not been specifically noted anywhere we have seen; their absence is presumed here based on observations of specimens and the classification by Robbrecht (Opera Bot. Belg. 1: 1–271. 1988) of this genus in Antirrhoideae. W. C. Ko (in FRPS 71(2): 1. 1999) described the anthers as partially exserted, but these are fully exserted at anthesis on the specimens studied. On the few specimens studied (*T. T. Yü 1348*, *C. Schneider 2194*, *Forrest 10713*, all A; *Boufford et al. 35041*, MO), the flowers appear to be protandrous, with the stamens apparently dehiscing while the stigmas are enclosed in the corolla; on these plants subsequently the style elongates, the stigma is exserted by several millimeters, and then the two lobes separate and presumably become receptive.

**1. *Trailliaedoxa gracilis*** W. W. Smith & Forrest, Notes Roy. Bot. Gard. Edinburgh 10: 75. 1917.

丁茜 ding qian

Subshrubs, erect, 20–45(–60) cm tall, multibranched; branchlets weakly angled to terete, densely strigillose to pilosulous becoming glabrescent. Leaf blade drying papery to stiffly papery, obovate, elliptic, or oblanceolate, 0.5–1 × 0.3–0.4 cm, adaxially glabrous or sparsely pilosulous to strigillose, abaxially paler and glabrous or villosulous to strigillose or hispidulous at least along midrib, base acute or very shortly and abruptly truncate, apex rounded or obtuse; secondary veins indistinct; stip-

ules 0.6–1 mm, pilosulous to glabrescent. Inflorescences 0.5–1 × 0.8–1 cm, 6–12-flowered, pilosulous to villosulous, sessile or with peduncle to 5 mm; pedicels 1–2 mm. Calyx with ovary portion cylindrical-lanceoloid, ca. 1 mm, densely pilosulous; lobes narrowly elliptic or oblanceolate to linear, 0.8–1.5 mm, glabrescent, acute. Corolla outside sparsely villosulous to glabrescent; tube 1.8–2.5 mm; lobes elliptic-spatulate, 1–1.5 mm, obtuse to rounded. Schizocarps ca. 1.5 × 1 mm, densely villosulous. Fl. Jul–Aug, fr. Aug.

- On rocks or in thickets on mountain slopes in dry and warm valleys; 1400–3000 m. Sichuan, Yunnan.

## 94. *UNCARIA* Schreber, Gen. Pl. 125. 1789, nom. cons.

钩藤属 gou teng shu

Chen Tao (陈涛); Charlotte M. Taylor

*Aglyophora* Necker ex Rafinesque; *Ourouparia* Aublet.

Woody vines or lianas, climbing by recurved, usually paired spines generally 1–2 cm. Raphides absent. Leaves opposite, usually with domatia; stipules persistent or caducous, interpetiolar, generally ovate to ligulate in outline, entire to 2-lobed, usually reflexed. Inflorescences axillary and sometimes also terminal, capitate with heads globose and 1 to several in cymes or fascicles, pedunculate, bracteate; peduncles usually articulate in middle or upper portion, often with stipuliform bracts at articulation; bracts enclosing heads sometimes caducous, involucrel, stipuliform. Flowers sessile and bracteolate or pedicellate and bracteolate or ebracteolate, bisexual, monomorphic. Calyx limb 5-lobed. Corolla white to yellow, salverform or funnellform, inside glabrous or pubescent; lobes 5, imbricate in bud. Stamens 5, inserted in corolla tube near throat, exserted; filaments short; anthers dorsifixed. Ovary 2-celled, ovules numerous in each cell on axile placentas attached in upper third of septum; stigma globose or clavate, exserted. Fruiting heads globose, with fruiting pedicels when present often elongating notably. Fruit capsular, fusiform to obovoid, loculicidally dehiscent into 2 valves that usually remain attached at both ends, thinly to thickly papery or cartilaginous, with calyx limb persistent; seeds numerous, small to medium-sized, fusiform, flattened, winged with wing deeply bifid.

About 34 species: 29 in tropical Asia through Australia, three in Africa and Madagascar, two in tropical America; 12 species (five endemic) in China.

Ridsdale (Blumea 24: 43–46. 1978) presented an extensive consideration of the morphology, branching, and architecture of *Uncaria*. The characteristic hooked spines have been interpreted variously as modified plagiotropic shoots (Ridsdale, loc. cit.), peduncles that are modified into spines (e.g., Steyermark in Lasser, Fl. Venezuela 9: 32. 1974), and short shoots modified into thorns (Robbrecht, Opera Bot. Belg. 1: 1–271. 1988). By any name, these structures function to support the plants as they climb and sometimes bear a terminal inflorescence. Ridsdale (loc. cit.: 69) described the corolla lobe aestivation as valvate or thinly imbricate at their apices; other authors described them as imbricate. *Uncaria* was reviewed in detail for China by How (Sunyatsenia 6: 231–262. 1946), who emended the circumscriptions of several species, and then by Hsue and Wu (J. S. China Agric. Coll. 2(8): 21–32. 1981), who recognized ten species. The arrangement of the flowers and fruit, whether sessile or pedicellate, is taxonomically important; however, the pedicels usually elongate shortly before the flowers open and then continue to elongate as the fruit develop, often markedly, so the pedicel length at anthesis may be difficult to discern from inflorescences in bud.

*Uncaria* is considered medicinally useful, with uses ranging from general tonics to supposedly curing HIV-AIDS (e.g., K. C. Hsia & X. M. Liu, Acta Phytotax. Sin. 20: 319–320. 1982). Various parts of the plants are apparently used, with the materials generally wild-collected. *Uncaria gambir* (W. Hunter) Roxburgh, found from the Malay Peninsula through Borneo, is apparently both cultivated and wild-harvested as the source of gambir or gambier (Ridsdale, loc. cit.: 82; Mabberley, Mabberley's Pl.-Book, ed. 3, 885–886. 2008), a yellowish dry resin chewed together with the betel nut and sometimes used in tanning. How (loc. cit.) noted that the Chinese drug Kou-T'eng is derived from the "hardened sterile peduncle with attached portions of the stem" of a species that is probably *U. rhynchophylla*.

- 1a. Flowers subsessile to pedicellate, fruit pedicellate.
- 2a. Stipules suborbicular, 14–16 mm, entire ..... 12. *U. yunnanensis*
- 2b. Stipules ovate, 6–12 mm, shallowly to deeply 2-lobed.
- 3a. Leaves drying papery, 2–8 cm wide; flowers subsessile; fruit 1–3 mm wide ..... 5. *U. lanosa*
- 3b. Leaves drying thinly leathery, 6–12 cm wide; flowers with well-developed pedicels; fruit 4–5 mm wide ..... 6. *U. macrophylla*
- 1b. Flowers and fruit sessile to subsessile.
- 4a. Leaf blade abaxially strigillose, strigose, puberulent, and/or hirsute on lamina (but sometimes with different pubescence on veins); stems strigillose, tomentulose, strigose, hirtellous, hirsute, or pilosulous; stipules 2-lobed.
- 5a. Flowering heads 18–25 mm in diam. across calyces; stipule lobes ovate to lanceolate; calyx limb with tube 2–4 mm, lobes 2–3 mm ..... 1. *U. hirsuta*
- 5b. Flowering heads 9–12 mm in diam. across calyces; stipule lobes narrowly triangular, lanceolate, or ovate; calyx limb deeply lobed, lobes 0.75–2 mm.
- 6a. Corolla lobes ca. 1.25 mm; leaves 2.5–4 cm wide ..... 2. *U. homomalla*
- 6b. Corolla lobes ca. 2 mm; leaves 3–5.5 cm wide ..... 9. *U. scandens*
- 4b. Leaf blade abaxially glabrous to puberulent on lamina; stems glabrous, puberulent, sparsely hirsute, or sparsely hirtellous; stipules entire or 2-lobed.
- 7a. Stipules entire or shallowly emarginate, broadly triangular, ovate, or suborbicular ..... 11. *U. sinensis*
- 7b. Stipules 2-lobed, elliptic-oblong, ligulate, lanceolate, or ovate, with lobes narrowly triangular, linear, ovate, lanceolate, or triangular-ovate.
- 8a. Leaf blade drying thinly leathery; calyx lobes 0.1–0.3 mm.
- 9a. Leaf blade not glaucous abaxially, with tertiary venation mostly reticulate and not strongly scalariform on adaxial surface; peduncles simple; corolla lobes externally glabrous; fruit 6–8 mm ..... 3. *U. laevigata*
- 9b. Leaf blade often glaucous abaxially, with tertiary venation rather evidently scalariform at least on adaxial surface; peduncles simple or often branched; corolla lobes externally sericeous; fruit 10–14 mm ..... 10. *U. sessilifructus*
- 8b. Leaf blade drying thickly papery to thinly papery; calyx lobes 0.5–2 mm.
- 10a. Corollas 7–9 mm; leaf blade often drying reddish brown or dark red, often glaucous abaxially; calyx limb ca. 1 mm ..... 7. *U. rhynchophylla*
- 10b. Corollas 10.5–14.5 mm; leaf blade drying brown, grayish brown, or green, not glaucous abaxially; calyx limb 1.5–4 mm.
- 11a. Calyx limb ca. 1.5 mm ..... 8. *U. rhynchophylloides*
- 11b. Calyx limb 2–4 mm.
- 12a. Flowering heads 13–15 mm across calyces; leaves glabrous ..... 4. *U. lancifolia*
- 12b. Flowering heads 18–20 mm across calyces; leaves glabrous or usually puberulent at least on veins abaxially ..... 5. *U. lanosa*

**1. *Uncaria hirsuta* Haviland, J. Linn. Soc., Bot. 33: 88. 1897.**

毛钩藤 mao gou teng

*Nauclea formosana* Matsumura; *Ourouparia hirsuta* (Haviland) Yamamoto; *Uncaria formosana* (Matsumura) Hayata; *U. kawakamii* Hayata; *U. uraiensis* Hayata.

Lianas, height unknown. Young stems slender, terete or weakly 4-angled, sparsely to densely strigillose, strigose, or hirsute. Petiole 3–6 mm, strigose to strigillose; leaf blade drying thickly papery to thinly leathery, ovate, lanceolate-oblong, or elliptic, 8–12 × 3.5–7 cm, adaxially glabrous and smooth to sparsely puberulent-scabrous on lamina and puberulent on veins, abaxially sparsely to densely strigose with trichomes generally produced regularly along and at 90° to tertiary veins, apex acuminate; secondary veins 7–11 pairs, usually with hirtellous domatia; stipules generally deciduous, broadly ovate, 7–10 mm, 2-lobed for at least 2/3, strigillose, puberulent, or glabrescent, lobes ovate to lanceolate, ciliate, acute to acuminate. Inflorescences axillary or frequently paired and terminal on stems (apparently due to terminal bud not developing further), pilose

to pilosulous; peduncle 2.5–5 cm, simple; bracts 5–10 mm; flowering heads 18–25 mm in diam. across calyces, 30–40 mm in diam. across corollas; bracteoles linear or spatulate, ca. 2 mm. Flowers subsessile. Calyx with hypanthium portion obconic, ca. 2 mm, densely pilose to strigose; limb densely strigillose, with tube 2–4 mm; lobes linear-oblong, 2–3 mm. Corolla pale yellow or pale red, salverform, outside sparsely to densely strigillose; tube 7–10.5 mm; lobes oblong to elliptic, 2–2.5 mm, obtuse to rounded. Fruiting heads 30–35 mm in diam. Fruit subsessile, obovoid, 5–9 mm (not including persistent calyx limb), densely strigose; seeds ca. 1.5 mm. Fl. and fr. Jan–Dec.

• Thickets or forests at streamsides in valleys; below 100–500 m. Fujian, Guangdong, Guangxi, Guizhou, Taiwan.

H. H. Hsue and H. Wu (in FRPS 71(1): 257. 1999) listed “*Ourouparia setiloba* Sakai” as a synonym of this species, but that name is correctly “*Ourouparia setiloba* (Benth.) Sakai,” which is a combination based on *Uncaria setiloba*, here treated as a synonym of *U. lanosa* var. *appendiculata*. Hsue and Wu described the corolla tubes as 7–10 mm, but these are 8–10.5 mm on all the specimens studied and in descriptions of other authors.

## 2. *Uncaria homomalla* Miquel, Fl. Ned. Ind. 2: 343. 1857.

北越钩藤 bei yue gou teng

*Uncaria tonkinensis* Haviland.

Lianas, climbing to 25 m tall. Young stems quadrate, sparsely to densely, usually ferruginous tomentulose or -hirtellous. Petiole 3–6 mm, hirtellous to strigose; leaf blade drying papery, elliptic, lanceolate, elliptic-lanceolate, or ovate-lanceolate, 6–10 × 2.5–4 cm, adaxially rather sparsely but evenly puberulent to strigillose on lamina and densely tomentulose on costa, abaxially moderately to densely hirsute or strigose with trichomes produced mostly along veins, base rounded, apex acuminate or caudate; secondary veins 6–8 pairs, usually with well-developed pilosulous domatia; stipules generally deciduous, deeply 2-lobed, lobes narrowly triangular, 4–5 mm, acute. Inflorescences axillary and sometimes also terminal, densely hirtellous to strigose; peduncles simple, 2.5–3 cm, at articulation with narrowly triangular bracts 2–3 mm; flowering heads 7–10 mm in diam. across calyces, 25–30 mm in diam. across corollas; bracteoles apparently absent. Flowers sessile. Calyx with hypanthium portion obconic, ca. 1.2 mm; limb deeply lobed; lobes linear to narrowly triangular, 0.75–1 mm, densely pilosulous, acute. Corolla yellow [to pale green], outside densely strigose to strigillose; tube 5–8.5 mm; lobes ligulate to elliptic-oblong, ca. 1.25 mm, obtuse to rounded. Fruiting heads 12–20 mm in diam. Fruit sessile, obovoid, ca. 4 × 2 mm, strigose to pilosulous; seeds 2–3 mm. Fl. Apr, May.

Evergreen to seasonal forests; 200–600 m. Guangxi, Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

H. H. Hsue and H. Wu (in FRPS 71(1): 258. 1999) described the leaves as up to 5.5 cm wide, but this has not been seen on specimens studied nor reported by other authors. Ridsdale (Blumea 24: 95. 1978) reported this species from Guangdong and Hainan but without vouchers. The separation here of *Uncaria homomalla* and *U. scandens* follows previous Chinese authors, but the separation of these species (or possibly the application of these names to the Chinese plants) needs further study. Ridsdale (loc. cit.) separated *U. homomalla* from *U. scandens* based on the size of the flowering heads and leaves; however, Chinese specimens included previously in *U. scandens* (e.g., *Henry 11868*, MO!) have flowering heads and leaves similar in size to those of *U. homomalla*.

## 3. *Uncaria laevigata* Wallich ex G. Don, Gen. Hist. 3: 470. 1834.

平滑钩藤 ping hua gou teng

*Nauclea laevigata* (Wallich ex G. Don) Walpers.

Lianas, height unknown. Young stems slender, quadrangular, glabrous [to puberulent]. Petiole 7–11 mm, glabrous; leaf blade drying thinly leathery, elliptic, lanceolate, or elliptic-oblong, 8.5–12 × 3–6 cm, glabrous on both surfaces or puberulent on veins abaxially, base rounded to cuneate, apex acute or acuminate; secondary veins 4–7 pairs, usually with hirtellous domatia; stipules caducous, elliptic-oblong to ovate, 4–6 mm, 1-lobed for 1/2 or more, glabrous or sparsely puberulent, lobes narrowly triangular, acute. Inflorescences axillary and sometimes in terminal groupings, glabrous; peduncles 2.5–6 cm,

simple; bracts 2–4 mm; flowering heads 8–10 mm in diam. across calyces, 25–35 mm in diam. across corollas; bracteoles linear or subspatulate, 2–3 mm. Flowers sessile. Calyx with hypanthium portion obconic, 1–1.5 mm, densely sericeous or strigose; limb densely puberulent to strigillose, with tube 1–1.5 mm; lobes ligulate, 0.1–0.3 mm, obtuse. Corolla color unknown, salverform, glabrous outside; tube 7–10 mm; lobes oblong, ca. 2 mm, obtuse to rounded. Fruiting head 25–30 mm in diam. Fruit sessile, fusiform, 6–8 mm, strigose to strigillose; seeds not seen. Fl. and fr. May–Nov.

Forests; 600–1300 m. Guangxi, Taiwan, Yunnan [Bangladesh, India, Laos, Myanmar, Thailand, Vietnam].

## 4. *Uncaria lancifolia* Hutchinson in Sargent, Pl. Wilson. 3: 407. 1916.

倒挂金钩 dao gua jin gou

Large lianas, height unknown. Young stems quadrangular, glabrous. Petiole 3–5 mm, glabrous; leaf blade drying papery, oblong-lanceolate or ovate-lanceolate, 9–12 × 3–6 cm, glabrous on both surfaces, base rounded to truncate or subcordate, apex acute or acuminate; secondary veins 5–10 pairs, without domatia; stipules often persistent, ovate, 5–8 mm, 2-lobed for 1/3–1/2, glabrous, lobes lanceolate, acute. Inflorescences axillary and terminal, glabrous; peduncles 4–7 cm, simple; bracts caducous, ca. 5 mm; flowering heads ca. 15 mm in diam. across calyces, ca. 45 mm in diam. across corollas; bracteoles linear or linear-spatulate, 3–4.5 mm. Flowers sessile. Calyx with hypanthium portion obconic, ca. 3 mm, densely sericeous to pilose; limb densely puberulent to strigillose, with tube 1–2 mm; lobes spatulate, ca. 2 mm, obtuse to rounded. Corolla greenish white, salverform, glabrous; tube 9–12 mm; lobes oblong, 1.5–2.5 mm, obtuse to rounded. Fruiting head 25–35 mm in diam. Fruit sessile, obovoid, 9–12 mm, sericeous to strigose; seeds 2.5–3 mm. Fl. and fr. Jun–Dec.

Subtropical evergreen broad-leaved forests; 1500–1900 m. Yunnan [Vietnam].

How (Sunyatsenia 6: 252. 1946) first described the flowers of this species. H. H. Hsue and H. Wu (in FRPS 71(1): 253. 1999) described the leaves as having domatia; but the type specimen and several additional specimens studied lack these, and How did not mention them.

## 5. *Uncaria lanosa* Wallich var. *appendiculata* (Benth) Ridsdale, Blumea 24: 88. 1978.

恒春钩藤 heng chun gou teng

*Uncaria appendiculata* Benth, London J. Bot. 2: 222. 1843; *Ouroparia setiloba* (Benth) Sakai; *U. lanosa* f. *setiloba* (Benth) Ridsdale; *U. philippinensis* Elmer; *U. setiloba* Benth.

Woody vines, height not noted. Young stems quadrangular, sparsely hirsute to glabrescent. Petiole 4–10 mm, sparsely hirsute to glabrescent; leaf blade drying papery, ovate, lanceolate, or lanceolate-oblong, 7–11 × 3.5–8 cm, adaxially shiny and glabrous except sparsely hirsute along veins, abaxially glabrescent except sparsely hirsute along veins, base rounded, truncate, or cordulate, apex acute to acuminate; secondary veins 6–9 pairs, usually with domatia in axils of secondary and often also ter-

tiary veins; stipules persistent or caducous, ovate, 6–10 × 8–10 mm, 2-lobed for 1/3–1/2, lobes narrowly triangular, acute to acuminate. Inflorescences axillary and frequently also terminal, strigose to hirsute or glabrescent; peduncle 2.5–4.5 cm; bracts ca. 10 mm; flowering heads solitary (or 2), 18–20 mm in diam. across calyces, 30–37 mm in diam. across corollas; bracteoles apparently absent. Flowers sessile or subsessile. Calyx densely strigillose; hypanthium portion fusiform, ca. 2 mm; limb deeply lobed; lobes linear, ca. 2 mm, obtuse. Corolla color unknown, salverform, externally sparsely sericeous to glabrescent; tube ca. 12 mm; lobes oblong, ca. 2.5 mm, obtuse. Fruiting heads 30–40 mm in diam.; pedicels 5–9 mm. Fruit pedicellate, fusiform, 9–27 × 1–3 mm, strigose; seeds 2.5–3 mm. Fl. Feb, perhaps Oct, fr. Feb.

Forests; ca. 300 m. S Taiwan [Indonesia (Sulawesi), Philippines].

Ridsdale (loc. cit.: 70) keyed *Uncaria lanosa* based on its stipules that are subentire, but in our plants as well as the type of *U. philippinensis*, treated by him as a synonym of *U. lanosa* (NY, Web!), they are markedly 2-lobed.

*Uncaria lanosa* var. *lanosa* occurs in Australia, Borneo, Indonesia, Malaysia, Myanmar, New Guinea, Pacific islands (Caroline Islands, Palau, Solomon Islands), Philippines, and Thailand.

**6. *Uncaria macrophylla*** Wallich in Roxburgh, Fl. Ind. 2: 132. 1824.

大叶钩藤 da ye gou teng

Large lianas, height not noted. Young stems weakly to markedly quadrangular, pilosulous, tomentulose, or glabrescent. Petiole 3–25 mm, glabrous to densely tomentulose; leaf blade drying thinly leathery and yellowish brown adaxially, ovate or broadly elliptic, 10–16 × 6–12 cm, adaxially glabrous except strigillose along veins, abaxially sparsely to densely hirsutulous with pubescence denser along veins, base rounded, subcordate, or cordate, apex acute or shortly acuminate; secondary veins 6–9 pairs, usually with pubescent domatia; stipules caducous, ovate, 6–12 × 6–15 mm, 2-lobed for 1/2 or 2/3, lobes triangular to ovate. Inflorescences axillary, tomentulose to glabrescent; peduncle 3–7 cm; bracts triangular, 6–8 mm; flowering heads solitary, 15–20 mm in diam. across calyces, 40–50 mm in diam. across corollas; bracteoles absent; pedicels 2–5 mm. Flowers pedicellate. Calyx densely strigillose; hypanthium portion obconic, 2–2.5 mm; limb deeply lobed; lobes linear-oblong, 3–4 mm, obtuse to rounded. Corolla pale green to white, salverform, outside strigillose to tomentulose; tube 9–10 mm; lobes oblong to ligulate, ca. 2 mm, obtuse to rounded. Fruiting head 8–10 cm in diam.; pedicels 6–18 mm. Fruit pedicellate, fusiform, 14–20 × 4–5 mm, densely strigillose; seeds 6–8 mm. Fl. Jul, Sep, Dec, fr. Mar–Apr, Sep–Nov.

On canopy crowns in secondary forests; 300–900 m. Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, Bhutan, India, Laos, Myanmar, N Thailand, Vietnam].

**7. *Uncaria rhynchophylla*** (Miquel) Miquel ex Haviland, J. Linn. Soc., Bot. 33: 890. 1897.

钩藤 gou teng

*Nauclea rhynchophylla* Miquel, Ann. Mus. Bot. Lugduno-

Batavi 3: 108. 1867; *Orouparia rhynchophylla* (Miquel) Matsumura; *Uncaria rhynchophylla* var. *koutong* Yamazaki.

Lianas, height unknown. Young stems slender, weakly to markedly quadrangular, glabrous, sometimes glaucous. Petiole 5–15 mm, glabrous; leaf blade drying papery and often red-brown or dark red, elliptic, lanceolate, or elliptic-oblong, 5–12 × 3–7 cm, glabrous on both surfaces, often glaucous abaxially, base cuneate, obtuse, or rounded, apex acute to usually acuminate; secondary veins 4–8 pairs, sometimes with pilosulous domatia; stipules often deciduous, lanceolate to ovate, 4–15 mm, 2-lobed for up to 4/5, glabrous, lobes linear to triangular-lanceolate or ovate, acute to acuminate. Inflorescences axillary and terminal, solitary or usually in terminal groups of 7–11, glabrous; peduncles 1.5–5 cm, simple; bracts 1–4 mm; flowering heads 4–8 mm in diam. across calyces, 12–15 mm in diam. across corollas; bracteoles linear or linear-spatulate, ca. 2 mm. Flowers sessile or subsessile. Calyx with hypanthium portion obconic, ca. 1 mm, densely strigillose to strigose; limb densely strigillose, ca. 1 mm, lobed for 1/2 or more; lobes triangular to spatulate, acute to obtuse. Corolla color unknown, salverform, outside puberulent to glabrous; tube 5.5–6 mm; lobes ovate, 1.5–2 mm, rounded to obtuse. Fruiting head 10–20 mm in diam. Fruit sessile or subsessile, obovoid to fusiform, 5–7 mm, strigillose to strigose; seeds 2–3 mm. Fl. and fr. May–Dec.

Sparse forests or thickets at streamsides in valleys; near sea level to 1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Yunnan, Zhejiang [Japan].

Ridsdale (Blumea 24: 93. 1978) included *Uncaria rhynchophylloides* as a synonym of *U. rhynchophylla*; however, these do appear to be distinct.

**8. *Uncaria rhynchophylloides*** F. C. How, Sunyatsenia 6: 257. 1946.

侯钩藤 hou gou teng

Lianas, to 13 m tall. Young stems quadrangular, puberulent to glabrescent. Petiole 5–7 mm, puberulent to glabrous; leaf blade drying thickly papery and dark brown to grayish brown, ovate, lanceolate, or elliptic-ovate, 5–9 × 2.5–4.5 cm, both surfaces puberulent to glabrescent, base cuneate to obtuse, rounded, or cordulate, apex acuminate; secondary veins 5–7 pairs, usually with pilosulous domatia; stipules generally persistent, ovate, deeply 2-lobed, glabrous to puberulent, lobes triangular to ovate, 3–4 mm, acute to acuminate. Inflorescences axillary and often in terminal groups of 3–5, puberulent to glabrescent; peduncles 3.5–6 cm, simple but sometimes with 2 articulations; bracts 3–4 mm; flowering heads 9–11 mm in diam. across calyces, 25–30 mm in diam. across corollas; bracteoles linear or linear-spatulate, 2.5–3.5 mm. Flowers sessile. Calyx with hypanthium portion obconic, ca. 1.5 mm, densely sericeous or strigose; limb deeply lobed, densely strigillose; lobes oblong to spatulate, ca. 1.5 mm, obtuse to rounded. Corolla color unknown, salverform, outside puberulent; tube ca. 12 mm; lobes obovate or oblong-obovate, 2–2.5 mm, rounded. Fruiting head 16–20 mm in diam. Fruit sessile, obovoid-ellipsoid, 8–10 × 3–3.5 mm, sericeous to strigillose; seeds not seen. Fl. and fr. May–Dec.

• Forests, forest margins; 500–800 m. Guangdong, Guangxi.

This species was illustrated by How (loc. cit.: 257, f. 31). Ridsdale (Blumea 24: 93. 1978) included *Uncaria rhynchophylloides* as a synonym of *U. rhynchophylla*; however, these do appear to be distinct.

**9. *Uncaria scandens*** (Smith) Hutchinson in Sargent, Pl. Wilson. 3: 406. 1916.

攀茎钩藤 *pan jing gou teng*

*Nauclea scandens* Smith in Rees, Cycl. 24: *Nauclea* no. 9. 1813; *Cephalanthus cavaleriei* H. Léveillé; *Uncaria wangii* F. C. How.

Large lianas, height not noted. Young stems slender, weakly to markedly quadrangular, densely hirtellous or pilosulous. Petiole 3–6 mm, hirtellous to pilosulous; leaf blade drying papery, ovate, ovate-oblong, lanceolate, elliptic, or elliptic-oblong, 10–15 × 3–5.5 cm, adaxially sparsely to moderately strigillose or scabrous-puberulent on lamina and densely puberulent to strigillose on veins, abaxially moderately to densely pilosulous, hirtellous, and/or strigillose usually with at least some pubescence spreading, base rounded to truncate, subcordate, or cordulate, apex acute or usually acuminate; secondary veins 7–10 pairs, usually with pilosulous domatia; stipules deciduous, ovate, 6–10 mm, deeply 2-lobed, strigillose, puberulent, or glabrescent, lobes lanceolate, ovate, or narrowly triangular, acute. Inflorescences axillary and often in terminal groups of 5–7 heads, densely pilosulous to tomentulose; peduncles 3–7 cm, simple; bracts 4–9 mm; flowering heads 9–12 mm in diam. across calyces, 25–30 mm in diam. across corollas; bracteoles linear or linear-spatulate, 1–3 mm, sparsely pubescent. Flowers sessile. Calyx with hypanthium portion obconic, 1–1.5 mm, densely strigose or pilose; limb 2–3 mm, lobed for up to 2/3, densely grayish white strigillose; lobes linear or linear-spatulate, 1.5–2 mm, obtuse. Corolla pale yellow sometimes flushed with pink, salverform, outside sparsely to densely hirtellous; tube 8–10 mm; lobes obovate to elliptic, ca. 2 mm, rounded. Fruiting head 20–25 mm in diam. Fruit sessile, obovoid to ob-lanceoloid, 6–9 mm, hirtellous; seeds orange-yellow, ca. 2 mm. Fl. Feb, Apr, fr. Jul, Nov.

• Sparse forests, broad-leaved forests; 100–1500 m. Guangdong, Guangxi, Hainan, Sichuan, Xizang, Yunnan.

This species was illustrated by How (Sunyatsenia 6: t. 42. 1946, as *Uncaria wangii*). See comments about the separation of this species under *U. homomalla*.

**10. *Uncaria sessilifructus*** Roxburgh, Fl. Ind. 2: 130. 1824.

白钩藤 *bai gou teng*

*Nauclea sessilifructus* (Roxburgh) D. Dietrich.

Large lianas, height unknown. Young stems slender, quadrangular, sparsely puberulent or hirtellous to glabrous. Petiole 5–10 mm, glabrous; leaf blade drying thinly leathery, ovate, elliptic, or elliptic-oblong, 8–12 × 4–6.5 cm, glabrous on both surfaces or abaxially puberulent on principal veins, often glaucous abaxially, base cuneate to rounded, apex acute or acuminate; secondary veins 4–7 pairs, usually with pilosulous domatia; stipules deciduous, ligulate to lanceolate, 7–10 mm, 2-lobed for 2/3 or more, glabrous to densely puberulent, lobes narrowly triangular, acute. Inflorescences axillary or terminal, heads solitary or in groups of 5–15, strigillose to glabrescent; peduncles

3–5.5 cm, simple or often branched to 1 order; flowering heads 5–10 mm in diam. across calyces, 25–35 mm in diam. across corollas; bracteoles linear or subspatulate, 2–3 mm. Flowers sessile. Calyx with hypanthium portion obconic, 1.5–2 mm, densely strigose to sericeous; limb densely strigillose to pilosulous, with tube 1–2 mm; lobes oblong to triangular, 0.25–1 mm, obtuse to acute. Corolla yellowish white, salverform; tube 6–10 mm, outside glabrous, pilosulous, or sericeous; lobes oblong, ca. 2 mm, outside sericeous or hirtellous, rounded to obtuse. Fruiting head 25–35 mm in diam. Fruit sessile, fusiform, 10–14 mm, sericeous; seeds not seen. Fl. and fr. Mar–Dec.

Dense forests or thickets in valleys; 300–1500 m. Guangxi, Yunnan [Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Vietnam].

This species was illustrated by Ridsdale (Blumea 24: 91, f. 11. 1978).

**11. *Uncaria sinensis*** (Oliver) Haviland, J. Linn. Soc., Bot. 33: 89. 1897.

华钩藤 *hua gou teng*

*Nauclea sinensis* Oliver, Hooker's Icon. Pl. 20: t. 1956. 1891; *Uncaria membranifolia* F. C. How.

Lianas, height unknown. Young stems slender, quadrangular, glabrous. Petiole 6–10 mm, glabrous; leaf blade drying thinly papery, elliptic to ovate, 9–14 × 5–8.5 cm, both surfaces sparsely puberulent to glabrous, base obtuse to rounded, apex acuminate; secondary veins 6–8 pairs, without domatia; stipules often persistent, broadly triangular, ovate, or orbicular, 3–10 mm, glabrous, rounded to truncate or sometimes shallowly emarginate. Inflorescences axillary, heads solitary or sometimes in terminal groups of 3–5, glabrous; peduncles 3–7 cm, rather slender; bracts 2–3 mm; flowering heads 10–15 mm in diam. across calyces, ca. 30 mm in diam. across corollas; bracteoles linear or subspatulate, 2–3 mm. Flowers subsessile. Calyx with hypanthium portion ca. 2 mm, densely strigose to strigillose; limb deeply lobed, densely strigillose; lobes linear-oblong, 1–1.5 mm, obtuse to rounded. Corolla color unknown, salverform; tube 7–8 mm, outside glabrous; lobes ligulate to triangular, ca. 2 mm, outside puberulent, acute to obtuse. Fruiting head 20–30 mm in diam. Fruit sessile, ellipsoid, 8–10 mm, strigillose to strigose; seeds not seen. Fl. and fr. Jun–Oct.

• Sparse forests or wet secondary forests at middle elevations; 900–1100 m. Gansu, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

This species was illustrated by How (Sunyatsenia 6: 254, f. 30. 1946, as *Uncaria membranifolia*).

**12. *Uncaria yunnanensis*** K. C. Hsia, Acta Phytotax. Sin. 20: 319. 1982.

云南钩藤 *yun nan gou teng*

Woody vines or lianas, to 15–25 m tall. Young branches weakly quadrangular, ferruginous villous. Petiole glabrous or ferruginous hirtellous; leaf blade drying leathery, ovate, elliptic, or elliptic-oblong, 9–18 × 5–8 cm, both surfaces glabrous, base obtuse, apex shortly acuminate; secondary veins ca. 4 pairs; stipules caducous, suborbicular, 14–16 mm, rounded. Inflorescences axillary and sometimes terminal, with heads solitary,

brown hirtellous; peduncle 30–35 mm; flowering heads 15–20 mm in diam. in bud. Flowers not seen. Fruiting head ca. 40 mm in diam.; pedicels 6–8 mm. Fruit pedicellate, fusiform, ca. 10 mm, brown hirtellous. Fl. Jul, fr. Jan.

- Forest margins, thickets. Yunnan (Xishuangbanna).

H. H. Hsue and H. Wu (in FRPS 71(1): 249. 1999) described the

petioles as ferruginous pubescent, but the protologue description of this species says "*petioli glabri nitiduli*," though these "*petioli*" are described as structures belonging to "*pedunculus communis*" and may be pedicels rather than petioles.

The possibility cannot be completely excluded based on the information available that this name will be found synonymous with *Uncaria gambir*.

## 95. UROPHYLLUM Wallich in Roxburgh, Fl. Ind. 2: 184. 1824.

尖叶木属 *jian ye mu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Trees or shrubs, sometimes dioecious, unarmed. Raphides present. Leaves opposite, often distichous on horizontal branches, apparently without domatia, with tertiary venation often regularly rectangular-areolate or clathrate and quaternary venation not visible; stipules persistent or caducous, interpetiolar, narrowly triangular to linear [or sometimes reduced], acute. Inflorescences axillary, capitate to cymose or often umbelliform, few to several flowered, pedunculate or sessile, bracteate or bracts reduced. Flowers pedicellate and ebracteate, bisexual and apparently monomorphic or sometimes unisexual. Calyx limb cupular, (4 or)5(–7)-toothed. Corolla white to yellow, rotate, shortly tubular, or funnellform, inside villous in throat, leathery; lobes (4 or)5(–7), valvate in bud. Stamens (4 or)5(–7), inserted in corolla throat, included or exserted; filaments short; anthers apparently dorsifixed. Ovary (4 or)5(–7)-celled, ovules numerous in each cell on axile placentas attached at inner corner of cell; style often swollen at base; stigmas 3–8-lobed, exserted. Fruit white, orange, yellow, or red, baccate, fleshy, ellipsoid to subglobose, with calyx limb persistent; seeds numerous, small, subglobose; testa crustaceous, areolate; embryo clavate.

About 150 species: widespread in tropical Asia; three species (two endemic) in China.

Although this genus is sometimes said to range into Africa, more recently the African species formerly included in *Urophyllum* have all been moved to other genera (Lebrun & Stork, Énum. Pl. Fleurs Afr. Trop. 1–249. 1997). This genus does not seem well known, apart from a consideration of its delimitation in the Philippines by Bremekamp (J. Arnold Arbor. 21: 32–41. 1940). Puff et al. (Rubiaceae of Thailand, 134. 2005) found *Urophyllum* to be wholly dioecious in Thailand and noted that the staminate plants sometimes bear what they call "sterile pseudo-fruit consisting of [a] fleshy cuplike calyx and enlarged, empty ovaries [sic]." The reproductive biology of the Chinese species was not noted by H. S. Lo (in FRPS 71(1): 326–329. 1999).

- 1a. Leaves at apex rounded then abruptly caudate with tips narrowly triangular to linear, 15–20 mm; corolla ca. 2 mm ..... 2. *U. parviflorum*  
 1b. Leaves at apex acute or tapered to an acuminate apex, with tips narrowly triangular, 3–15 mm; corolla 3–4 mm.  
 2a. Stems flattened; stipules 10–19 mm; corolla lobed for ca. 1/2 ..... 1. *U. chinense*  
 2b. Stems subterete; stipules 7–10 mm; corolla lobed for ca. 1/3 ..... 3. *U. tsaiantum*

**1. *Urophyllum chinense*** Merrill & Chun, Sunyatsenia 2: 19. 1934.

尖叶木 *jian ye mu*

Shrubs or small trees, 1.5–4 m tall; branches compressed, longitudinally sulcate on each interpetiolar side, ascending strigose to sericeous, sometimes becoming glabrescent. Petiole 7–15 mm, strigillose to glabrescent; leaf blade drying papery, olive-green, oblong-elliptic, lanceolate, oblong-lanceolate, or rarely subovate, 8–20 × 2.5–6.5 cm, adaxially glabrous, abaxially sparsely to moderately strigillose with pubescence denser on veins, base obtuse to acute, apex acute to acuminate, tip 3–20 mm; secondary veins 7–9 pairs, tertiary venation subclathrate; stipules persisting on 1–3 apical nodes, narrowly lanceolate or narrowly oblong, 10–19 mm, densely strigose to sericeous, obtuse or acute. Inflorescences cymose, umbelliform, or corymbiform, several to many flowered, strigose to strigillose; peduncle 2–12 mm; bracts lanceolate, 2–3 mm, acute; pedicels 3–11 mm. Calyx strigillose or puberulent to glabrescent; hypanthium portion in staminate flowers obconic, ca. 0.5 mm, in pistillate flowers cupuliform, 1.5–2 mm; limb dentate, ca. 1 mm; lobes triangular. Corolla white, 3–4 mm, outside glabrous, vil-

lous in throat, 5-parted for ca. 1/2; lobes ovate to subtriangular. Berries red or orange-yellow, subglobose, ca. 8 mm in diam. Fl. Jun–Aug, fr. Aug–Oct.

Thickets on mountains; 400–900 m. Guangdong, Guangxi, Yunnan [N Vietnam].

**2. *Urophyllum parviflorum*** F. C. How ex H. S. Lo, Bull. Bot. Res., Harbin 18: 278. 1998.

小花尖叶木 *xiao hua jian ye mu*

Shrubs or small trees; branches laterally compressed, often longitudinally sulcate along interpetiolar sides, glabrous except sparsely hispidulous on nodes. Petiole 5–8 mm, hispidulous in lines; leaf blade drying papery, adaxially greenish gray, abaxially pale brown, elliptic-oblong, oblanceolate, or oblong-lanceolate, 13–16 × 3–5.5 cm, adaxially glabrous, abaxially hispidulous along principal veins and strigillose to glabrescent on higher order venation and blade, base acute to rounded, apex rounded then abruptly caudate, tips narrowly triangular to linear, 15–20 mm; secondary veins 7–10 pairs, tertiary veins generally parallel; stipules caducous or persisting on apical 1 or 2 nodes, narrowly lanceolate to narrowly ligulate, 7–13 mm,

densely sericeous, acute to obtuse. Inflorescences corymbose to umbelliform, several flowered, strigillose to hispid; peduncle 3–5 mm; bracts lanceolate-linear, ca. 2 mm; pedicels 3–9 mm. Calyx strigillose; hypanthium portion in pistillate flowers cupulate, ca. 1.5 mm; limb ca. 1 mm, shallowly 4- or 5-lobed; lobes triangular. Corolla ca. 2 mm, lobed for ca. 1/2; lobes 4 or 5, triangular. Berries ellipsoid to subglobose, ca. 4 × 5.5 mm. Fl. May, fr. Aug.

- About 700 m. Yunnan (Jinping).

**3. *Urophyllum tsaianum*** F. C. How ex H. S. Lo, Bull. Bot. Res., Harbin 18: 279. 1998.

滇南尖叶木 *dian nan jian ye mu*

Shrubs or small trees, 2–6 m tall; branches subterete,

hispidulous. Petiole 5–8 mm, hispidulous; leaf blade drying papery, pale brown or greenish gray, narrowly lanceolate, narrowly elliptic-oblong, elliptic-oblong, or lanceolate, slightly inequilateral, 6–13.5 × 2–4 cm, adaxially glabrous, abaxially strigillose, base obtuse or acute, apex acuminate; secondary veins 6–9 pairs; stipules linear-lanceolate, 7–10 mm, densely adpressed sericeous or -villous, acuminate. Inflorescences corymbiform to umbelliform, few to several flowered, hispidulous; peduncle 5–10 mm; bracts subulate, ca. 2 mm; pedicels 3–6 mm, unequal. Calyx hispidulous to glabrous; hypanthium portion cupulate, ca. 2 mm; limb deeply lobed; lobes broadly triangular, ca. 0.6 mm. Corolla yellow or white, tubular, ca. 3 mm, glabrous outside, lobed for ca. 1/3; lobes triangular. Berries red, globose, ca. 5 mm in diam. Fl. Jul, fr. Jan–Feb.

- Dense forests on mountains; 1000–1500 m. S Yunnan.

## 96. *WENDLANDIA* Bartling ex Candolle, Prodr. 4: 411. 1830, nom. cons., not Willdenow (1799).

水锦树属 *shui jin shu shu*

Chen Tao (陈涛); Charlotte M. Taylor

Shrubs or trees, unarmed; branches sometimes flattened. Raphides absent. Leaves opposite or occasionally in whorls of 3, without or rarely with domatia, with margins rarely denticulate (apparently where scabrous projections form triangular thickenings), infrequently with venation not visible abaxially; stipules persistent or caducous as a whole or by fragmentation, interpetiolar, triangular to pandurate or leaflike (i.e., generally ovate and narrowed to a stipitate base), entire or rarely bilobed, erect and flat to longitudinally folded and/or spreading to reflexed. Inflorescences terminal, cymose, thyrsoid, or paniculiform, many flowered, sessile to pedunculate, bracteate. Flowers sessile or pedicellate, bisexual, monomorphic, often fragrant. Calyx limb 5-lobed. Corolla white, purple, or red, tubular, salverform, or funnelform, glabrous or pubescent inside, with top portion of tube often reflexed at anthesis; lobes (4 or)5, imbricate in bud, strongly reflexed to revolute at anthesis. Stamens (4 or)5, inserted in corolla tube near throat, partially to fully exserted; filaments short to developed; anthers dorsifixed, sometimes with connective prolonged in short apical and/or basal appendages. Ovary 2(or 3)-celled, ovules numerous in each cell on peltate axile placentas; stigma bifid or rarely clavate and shortly emarginate at apex (*Wendlandia pendula*), exserted. Fruit capsular, subglobose, loculicidally dehiscent across apical portion into 2 valves with valves later sometimes splitting septically, papery to woody, with calyx limb persistent; seeds numerous, small, compressed, sometimes narrowly winged; testa membranous, reticulate-striate; endosperm fleshy.

At least 90 species: mainly in tropical and subtropical Asia and a few in the Pacific region; 31 species (21 endemic) in China.

The flowers seem to open generally all at once on an individual plant and perhaps in the population. They are reported in several species to be strongly fragrant. W. C. Chen (in FRPS 71(1): 191. 1999) described the fruit as rarely septicidal, but this has not been reported by other authors and has not been seen on the specimens studied.

*Wendlandia* has been studied by several authors, notably in a comprehensive monograph by Cowan (Notes Roy. Bot. Gard. Edinburgh 16: 233–313, t. 232–235. 1932, with supplemental notes shortly afterward; Notes Roy. Bot. Gard. Edinburgh 18: 183–188. 1934) and then in treatments of the Chinese species by F. C. How (Sunyatsenia 7(1–2): 32–62. 1948) and later W. C. Chen (Acta Phytotax. Sin. 21: 277–284, 386–403. 1983).

Many *Wendlandia* species seem to be morphologically variable with much of the variation difficult to partition into distinct clusters, as discussed by Cowan (loc. cit. 1932). Cowan also evaluated characters used by various authors to distinguish species and concluded that many were variable and/or incorrectly interpreted, although he used several of these to distinguish infraspecific taxa. With more species known now, there also seems to be variation within species in some of the characters that Cowan considered reliable to distinguish species. W. C. Chen (loc. cit. 1983) used Cowan's characters to delimit some of his new species, but circumscribed other species to include a relatively wide range of variation in some of the same features (e.g., *W. pingpiensis*).

Cowan recognized four series and four subseries, distinguished by stigmas, anther, and stipule morphology as well as habit. These taxa were accepted by W. C. Chen in FRPS (loc. cit. 1999: 195, 196, 200, 202, 208, 218, 221); however, the classification following Cowan's treatment of several Chinese *Wendlandia* species described by recent authors is problematic because flowers are needed but are unknown for these. The key published by W. C. Chen (loc. cit. 1999: 192–195) closely follows that of Cowan except some leads were numbered incorrectly while others appear to be missing, and the updated information on morphological variation and geographic distribution was not added to the key so could be problematic to use. The key to *Wendlandia* species here follows that of W. C. Chen, to outline for reference the species distinctions in that treatment; however, it has been augmented with the new morphological and distributional information.

In addition to the species treated here, F. C. How (loc. cit.: 43) reported *Wendlandia ternifolia* Cowan provisionally from China based on *Tsang* 21937, *Liang* 67941, and *Zoo* 69290. However, W. C. Chen in FRPS (loc. cit. 1999: 192) commented that study of *Tsang* 21937 showed the calyx to have stiff pubescence, which is inconsistent with the protologue description of *W. ternifolia*, while the other two specimens cited have no flowers in

adequate condition for identification. Therefore, *W. ternifolia* was excluded from the Chinese flora; no new or alternative identification was given by Chen for these specimens.

- 1a. Most or all flowers with well-developed pedicels 2–6 mm; stipules triangular to broadly triangular, acute, cuspidate, or narrowly spatulate.
  - 2a. Shrubs or trees; petioles 0.5–1.5 cm; corolla lobes 1–2.5 mm; anthers 0.8–2 mm, subsessile or with filaments less than 1 mm.
    - 3a. Corolla with lobes ca. 1 mm, less than half as long as tube; anthers ca. 1 mm ..... 12. *W. laxa*
    - 3b. Corolla with lobes 1.5–2.5 mm, half as long as tube to  $\pm$  equal to tube; anthers 1.2–2 mm.
      - 4a. Leaves abaxially with secondary and higher order venation well marked; corolla white to yellow, with tube 1.5–4 mm ..... 8. *W. formosana*
      - 4b. Leaves abaxially with secondary and higher order venation hardly visible; corolla purplish red, with tube 2.3–3 mm ..... 16. *W. longipedicellata*
  - 2b. Low shrubs or sometimes trees up to 12 m tall; petioles 0.1–0.6 cm; corolla lobes 3.5–8 mm; anthers 2–3.5 mm, exserted on filaments 4–6 mm (*W. ser. Montigenae* Cowan).
    - 5a. Shrubs or trees 1–12 m tall; leaves elliptic-oblong, oblong-lanceolate, oblanceolate, or elliptic, 3–14.5 cm, glabrous on both surfaces; stipules spatulate to lanceolate or leaflike (i.e., ovate and stipitate); Hainan ..... 18. *W. merrilliana*
    - 5b. Leaves elliptic-lanceolate, lanceolate, narrowly lanceolate, ovate, or suborbicular, 0.8–3 cm, pubescent on one or both surfaces; stipules triangular, lanceolate-triangular, or ovate; mainland.
      - 6a. Leaves acute, shortly acuminate, or obtuse at apex, with secondary veins ca. 3 pairs, visible abaxially; calyx lobes linear-oblong, spatulate, or oblanceolate ..... 15. *W. longidens*
      - 6b. Leaves obtuse at apex, veins not visible abaxially; calyx lobes triangular or lanceolate ..... 28. *W. subalpina*
- 1b. Flowers sessile to shortly pedicellate, with pedicels up to 2 mm; stipules variously shaped, generally triangular, spatulate, ovate, suborbicular, leaflike, or pandurate.
  - 7a. Stipules triangular, ovate, broadly triangular, or leaflike, at apex acute, cuspidate, ligulate, or aristate, erect or slightly spreading with age.
    - 8a. Leaves subsessile or shortly petiolate, petioles up to 3 mm.
      - 9a. Leaves opposite or ternate, ovate to ovate-lanceolate, 1.8–4 cm wide, drying papery, margins not thickened nor edged with a vein; stigma clavate ..... 22. *W. pendula*
      - 9b. Leaves opposite, narrowly elliptic to narrowly lanceolate, 0.4–1.2 cm wide, drying thinly leathery, marginally edged with a thickened vein; stigma deeply bilobed ..... 25. *W. salicifolia*
    - 8b. Leaves petiolate, petioles 3–25 mm.
      - 10a. Stipule apex prolonged, ligulate, 5–7 mm ..... 9. *W. grandis*
      - 10b. Stipule apex acute, cuspidate, or shortly acicular, 0.5–2 mm.
        - 11a. Calyx lobes narrowly triangular to linear, 1–1.2 mm, equal or unequal on an individual flower with at least one of lobes longer than 1 mm.
          - 12a. Petioles 0.8–1.2 cm; stipules ca. 5 mm; corolla lobes ca. 1 mm ..... 6. *W. cavaleriei*
          - 12b. Petioles 0.8–1.5 cm; stipules 2–3 mm; corolla lobes 1.5–2.2 mm ..... 13. *W. ligustrina*
        - 11b. Calyx lobes lanceolate, triangular, or spatulate, 0.3–1.2 mm, equal or subequal.
          - 13a. Leaves strigillose to puberulent on both surfaces; corolla tube 8.5–11 mm ..... 1. *W. aberrans*
          - 13b. Leaves strigillose, puberulent, tomentulose, villous, or glabrescent on both surfaces; corolla tube 1.5–4 mm.
            - 14a. Calyx lobes 0.3–0.5 mm ..... 8. *W. formosana*
            - 14b. Calyx lobes 0.8–1 mm.
              - 15a. Inflorescences smaller, 5–6  $\times$  3–6 cm; calyx glabrous or sparsely villosulous; leaves sparsely pubescent to glabrous abaxially ..... 4. *W. brevipaniculata*
              - 15b. Inflorescences larger, 9–17  $\times$  6–22 cm; calyx glabrous to densely pilosulous, hirtellous, or villosulous; leaves glabrous to strigillose, tomentose, or villous abaxially.
                - 16a. Inflorescences 9–17  $\times$  9–22 cm; corolla outside with tubes and lobes variously glabrous, strigillose, and/or villosulous (including glabrous on tube and densely villosulous on lobes in subsp. *affinis*) ..... 29. *W. tinctoria*
                - 16b. Inflorescences 9–12  $\times$  6–11 cm; corolla outside glabrous on tube and densely villosulous or hirtellous on lobes ..... 31. *W. villosa*
        - 7b. Stipules triangular, ovate, suborbicular, leaflike, or pandurate, with apex obtuse, rounded, shortly acuminate, 2-lobed, or ligulate and usually spreading to reflexed.
          - 17a. Anthers linear-lanceolate, 1.3–2 mm, exserted from corolla on developed filaments; corolla 7–9.4 mm; capsule 2.5–3 mm in diam. (*W. ser. Euexsertae* Cowan p.p., *W. subser. Orbiculares* Cowan) ..... 27. *W. speciosa*

- 17b. Anthers lanceolate or elliptic, 0.5–1.7 mm, partially included, sessile or with filaments less than 1 mm; corolla 2–13.5 mm; capsule 1–2.5 mm in diam. (fruit unknown in *W. augustinii*, *W. erythroxyton*, *W. myriantha*, *W. parviflora*, *W. pubigera*) (*W. ser. Wendlandia* p.p., *W. subser. Paniculatae* Cowan).
- 18a. Leaves abaxially densely strigose or sericeous along midrib; inflorescences smaller, 4–10.5 × 3–10 cm; corolla 11.5–13.5 mm, red or purple; capsule 2–2.5 mm in diam. .... 3. *W. bouvardioides*
- 18b. Leaves abaxially glabrous, glabrescent, or sparsely to densely strigillose, puberulent, pilosulous, tomentose, hispidulous, or hirtellous; inflorescences often larger, 4–30 × 4–25 cm; corolla 2–6 mm, white, pale green, pale yellow, or yellowish green; capsule 1–2 mm in diam. (unknown in *W. augustinii*, *W. erythroxyton*, *W. myriantha*, *W. parviflora*, *W. pubigera*).
- 19a. Corolla tube 1–1.5 mm, with lobes equal to, longer than, or sometimes slightly shorter than tube; leaves 5–17 × 2–8.5 cm.
- 20a. Leaves glabrescent or sparsely strigillose to pilosulous abaxially; Guangdong, Guangxi ..... 5. *W. breviflora*
- 20b. Leaves densely ferruginous pubescent abaxially; Yunnan ..... 21. *W. parviflora*
- 19b. Corolla tube 2–5 mm, with lobes clearly shorter than tube; leaves 3–26 × 1.5–14 cm.
- 21a. Leaves drying leathery, abaxially with secondary veins plane and tertiary venation hardly or not visible.
- 22a. Calyx densely hirtellous ..... 14. *W. litseifolia*
- 22b. Calyx glabrous to sparsely strigillose ..... 20. *W. oligantha*
- 21b. Leaves drying papery to leathery, abaxially with secondary veins raised and tertiary venation easily visible and usually also raised (i.e., most common condition).
- 23a. Calyx glabrous to sparsely puberulent, with lobes 1.2–2 mm, entire to ciliate.
- 24a. Calyx lobes 1.2–2 mm; corolla tube 2–3.5 mm; Guangdong, Hainan ..... 10. *W. guangdongensis*
- 24b. Calyx lobes 1.2–1.5 mm; corolla tube 2.5–4 mm; Guangxi, Taiwan.
- 25a. Leaves entire or scabrous to denticulate marginally; stipules entire; Taiwan ..... 7. *W. erythroxyton*
- 25b. Leaves entire, smooth or ciliate marginally; stipules entire or 2-lobed; Guangxi ..... 19. *W. myriantha*
- 23b. Calyx with hypanthium portion and limb glabrous, glabrescent, or pilosulous, puberulent, tomentose, hirtellous, pilose, strigose, or strigillose, with lobes 0.3–1 mm.
- 26a. Leaves abaxially moderately to densely hirtellous, strigillose, pilosulous, pilose, or strigose with pubescence on lamina spreading and/or partly obscuring its surface.
- 27a. Leaves scaberulous on lamina adaxially; stipules usually equal to or only slightly wider than stem; corolla inside with short trichomes confined to lower to upper part of tube; Yunnan ..... 26. *W. scabra*
- 27b. Leaves sparsely hirtellous, hispidulous or scaberulous adaxially; stipules usually twice or more as wide as stem; corolla hirsute inside upper part of tube and throat ..... 30. *W. uvariifolia*
- 26b. Leaves abaxially glabrous to sparsely strigillose or hispidulous on lamina and strigillose to moderately hispidulous or hirtellous on principal veins.
- 28a. Leaves abaxially glabrous on lamina and sparsely strigillose and/or hirtellous on principal veins; Taiwan ..... 17. *W. luzoniensis*
- 28b. Leaves abaxially glabrous to hispidulous or strigillose; mainland.
- 29a. Stipules with apex ligulate, obtuse, often longitudinally folded ..... 9. *W. grandis*
- 29b. Stipules with apex oblanceolate to suborbicular, folded to usually flat.
- 30a. Corolla tube 4–5 mm; Yunnan.
- 31a. Stipules with apical portion 3–4 mm wide; leaves with secondary veins 7–9 pairs ..... 2. *W. augustinii*
- 31b. Stipules with apical part broad, ca. 10 mm wide; leaves with secondary veins 7–13 pairs ..... 23. *W. pingpienensis*
- 30b. Corolla tube 2–3 mm.
- 32a. Leaves smaller, 7–10.5 × 2–4 cm, abaxially glabrous on lamina and sparsely pubescent only on veins; secondary veins 7 or 8 pairs; Yunnan ..... 11. *W. jingdongensis*
- 32b. Leaves larger, 14.5–18 × 6–7 cm, abaxially glabrous to sparsely pubescent on lamina with pubescence denser along veins; secondary veins 10 or 11 pairs; Guangxi .... 24. *W. pubigera*

1. *Wendlandia aberrans* F. C. How, Sunyatsenia 7(1–2): 44. 1948.

广西水锦树 *guang xi shui jin shu*

Shrubs, 1–3 m tall; branches terete, yellowish brown, densely adpressed ferruginous hirsute. Leaves opposite; petiole 3–10 mm, appressed yellowish brown pubescent; blade drying papery and reddish yellow, oblong-elliptic or ovate-elliptic, 5–

16 × 2–5.8 cm, adaxially adpressed puberulent with pubescence denser along midrib, abaxially sparsely puberulent with pubescence denser along principal veins, base cuneate or acute, apex shortly caudate-acuminate or acute; secondary veins 6–12 pairs; stipules late deciduous to persistent, triangular, 3–5 mm, yellowish brown pubescent becoming glabrescent, cuspidate. Inflorescences congested-paniculate, narrowly pyramidal in outline, 5–10 × 3–8 cm, appressed ferruginous pubescent, tripartite

and sessile or pedunculate; bracts leaflike or filiform. Flowers subsessile to shortly pedicellate. Calyx grayish white pilosulous or hirtellous; hypanthium portion subglobose, 0.8–1.2 mm; limb lobed nearly to base; lobes lanceolate to triangular, 0.7–1.2 mm. Corolla reddish white, slenderly funnelform, glabrous outside; tube 8.5–11 mm, sparsely white villous at middle inside; lobes oblong-ovate, 1.5–2 mm. Anthers linear-oblong, 1–1.7 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.8 mm. Capsules not seen. Fl. Apr–Dec.

- Forests on hill slopes; 900–1200 m. Guangxi (Napo).

W. C. Chen's key (in FRPS 71(1): 192. 1999) described the leaves of this species as hispidulous on both surfaces, but this conflicts with the protologue and Chen's species description.

**2. *Wendlandia augustinii*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 298. 1932.

思茅水锦树 *si mao shui jin shu*

Shrubs, 2–3 m tall; branches terete, densely tomentulose to hirtellous becoming glabrescent. Leaves opposite; petiole 5–15 mm, densely tomentulose; blade drying papery, elliptic or elliptic-ovate, 9–15.5 × 2–6 cm, adaxially sparsely hispidulous to glabrous on lamina and sparsely to densely puberulent on principal veins, abaxially sparsely strigillose to hispidulous, base cuneate to acute, apex acute to acuminate; secondary veins 7–9 pairs; stipules generally persistent, pandurate, 5–7 × 3–4 mm, densely hirtellous, pilosulous, or strigillose, apically spreading, obtuse to rounded. Inflorescences paniculate, pyramidal in outline, 11–12 × 11–14 cm, branched to 2 or 3 orders, densely pilosulous to strigillose, pedunculate; peduncle 0.8–1.5 cm; bracts linear to narrowly lanceolate, 1–1.5 mm. Flowers sessile or subsessile. Calyx densely pilosulous to puberulent; hypanthium portion ellipsoid to turbinate, 0.8–1.2 mm; limb deeply lobed; lobes triangular, ca. 0.3 mm. Corolla white, funnelform, outside glabrous; tube 4–5 mm, inside glabrous or puberulent in throat; lobes ovate, 0.6–1 mm. Anthers elliptic, subsessile, ca. 0.8 mm, partially exserted. Stigma bilobed, ca. 0.4 mm. Capsules not seen.

- Forests on mountains; ca. 1300 m. Yunnan (Simao).

**3. *Wendlandia bouvardioides*** Hutchinson in Sargent, Pl. Wilson. 3: 393. 1916.

薄叶水锦树 *bao ye shui jin shu*

Shrubs or small trees, 1–5 m tall; branches terete, densely strigose to hirsute. Leaves opposite; petiole 0.4–1.2 cm, strigose to strigillose; blade drying thinly papery, elliptic, narrowly elliptic, or lanceolate, 5–20 × 1.2–5.5 cm, adaxially strigillose on principal veins and glabrescent on lamina, abaxially glabrescent on lamina, strigose to sericeous on principal veins, and strigillose on higher order veins, base acute to attenuate, apex long acuminate; secondary veins 5–8 pairs; stipules deciduous, suborbicular, ovate, or leaflike, 3–5 × 3.5–5 mm, strigose to glabrescent, base shortly stipitate, apex spreading to reflexed, obtuse to shortly acuminate. Inflorescences congested-cymose or thyrsoid, cylindrical in outline, branched to 1 or 2 orders, 4–10.5 × 3–10 cm, densely strigose, hirsute, or strigillose, subsessile to pedunculate; peduncle to 1 cm; bracts subulate, linear,

narrowly triangular, or lanceolate, 1–5 mm; pedicels to 1 mm. Flowers subsessile to pedicellate. Calyx densely strigillose; hypanthium portion turbinate, ca. 1 mm; limb deeply lobed; lobes lanceolate to narrowly triangular, 0.3–1.5 mm, unequal on an individual flower (this entire size range found on one flower). Corolla red or purple, salverform or tubular, outside glabrous; tube 10–11 mm; lobes oblong to lanceolate, 1.5–2.5 mm, obtuse to rounded. Anthers lanceolate, 1–1.7 mm, partially exserted, subsessile. Stigma 2-lobed, 0.3–0.5 mm. Capsules globose, 2–2.5 mm in diam., strigillose. Fl. Feb–Dec, fr. May–Dec.

- Thickets or forests in valleys, on mountain slopes, or at stream-sides; 1200–1800 m. Yunnan.

This species seems to have been grouped together with *Wendlandia* species with relatively long, fully exserted anthers by W. C. Chen (in FRPS 71(1): 192–193. 1999), but it actually has relatively short fat anthers that are not exserted, as noted in the protologue.

**4. *Wendlandia brevipaniculata*** W. C. Chen, Acta Phytotax. Sin. 21: 386. 1983.

吹树 *chui shu*

Trees; branches subterete, yellowish brown velutinous or mealy pubescent. Leaves opposite; petiole 0.8–1.2 cm, puberulent; blade drying leathery, elliptic or ovate-elliptic, 4.5–10.5 × 2.5–4.5 cm, sparsely pubescent to glabrescent on both surfaces with pubescence denser along principal veins, base cuneate to obtuse, apex abruptly shortly acuminate or acute; secondary veins 8–10 pairs; stipules generally persistent, triangular to ovate, ca. 4 mm, puberulent to strigillose, apex cuspidate, erect. Inflorescence paniculate, subglobose, 5–6 × 3–6 cm, densely tomentose or strigillose to glabrescent, sessile and tripartite or pedunculate; peduncle 0.8–1.8 cm; bracts lanceolate to linear, 1–5 mm. Flowers subsessile. Calyx glabrous or sparsely villosulous; hypanthium subglobose, ca. 0.8 mm; limb lobed nearly to base; lobes lanceolate, ca. 0.8 mm. Corolla tubular-salverform, outside glabrous or villosulous on lobes; tube 2–3 mm, white hirsute inside; lobes elliptic, ca. 1 mm. Filaments ca. 0.8 mm; anthers elliptic, ca. 0.8 mm, partially exserted. Stigma 2-lobed, ca. 0.2 mm. Capsules globose, ca. 2 mm in diam., puberulent, villosulous, or subglabrous. Fl. and fr. Sep.

- Forests; 200–300 m. Yunnan (Jingdong).

**5. *Wendlandia brevitiba*** Chun & F. C. How ex W. C. Chen, Acta Phytotax. Sin. 21: 397. 1983.

短筒水锦树 *duan tong shui jin shu*

Shrubs, 0.5–3 m tall; branches flattened to terete, densely hirtellous, pilosulous, or strigillose. Leaves opposite; petiole 0.3–1.5 cm, densely hirtellous or pilosulous; blade drying papery, elliptic-oblong, elliptic-ovate, or elliptic, 5–15 × 2–6.3 cm, adaxially glabrous or sparsely strigillose on lamina and densely strigillose on principal veins, abaxially sparsely strigillose to glabrous on lamina and densely strigillose to pilosulous on principal veins, base cuneate, apex acuminate to shortly acuminate; secondary veins 4–8 pairs; stipules deciduous, suborbicular, elliptic, or pandurate, 2–6 × 1.5–4 mm, moderately to densely strigillose, spreading at apex to fully reflexed, apex obtuse to rounded. Inflorescences rather laxly paniculate, pyra-

midal in outline, branched to 1 or 2 orders, 4–7 × 4–11 cm, densely pilosulous to hirtellous, sessile and tripartite or pedunculate; peduncle 0.3–3.5 cm; bracts linear to triangular, 0.3–1 mm. Flowers subsessile. Calyx densely strigillose to pilosulous; hypanthium portion subglobose, ca. 0.8 mm; limb deeply lobed; lobes lanceolate to triangular, 0.5–1 mm. Corolla white, tubular or salverform, sparsely pilosulous or glabrous outside; tube 1–1.5 mm, sparsely pubescent or glabrescent inside; lobes oblong-ovate or subovate, 1–1.5 mm, rounded to obtuse. Anthers elliptic, ca. 0.8 mm, subsessile, partially exserted. Stigma bifid, ca. 1 mm. Capsules subglobose, 1–1.5 mm in diam., pilosulous. Fl. Apr–May, fr. Jun–Dec.

• Forests in valleys; 100–900 m. Guangdong, Guangxi.

**6. *Wendlandia cavaleriei*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 10: 434. 1912.

贵州水锦树 *gui zhou shui jin shu*

*Wendlandia feddei* H. Léveillé.

Shrubs or small trees, 1.5–3 m tall; branches brown, subterete, strigillose to glabrescent. Leaves opposite; petiole 0.8–1.2 cm, strigillose; blade drying subleathery, ovate, elliptic, or oblanceolate-elliptic, 4.5–13.5 × 2–6 cm, adaxially glabrous to sparsely strigillose on lamina and sparsely pubescent along midrib, abaxially sparsely hirsute with pubescence denser along veins, base obtuse to acute, apex acute or acuminate; secondary veins 7–10 pairs; stipules generally persistent, broadly triangular, ca. 5 mm, strigillose, apex erect, cuspidate. Inflorescence paniculate, pyramidal to ovate in outline, 7–21 × 6–15 cm, densely many flowered, branched to 2 or 3 orders, densely yellowish brown pilosulous, sessile and tripartite or pedunculate; peduncle 1–6 cm; bracts triangular, 1–3 mm. Flowers sessile. Calyx densely hirtellous to pilosulous; hypanthium portion subglobose, ca. 1 mm; limb deeply lobed; lobes narrowly triangular, 1–1.2 mm. Corolla white or purple, tubular-funnelform, glabrous to pilosulous; tube ca. 3.5 mm, inside white villosulous; lobes ovate to elliptic, ca. 1 mm. Anthers elliptic, ca. 0.8 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.7 mm. Capsules globose, ca. 1.5 mm in diam., pilosulous. Fl. Mar–Apr, fr. Apr.

• Forests or thickets on hill slopes; 200–700 m. Guangxi (Tianyang), Guizhou.

W. C. Chen (in FRPS 71(1): 203. 1999) described the corollas as glabrous outside, but Cowan (Notes Roy. Bot. Gard. Edinburgh 16: 263–264. 1932) specifically noted that the corollas of *Wendlandia cavaleriei* vary from glabrous to pubescent in China, as described here.

**7. *Wendlandia erythroxylon*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 299. 1932.

红木水锦树 *hong mu shui jin shu*

Trees, ca. 7 m tall; wood firm, red; branches quadrate, brownish gray, moderately to densely mixed pubescent, hirsute and pilosulous, sometimes becoming glabrescent. Leaves opposite; petiole 0.5–1 cm, moderately to densely strigillose to hirtellous; blade drying leathery or papery, elliptic-ovate, obovate, or ovate, 5–12 × 3–5.5 cm, adaxially sparsely strigillose or hirtellous to glabrescent, abaxially sparsely to moderately hirtel-

lous with pubescence denser along principal veins, base obtuse to acute, margins scaberrulous to denticulate, apex acute to acuminate; secondary veins 6 or 7 pairs; stipules generally persistent, suborbicular to pandurate, 5–8 × 4–5.5 mm, sparsely to densely strigillose or strigose basally and glabrescent above, apex usually spreading to reflexed, obtuse to rounded. Inflorescence rather laxly paniculate, 5–13 × 3–12.5 cm, sparsely to densely hirtellous to hirsute, tripartite and sessile or pedunculate; peduncle 1–6 cm; bracts ligulate to lanceolate or narrowly elliptic, 1.2–5 mm, often glabrescent. Flowers sessile or subsessile. Calyx glabrous or sparsely pilose; hypanthium portion subglobose to ellipsoid, ca. 0.8 mm; limb lobed nearly to base; lobes ovate-oblong to ligulate, ca. 1.2 mm, ciliate. Corolla tubular to salverform, glabrous outside; tube 2.5–3 mm, in throat white hirsute; lobes ovate, 1–1.2 mm. Anthers elliptic, ca. 0.8 mm, subsessile, partially exserted. Stigma ca. 0.5 mm, 2-lobed. Capsules unknown. Fl. Apr–Oct.

• Forests on hills of low elevations. Taiwan.

The leaf margins of the specimens seen are denticulate, with the teeth apparently scabrosities rather than dentate mesophyll tissue.

**8. *Wendlandia formosana*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 247. 1932.

水金京 *shui jin jing*

Shrubs or trees, 2–8 m tall; branches flattened to terete, densely puberulent to glabrescent, reddish brown to gray. Leaves opposite; petiole 0.7–2.5 cm, thinly puberulent or glabrous; blade drying papery, elliptic or elliptic-lanceolate, 6–14 × 2–6.5 cm, both surfaces glabrescent or sparsely to densely puberulent or strigillose at least on principal veins, base acute to obtuse, apex acute to acuminate; secondary veins 5–10 pairs; stipules generally persistent, broadly triangular, 2–3.5 mm, densely strigillose to puberulent, apex erect, acute, cuspidate, or sometimes narrowly spatulate. Inflorescences paniculate, pyramidal in outline, 12–20 × 10–20 cm, branched to 2 or 3 orders, densely puberulent to strigillose, sessile and tripartite or pedunculate; peduncle 2–4 cm; bracts linear, spatulate, or narrowly elliptic, 1–6 mm; pedicels 0.5–4 mm. Flowers subsessile to pedicellate. Calyx glabrous; hypanthium portion subglobose, ca. 0.8 mm; limb lobed nearly to base; lobes triangular, 0.3–0.5 mm, sometimes ciliolate. Corolla white to yellow, funnelform, glabrous outside; tube 1.5–4 mm, villosulous in throat; lobes spatulate, 1.5–2.5 mm. Filaments ca. 0.8 mm; anthers linear-lanceolate, ca. 2 mm, partially exserted. Stigma 2-lobed, ca. 0.8 mm. Capsules globose, 1.8–2 × 2–2.2 mm, glabrous. Fl. Apr–Jun, fr. May–Dec.

Thickets or forests at low elevations or on hills or mountains; 200–1600 m. Guangdong, Guangxi, Taiwan, Yunnan [Japan (Ryukyu Islands), Vietnam].

- 1a. Leaf secondary veins 7–10 pairs, closely set, usually prominent abaxially; corolla 3–5 mm, with tube slightly longer than lobes ..... 8a. subsp. *breviflora*
- 1b. Leaf secondary veins 5–9 pairs, rather well spaced, prominulous abaxially; corolla 5–6.5 mm, with tube markedly longer than lobes ..... 8b. subsp. *formosana*

**8a. *Wendlandia formosana* subsp. *breviflora*** F. C. How, Sunyatsenia 7(1–2): 38. 1948.

短花水金京 duan hua shui jin jing

Leaf secondary veins 7–10 pairs, closely set, usually prominent abaxially. Corolla tube 1.5–3 mm, lobes 1.5–2 mm. Fl. Apr–Jun, fr. May–Dec.

Thickets or forests on hills or mountains; 200–1600 m. Guangdong, Guangxi, Yunnan [Vietnam].

**8b. *Wendlandia formosana* subsp. *formosana***

水金京(原亚种) shui jin jing (yuan ya zhong)

Secondary veins 5–7 pairs in leaves of flowering branches, 5–9 pairs in leaves of vegetative branches (*Tsang 23991*, MO), rather well spaced, prominulous abaxially. Corolla tube 3–4 mm, lobes 2–2.5 mm. Fl. Apr–Jun, fr. Jun–Aug.

Forests on hills at low elevations; 200–500 m. Taiwan [Japan (Ryukyu Islands)].

**9. *Wendlandia grandis*** (J. D. Hooker) Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 261. 1932.

西藏水锦树 xi zang shui jin shu

*Wendlandia tinctoria* (Roxburgh) Candolle var. *grandis* J. D. Hooker, Fl. Brit. India 3: 38. 1880.

Trees, 3–4 m tall; branches brown, fissured, strigillose to glabrescent. Leaves opposite; petiole 0.5–1.5 cm, strigillose; blade drying leathery or thickly papery, elliptic, elliptic-oblong, or obovate-oblong, 5–17 × 2.5–7 cm, adaxially glabrous or sparsely strigillose, abaxially glabrous or sparsely pubescent on lamina, sparsely hispidulous along veins, and with pubescence denser along midrib, base cuneate or acute, apex acute or shortly acuminate; secondary veins 8–12 pairs; stipules generally persistent, triangular to ovate, 9–12 mm, strigillose, apex erect to spreading, ligulate, 5–7 mm, often longitudinally folded. Inflorescences paniculate, ovoid, 9–17 × 5–15 cm, densely brown hirsute; bracts lanceolate, ca. 5 mm. Flowers sessile. Calyx densely brown hirtellous; hypanthium portion ca. 1 mm; limb deeply lobed; lobes lanceolate, 0.5–1 mm. Corolla white, funelform, glabrous outside; tube ca. 4 mm, white hirsute inside; lobes triangular, 1–1.2 mm. Anthers elliptic, ca. 0.8 mm, subsessile, partially exserted. Stigma 2-lobed. Capsules subglobose, ca. 2 mm in diam., pubescent. Fl. and fr. Aug.

Evergreen forests, secondary forests; 700–1300 m. Xizang (Mêdog) [Bangladesh, Bhutan, India, Myanmar, Nepal].

Springate et al. (Fl. Bhutan 2(2): 754. 1999) described the leaf size of plants from Bhutan as 10–24 × 5–11 cm and the corolla tubes there as 2.5–5 mm; these measurements might be found in Chinese plants.

**10. *Wendlandia guangdongensis*** W. C. Chen, Acta Phytotax. Sin. 21: 393. 1983.

广东水锦树 guang dong shui jin shu

Shrubs or trees, 4–6 m tall; branches terete, moderately to densely hirsute. Leaves opposite; petiole 0.3–1.2 cm, moderately to densely hirtellous; blade drying thickly papery, lanceolate-oblong or ovate-elliptic, 7–16 × 3–8.5 cm, adaxially

sparsely strigillose or puberulent to glabrescent on lamina and moderately to densely strigillose or hirtellous on principal veins, abaxially sparsely to moderately hirtellous throughout, base rounded to obtuse, apex obtuse, shortly acuminate, or acute; secondary veins 7–11 pairs; stipules generally persistent, pandurate, 5–6 × 4–6 mm, glabrescent, with upper part spreading to reflexed, apex rounded to obtuse. Inflorescences paniculate, branched to 2 or 3 orders, 13–17 × 10–20 cm, densely hirtellous to hirsute, pedunculate; peduncle 1–2 cm; bracts narrowly elliptic to oblanceolate, 1.5–3 mm. Flowers sessile in glomerules. Calyx glabrous; hypanthium portion subglobose, ca. 0.8 mm; limb divided nearly to base; lobes lanceolate or narrowly oblong, 1.2–2 mm, sparsely to densely ciliate. Corolla white or greenish yellow, tubular to salverform, glabrous outside; tube 2–3.5 mm, in throat white hirsute; lobes suborbicular, ca. 1 mm. Anthers elliptic, ca. 0.7 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.3 mm. Capsules subglobose, ca. 1.5 mm in diam., glabrous. Fl. Mar–Apr, fr. May.

• Thickets or forests in ravines or on hill slopes; 100–800 m. Guangdong, Hainan.

The ciliate filaments on the margins of the calyx lobes give the appearance of pilose pubescence on all of the calyx at first glance, but when teased apart the individual hypanthia on the material seen are completely glabrous.

**11. *Wendlandia jingdongensis*** W. C. Chen, Acta Phytotax. Sin. 21: 396. 1983.

景东水锦树 jing dong shui jin shu

Shrubs, ca. 3 m tall; branches pubescent. Petiole 0.7–1 cm, pubescent; leaf blade drying leathery, lanceolate-elliptic, 7–10.5 × 2–4 cm, adaxially glabrous or sparsely puberulent along veins, abaxially sparsely pubescent along veins and glabrous on lamina, base cuneate or acute, apex acuminate; secondary veins 7 or 8 pairs; stipules pandurate, as wide as or wider than branchlets, apex erect, rounded. Inflorescences 9–15 × 10–15 cm, densely brown hirsute. Flowers sessile. Calyx pubescent; lobes lanceolate. Corolla pale yellow, glabrous outside; tube 2.5–3 mm, white hirsute inside; lobes ca. 0.5 mm. Anthers elliptic, ca. 0.6 mm, subsessile, partially exserted. Stigma bifid. Capsules subglobose, ca. 1.5 mm in diam., densely pubescent. Fl. and fr. May.

• Forests on mountains; ca. 1700 m. Yunnan (Jingdong).

**12. *Wendlandia laxa*** S. K. Wu ex W. C. Chen, Acta Phytotax. Sin. 21: 390. 1983.

疏花水锦树 shu hua shui jin shu

Small trees, 5–8 m tall; branches mealy puberulent. Petiole 0.7–1.5 cm, glabrescent; leaf blade drying papery to thinly leathery, lanceolate-elliptic to elliptic, 4.5–13 × 2–5 cm, both surfaces glabrous throughout or puberulent on principal veins, base acute to obtuse, apex acute to shortly acuminate; secondary veins 6 or 7 pairs; stipules persistent, broadly triangular, 2.4–4.5 mm, glabrescent, apex erect, cuspidate. Inflorescences paniculate, pyramidal, 13–22 × 12–18 cm, densely puberulent; pedicels 2–4.5 mm. Flowers pedicellate. Calyx puberulent to glabrous; hypanthium portion turbinate; limb lobed nearly to

base; lobes ovate. Corolla white, tubular-salverform, outside puberulent to glabrous; tube 3.5–4 mm, sparsely puberulent inside; lobes subrounded, ca. 1 mm. Anthers elliptic, ca. 0.8 mm, partially exserted. Stigma 2-lobed. Capsules subglobose, glabrescent. Fl. Nov, fr. Jul, Dec.

- Mixed forests; 500–1000 m. Yunnan (Jingdong).

**13. *Wendlandia ligustrina*** Wallich ex G. Don, Gen. Hist. 3: 518. 1834.

小叶水锦树 xiao ye shui jin shu

Shrubs, 1.5–3 m tall; branches flattened to quadrangular, strigillose to glabrescent. Leaves opposite; petiole 0.8–1.5 cm, strigillose to glabrescent; blade drying leathery, dark brown adaxially, reddish brown abaxially, elliptic or elliptic-ovate, 3–12 × 1.5–6 cm, adaxially glabrous, abaxially glabrescent to sparsely strigillose or puberulent at least along principal veins, base cuneate and sometimes shortly decurrent, apex acute or obtuse; secondary veins 6–8 pairs; stipules generally persistent, broadly triangular, 2–3 mm, strigillose to glabrescent, apex erect, cuspidate. Inflorescences paniculate, pyramidal, 15–17 × 12–20 cm, branched to 2 or 3 orders, densely hirtellous to strigillose, sessile and tripartite or pedunculate; peduncle 2–3 cm; bracts 1.5–6 mm; pedicels to 1 mm. Flowers sessile to shortly pedicellate. Calyx moderately to sparsely strigillose; hypanthium portion ellipsoid, ca. 1 mm; limb lobed nearly to base; lobes narrowly triangular to linear, 1–1.5 mm, generally unequal on an individual flower. Corolla yellow or pale yellowish green, salverform to tubular-funnelform, glabrous outside; tube 3.5–5 mm, pilose in throat; lobes narrowly oblong to spatulate, 1.5–2.2 mm. Filaments ca. 1 mm; anthers linear-lanceolate, 1.2–1.5 mm, partially exserted. Stigma 2-lobed, ca. 1 mm. Capsules subglobose, ca. 2 mm, strigillose. Fl. Jun–Feb of following year.

Forests in valleys; 1500–1600 m. Guizhou (Qinglong), Yunnan [Myanmar].

**14. *Wendlandia litseifolia*** F. C. How, Sunyatsenia 7(1–2): 46. 1948.

木姜子叶水锦树 mu jiang zi ye shui jin shu

Trees, ca. 10 m tall; branches terete to subquadrangular, densely brown hirtellous to glabrescent. Leaves opposite; petiole 0.5–1.2 cm, densely hirtellous to strigillose; blade drying subleathery, obovate, obovate-elliptic, or rarely elliptic, 6.4–11.5 × 3–6.5 cm, adaxially sparsely hispidulous to puberulent with pubescence denser along midrib, abaxially sparsely to moderately strigillose or hirtellous with pubescence denser along veins, base obtuse, apex acute to abruptly and shortly acuminate; secondary veins 6–8 pairs, plane to hardly visible abaxially; stipules generally persistent, pandurate, 3–5 × 1.5–2 mm, densely strigillose, apex suberect to spreading, subrounded. Inflorescences paniculate, 7–10 × 4–5 cm, branched to 2 or 3 orders, dark yellow- to reddish brown tomentose to hirtellous, pedunculate; peduncle 0.5–0.8 cm; bracts linear to narrowly elliptic, 1–3 mm. Flowers sessile, densely grouped. Calyx densely hirtellous; hypanthium portion subglobose, ca. 0.8 mm; limb lobed nearly to base; lobes triangular to ovate, ca. 0.5 mm. Corolla pale yellow, tubular-funnelform, glabrous outside; tube 2.5–3 mm, sparsely pilose in throat; lobes ovate, ca. 1 mm.

Anthers elliptic, ca. 0.7 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.2 mm. Capsules subglobose to ovoid, ca. 2 × 2 mm, hirtellous. Fl. and fr. Jun.

- Forests on mountains or hills; ca. 800 m. Guangxi (Tianlin).

This species was included by How (loc. cit.) and W. C. Chen (Acta Phytotax. Sin. 21: 391. 1983) in the group of *Wendlandia* species with erect, triangular, acute stipules; but examination of an isotype (MO!) and careful study of the protologue (including the figure) shows that the stipules are oblanceolate to pandurate, with the apex narrow but mostly not spreading from the stem on most nodes.

**15. *Wendlandia longidens*** (Hance) Hutchinson in Sargent, Pl. Wilson. 3: 392. 1916.

水晶榉子 shui jing ke zi

*Hedyotis longidens* Hance, J. Bot. 20: 289. 1882; *Wendlandia henryi* Oliver.

Subshrubs, much branched, 0.2–1.5 m tall; branches terete, densely strigillose, hirtellous, or hispidulous. Leaves opposite; petiole 0.5–2 mm, strigillose to hirtellous; blade drying papery, elliptic-lanceolate, lanceolate, narrowly lanceolate, or ovate, 0.8–3 × 0.3–1 cm, adaxially densely hispidulous to glabrous, abaxially densely to sparsely hispidulous or strigillose or glabrous, base acute and usually decurrent, apex acute to shortly acuminate or rarely obtuse; secondary veins ca. 3 pairs, occasionally with foveolate pilosulous domatia; stipules lanceolate, triangular, or ovate-triangular, 2.5–4.5 mm, densely strigillose to hispidulous, apex erect to spreading, acute to cuspidate. Inflorescence paniculate to cymose, corymbiform to subglobose, 2–4 × 2–4 cm, densely strigillose, hirtellous, or strigose, sessile and tripartite or pedunculate; peduncle 3–6 mm; bracts linear to narrowly triangular, 0.5–5 mm; pedicels 2–3 mm. Flowers pedicellate. Calyx densely strigillose to glabrescent; hypanthium portion turbinate to ellipsoid, 1–2 mm; limb lobed nearly to base; lobes linear-oblong to spatulate or oblanceolate, 2–3 mm. Corolla white, tubular-salverform, glabrous outside; tube 7–8 mm; lobes linear-oblong, 7–8 mm. Filaments 5–6 mm; anthers linear-lanceolate, 3–3.2 mm, exserted. Stigma 2-lobed, ca. 2 mm. Capsule subglobose, 2–2.5 mm in diam., densely strigillose to glabrescent, with calyx lobes elongating, up to 4 mm. Fl. May–Jul, fr. Jul–Nov.

- Thickets at riversides or on mountain slopes; near sea level to 1800 m. Guizhou (Chishui), Hubei (Yichang), Sichuan, Yunnan.

**16. *Wendlandia longipedicellata*** F. C. How, Sunyatsenia 7(1–2): 39. 1948.

长梗水锦树 chang geng shui jin shu

Shrubs, ca. 1.5 m tall; branchlets ferruginous pubescent. Leaves opposite; petiole 0.5–1 cm, glabrous or sparsely pubescent; blade drying leathery, elliptic or lanceolate-elliptic, 4–8 × 0.8–2 cm, adaxially glabrous, abaxially sparsely pubescent along midrib, base acute and usually decurrent, apex acute; secondary veins not easily visible; stipules generally persistent, broadly triangular, 1.5–3 mm, apex erect, acute. Inflorescence paniculate, lax, pyramidal, 6–10.5 × 4.5–10.5 cm, ferruginous pilosulous, sessile and tripartite or pedunculate; peduncle 1.8–3.6 cm; pedicels 3–6 mm. Flowers pedicellate. Calyx sparsely

pilosulous or glabrous; hypanthium portion subglobose, ca. 1.75 mm; limb lobed nearly to base; lobes triangular, ca. 0.75 mm. Corolla purplish red, tubular-salverform, glabrous outside; tube 2.3–3 mm, sparsely strigillose inside; lobes narrowly oblong to spatulate, 1.7–2 mm. Anthers linear-lanceolate, ca. 1.2 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.5 mm. Capsules not seen. Fl. Feb.

• Forests on mountains; ca. 1600 m. Yunnan (Luxi).

**17. *Wendlandia luzoniensis*** Candolle, Prodr. 4: 412. 1830.

吕宋水锦树 lǚ song shuǐ jīn shù

*Wendlandia luzoniensis* var. *membranifolia* (Elmer) Cowan; *W. membranifolia* Elmer.

Shrubs or small trees; branches flattened-quadrate, glabrous to sparsely strigillose. Leaves opposite; petiole 0.8–1.2 cm, glabrous to sparsely strigillose; blade drying papery, ovate-oblong or elliptic, 10–20 × 4.5–7 cm, glabrous on both surfaces or sparsely strigillose on principal veins abaxially, base cuneate to acute, apex acute to shortly acuminate; secondary veins 6–9 pairs; stipules generally persistent, suborbicular, obovate, oblanceolate, or pandurate, 4–6 × 1–3 mm, glabrous or sparsely strigillose, apex erect to spreading, obtuse to rounded. Inflorescences paniculate, pyramidal to broadly obconic in outline, branched to 3 or 4 orders, 10–12 × 12–15 cm, densely strigillose to hirtellous, pedunculate; peduncle 0.8–1 cm; bracts linear to narrowly lanceolate, 0.5–2 mm. Flowers sessile or subsessile. Calyx with hypanthium portion subglobose, 1–1.5 mm, densely puberulent to strigillose; limb deeply lobed; lobes triangular to lanceolate, 0.5–1 mm, glabrous. Corolla white, tubular or tubular-funnelform, glabrous outside; tube 3–4 mm, villosulous in throat; lobes ovate, 0.8–1.5 mm. Anthers elliptic, ca. 1 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.3 mm. Capsules subglobose, 1.5–2 mm in diam., moderately to sparsely strigillose. Fl. and fr. Jul–Aug.

Forests. Taiwan (Taidong) [?India, Philippines, ?Vietnam].

*Wendlandia membranifolia* was cited by W. C. Chen (in FRPS 71(1): 214. 1999) as a synonym of *W. luzoniensis*, apparently based on Cowan's 1932 treatment (Notes Roy. Bot. Gard. Edinburgh 16: 294. 1932). However, Cowan subsequently (Notes Roy. Bot. Gard. Edinburgh 18: 187. 1934) separated these plants as *W. luzoniensis* var. *membranifolia*; because of the inclusion of the name *W. membranifolia*, this other name is here added too.

**18. *Wendlandia merrilliana*** Cowan, Notes Roy. Bot. Gard. Edinburgh 18: 303. 1935.

海南水锦树 hǎi nán shuǐ jīn shù

Shrubs or rarely trees, 1–3(–12) m tall; branches terete to somewhat flattened or quadrangular, sparsely strigillose or pilosulous to usually glabrous. Leaves opposite; petiole 1–6 mm, glabrous; blade drying leathery or subleathery, adaxially pale green to dark gray-green, abaxially rather pale or reddish brown to dark purple-gray or purple-black, elliptic-oblong, oblong-lanceolate, oblanceolate, or elliptic, 3–14.5 × 0.8–5 cm, glabrous on both surfaces, base cuneate to rounded, truncate, or cordulate, apex acute to acuminate; secondary veins 5–9 pairs; stip-

ules caducous or persistent, spatulate, lanceolate, or leaflike, 1–10 mm, glabrous, apex erect to spreading, acute. Inflorescence cymose to paniculate, narrowly pyramidal, 1.5–10 × 1.5–6.6 cm, branched to 2 orders, puberulent to glabrescent, pedunculate; peduncle 0.3–3 cm; bracts linear, lanceolate, or spatulate, 0.3–3 mm; pedicels 2–3.5 mm. Flowers pedicellate. Calyx glabrous; hypanthium portion subglobose to ellipsoid, 1.5–2 mm; limb deeply lobed; lobes triangular, 0.5–1 mm. Corolla white, salverform, glabrous outside; tube 5–8 mm, pilose in throat; lobes narrowly oblong, 5–6 mm. Filaments 4–4.5 mm; anthers linear-lanceolate, 3–3.3 mm, exserted. Stigma 2-lobed, 1.5–2 mm. Capsules red or purplish black, subglobose to ovoid, 2–3 × 2.5–3.5 mm, glabrous. Fl. and fr. Apr to Jan of following year.

• Open spaces or streamsides and rocks in forests on mountains; 400–1400 m. Hainan.

This species was included by Cowan in a group of generally similar species that are all reduced shrubs, but it apparently becomes rather large compared to the other species; also its stipules are anomalous in the group, as the other species otherwise have very narrow triangular stipules.

- 1a. Branch internodes 0.5–7 cm; leaves larger, 4.5–14.5 × 1.5–5 cm; stipules 4–10 mm, spatulate, lanceolate, or leaflike ..... 18a. var. *merrilliana*
- 1b. Branch internodes 0.4–2.2 cm; leaves smaller, 3–5 × 0.8–1.5 cm; stipules 1–4 mm, spatulate to lanceolate ..... 18b. var. *parvifolia*

**18a. *Wendlandia merrilliana* var. *merrilliana***

海南水锦树(原变种) hǎi nán shuǐ jīn shù (yuán biàn zhōng)

Branch internodes 0.5–7 cm. Leaves 4.5–14.5 × 1.5–5 cm; stipules spatulate, lanceolate, or leaflike, 4–10 mm. Fl. and fr. Apr to Jan of following year.

• Open spaces or streamsides and rocks in forests on mountains; 400–1400 m. Hainan.

**18b. *Wendlandia merrilliana* var. *parvifolia*** F. C. How, Sunyatsenia 7(1–2): 61. 1948.

细叶海南水锦树 xì yè hǎi nán shuǐ jīn shù

Branch internodes 0.4–2.2 cm. Leaves 3–5 × 0.8–1.5 cm; stipules spatulate to lanceolate, 1–4 mm. Fr. Oct.

• On rocks, infrequent. Hainan (Dongfang).

**19. *Wendlandia myriantha*** F. C. How, Sunyatsenia 7(1–2): 57. 1948.

密花水锦树 mì huā shuǐ jīn shù

Shrubs, ca. 3 m tall; branches terete to subquadrangular, brown strigillose. Leaves opposite; petiole 0.7–1.2 cm, puberulent; blade drying subleathery, elliptic, 7–12 × 2.5–6 cm, adaxially glabrescent or sparsely puberulent along midrib, abaxially puberulent, base cuneate, margin sparsely ciliolate, apex shortly acuminate; secondary veins 8–10 pairs; stipules generally persistent, ovate to pandurate, ca. 7 mm, sparsely puberulent, apex spreading to reflexed, rounded to 2-lobed. Inflorescences panic-

ulate, branched to 2–4 orders, 18–20 × 18–20 cm, puberulent, sessile and tripartite or pedunculate; peduncle 3–4 cm; lower bracts leaflike, upper bracts linear-lanceolate, oblong, oblong-lanceolate, or oblanceolate, 2–6 mm, strigillose. Flowers sessile in fasciculate groups. Calyx glabrous or sparsely puberulent; hypanthium portion subglobose, ca. 2 mm; limb lobed nearly to base; lobes ovate or ovate-triangular, ca. 1.5 mm. Corolla white, tubular-funnelform, glabrous outside; tube ca. 4 mm, in throat white hirsute; lobes ovate, ca. 1 mm. Anthers elliptic, ca. 1 mm, subsessile, partially exserted. Stigma 2-lobed. Capsules not seen. Fl. Mar.

- Forests in ravines; ca. 300 m. Guangxi (Shangsi).

**20. *Wendlandia oligantha*** W. C. Chen, Acta Phytotax. Sin. 21: 399. 1983.

龙州水锦树 long zhou shui jin shu

Shrubs or trees, 3–10 m tall; branches flattened to quadrangular, grayish brown, glabrous or sparsely or densely puberulent to pilosulous becoming glabrescent. Leaves opposite; petiole 3–15 mm, glabrous or mealy puberulent; blade drying leathery, adaxially dark brown and often shiny, elliptic, ovate, or ovate-oblong, 3–10.5 × 1.5–5 cm, adaxially glabrous, abaxially glabrous or sparsely to densely strigillose or puberulent along principal veins, base cuneate or acute, apex acute or shortly acuminate; secondary veins 5–7 pairs, hardly visible abaxially; stipules deciduous, spatulate to pandurate, 1.5–2.5 mm, pilosulous or puberulent, apex spreading to reflexed, rounded to obtuse. Inflorescences laxly paniculate, branched to 2 or 3 orders, 7–20 × 4–18 cm, moderately to densely pilosulous, sessile and tripartite or pedunculate; peduncle 0.5–1.5 cm; bracts linear, narrowly oblanceolate, or triangular, 1–5 mm. Flowers sessile to subsessile. Calyx glabrous to sparsely strigillose; hypanthium portion subglobose, ca. 0.5 mm; limb lobed nearly to base; lobes triangular to lanceolate, 0.3–0.5 mm. Corolla white, salverform to funnelform, outside glabrous; tube ca. 2.5 mm, rather abruptly narrowed at base, sparsely villous in throat; lobes triangular, ca. 1 mm. Anthers elliptic, ca. 0.7 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.2 mm. Capsules subglobose, ca. 1.5 mm in diam., glabrous. Fl. Jul–Aug, fr. Aug–Dec.

- Rocks in forests or thickets in valleys; 300–1000 m. Guangxi.

**21. *Wendlandia parviflora*** W. C. Chen, Acta Phytotax. Sin. 21: 394. 1983.

小花水锦树 xiao hua shui jin shu

Small trees, 4–5 m tall; branches ferruginous pubescent. Leaves opposite; petiole 0.8–1.5 cm, densely ferruginous pubescent; blade drying leathery, elliptic-oblong or ovate-elliptic, 8.5–17 × 4.5–8.5 cm, adaxially sparsely strigose except densely ferruginous pubescent along veins, abaxially densely ferruginous pubescent, base cuneate, acute, or sometimes obtuse, apex acuminate; secondary veins 8–13 pairs; stipules pandurate, 4–5 mm wide, pilosulous, apex spreading to reflexed. Inflorescences paniculate, ca. 19 × 15 cm, ferruginous pubescent; bracts ovate, ca. 1 mm. Flowers sessile. Calyx glabrous or pilose; hypanthium portion ca. 0.8 mm; limb deeply lobed; lobes semiorbicular, ca. 0.5 mm. Corolla pale green, outside glabrous; tube

1–1.5 mm, white hirsute in throat; lobes ca. 1 mm. Anthers elliptic, ca. 0.5 mm, subsessile, partially exserted. Stigma 2-lobed. Capsules not seen. Fl. Dec.

- Forests on flat land. Yunnan (Mengla).

**22. *Wendlandia pendula*** (Wallich) Candolle, Prodr. 4: 412. 1830.

垂枝水锦树 chui zhi shui jin shu

*Rondeletia pendula* Wallich in Roxburgh, Fl. Ind. 2: 140. 1824.

Shrubs, often straggly, 1–3 m tall; branches pendulous, terete, hispidulous or puberulent to glabrescent. Leaves opposite or ternate, subsessile; blade drying papery, ovate-lanceolate or ovate, 3.5–10 × 1.8–4 cm, adaxially glabrous to sparsely hispidulous, abaxially sparsely to moderately scaberulous or hispidulous with pubescence denser on principal veins, base rounded to cuneate, apex acute to weakly acuminate; secondary veins 4–7 pairs; stipules caducous to persistent, triangular, 1.5–2 mm, glabrescent, apex erect, cuspidate. Inflorescences paniculate, pyramidal in outline, 10–15 × 4–9 cm, branched to 2 or 3 orders, densely hispidulous to puberulent, sessile and tripartite or pedunculate; peduncle 2–4.5 cm; bracts triangular to ovate, 0.5–1 mm; pedicels 0.5–1.2 mm. Flowers shortly pedicellate. Calyx puberulent to glabrous; hypanthium ellipsoid to subglobose, 1–1.5 mm; limb lobed nearly to base; lobes lanceolate or triangular, 0.5–0.8 mm. Corolla red, tubular-funnelform, outside glabrous; tube 4–5 mm, inside pubescent in upper part; lobes oblong to elliptic, ca. 2 mm. Anthers linear-oblong, 1.3–1.5 mm, partially exserted. Stigmas clavate, ca. 1.3 mm. Capsules subglobose, 1.5–2 mm in diam., glabrous or pilose. Fl. and fr. Dec–Feb of following year.

Forests or thickets in ravines; 600–1300 m. Yunnan [Bhutan, India, Myanmar, Nepal].

W. C. Chen (in FRPS 71(1): 221. 1999) described the stipules as caducous, but these are persistent on all the specimens studied.

**23. *Wendlandia pingpiensis*** F. C. How, Sunyatsenia 7(1–2): 51. 1948.

屏边水锦树 ping bian shui jin shu

Shrubs or trees, 3–15 m tall. Petiole 1–3 cm, sparsely strigillose; leaf blade drying papery, elliptic-oblong or oblanceolate-oblong, 7.5–23 × 4–8 cm, adaxially glabrous or sometimes sparsely hispidulous along midrib, abaxially glabrous or sparsely hispidulous along principal veins, base cuneate or attenuate, apex acute or shortly caudate; secondary veins 7–13 pairs; stipules ca. 2 × as wide as branchlets, apex reflexed, subrounded. Inflorescences laxly paniculate, to 30 × 24 cm, ferruginous strigillose. Flowers sessile. Calyx pilosulous to strigillose; hypanthium portion subglobose, 1–1.5 mm; limb deeply lobed; lobes triangular. Corolla white, funnelform, glabrous outside; tube 4–5 mm, white hirsute inside upper part; lobes triangular, ca. 1 mm. Anthers elliptic, ca. 1 mm, subsessile, partially exserted. Stigma 2-lobed. Capsules subglobose, 1.5–2 mm in diam., pubescent or subglabrous. Fl. Apr–Oct, fr. Jun–Nov.

- Forests or thickets in valleys; 200–1500 m. Yunnan.

**24. *Wendlandia pubigera*** W. C. Chen, Acta Phytotax. Sin. 21: 395. 1983.

大叶木莲红 da ye mu lian hong

Shrubs, to 2 m tall; branches pubescent. Leaves opposite or ternate; petiole 0.8–1.8 cm, pubescent; blade drying thinly leathery, obovate-oblong or elliptic, 14.5–18 × 6–7 cm, adaxially glabrous or sparsely puberulent along principal veins, abaxially sparsely pubescent with pubescence denser along principal veins, base cuneate, apex shortly acuminate; secondary veins 10 or 11 pairs; stipules generally persistent, pandurate, 7.5–9 × 2.5–3 mm, nearly as wide as to slightly wider than branches, apex spreading, rounded. Inflorescence paniculate, pyramidal in outline, ca. 12 × 12–15 cm, branched to 2 or 3 orders, yellowish brown pubescent, sessile and tripartite or pedunculate; peduncle 1.8–3 cm. Flowers sessile. Calyx pubescent; hypanthium portion ca. 1.8 mm; limb lobed nearly to base; lobes ovate to deltoid, ca. 1 mm. Corolla white, tubular-salverform, outside glabrous; tube 2–3 mm, white villous inside upper part; lobes rounded to spatulate, ca. 1 mm. Anthers elliptic, ca. 0.7 mm, subsessile, partially exserted. Stigma 2-lobed. Capsules not seen. Fl. Mar.

• Dense forests. Guangxi (Shangsi).

Some of the characters in the description here are augmented with details from the protologue figure.

**25. *Wendlandia salicifolia*** Franchet ex Drake, J. Bot. (Morot) 9: 208. 1895.

柳叶水锦树 liu ye shui jin shu

*Ligustrum thea* H. Léveillé & Dunn.

Shrubs, to ca. 1 m tall; branches flattened to terete, hirtellous or strigillose to glabrescent. Leaves opposite; petiole 0.5–3 mm; blade drying thinly leathery, narrowly lanceolate to narrowly elliptic, 2–6.5 × 0.4–1.2 cm, glabrous on both surfaces or sparsely pubescent along midrib abaxially, base acute, margin usually edged with thickened vein, apex acute to weakly acuminate; secondary veins 5–7 pairs; stipules generally persistent, triangular, 1.5–4 mm, densely strigillose to hirtellous, apex erect, acute to aristate. Inflorescences paniculate, pyramidal in outline, 2–5 × 1–3 cm, branched to 2 or 3 orders, densely hirtellous to strigillose, sessile and tripartite or pedunculate; peduncle 0.4–0.7 cm; bracts linear, 1–5 mm; pedicels 0.3–1 mm. Flowers subsessile to pedicellate. Calyx moderately to sparsely strigillose; hypanthium portion ellipsoid to subglobose, ca. 0.8 mm; limb lobed nearly to base; lobes triangular, 0.3–0.5 mm. Corolla pale reddish white, funnelform, glabrous outside; tube 2–5 mm, apparently pubescent inside upper part; lobes linear-oblong, 2–2.5 mm. Filaments ca. 1 mm; anthers linear-lanceolate, ca. 1.4 mm, partially exserted. Stigma 2-lobed, 0.8–1 mm. Capsules subglobose to ovoid, ca. 1.5 × 2 mm, moderately to sparsely strigillose. Fl. Nov, fr. Jan of following year.

Streamsides in ravines and forests on hill slopes; 100–200 m. Guangxi (Donglan), Guizhou (Guanling), Yunnan [Laos, Vietnam].

**26. *Wendlandia scabra*** Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 310. 1872.

粗叶水锦树 cu ye shui jin shu

Shrubs or trees, 1–12 m tall; branches terete to quadrangular, densely brown hirtellous to -tomentose. Leaves opposite; petiole 0.5–2.7 cm, densely brown tomentulose to -hirtellous; blade drying papery or leathery, elliptic-obovate, elliptic, or ovate, 6.5–18 × 2.8–9 cm, adaxially sparsely to moderately scaberulous on lamina and densely strigillose to tomentulose on principal veins, abaxially sparsely to densely strigillose, pilosulous, hirtellous, strigose, or pilose, base obtuse, acute, or rounded, apex acute or acuminate; secondary veins 6–10 pairs; stipules generally persistent, spatulate to pandurate, 5–6 mm, strigillose or tomentulose to glabrescent, apex spreading, obtuse. Inflorescences paniculate, pyramidal, 20–30 × 20–25 cm, branched to 2 or 3 orders, erect and congested (var. *scabra*, var. *pilifera*) or pendulous and lax (var. *dependens*), densely hirtellous to tomentose, pedunculate; peduncle ca. 4 cm; bracts linear, 1–2.5 mm. Flowers sessile or subsessile. Calyx densely hirtellous; hypanthium portion turbinate to ellipsoid, ca. 0.5 mm; limb deeply lobed; lobes triangular, 0.5–0.8 mm. Corolla white, tubular-funnelform, glabrous outside or pubescent on lobes (var. *pilifera*); tubes 2.5–3 mm, inside glabrous or sparsely pubescent in lower part (var. *scabra*, var. *dependens*) or white villous or hispid in upper part (var. *pilifera*); lobes oblong, 1–1.25 mm. Anthers elliptic, 0.75–1 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.7 mm. Capsules subglobose, ca. 2 mm in diam., hirsute. Fl. Mar–May, fr. May–Jul.

Forests or thickets on mountains; 100–1800 m. Guangxi, Guizhou, Yunnan [Bangladesh, India, Myanmar, Nepal, Thailand, Vietnam].

The application of this name and the report of this species seem to be based on Cowan's incorporation of Kurz's report into his treatment and may deserve re-evaluation.

- 1a. Leaves densely<sup>\*</sup> strigillose or scaberulous adaxially, densely tomentulose abaxially ..... 26c. var. *scabra*
- 1b. Leaves glabrescent adaxially, sparsely strigose or pilose abaxially.
  - 2a. Leaves sparsely strigose abaxially; inflorescences lax, pendulous; corolla tubes inside glabrous or pubescent near middle ..... 26a. var. *dependens*
  - 2b. Leaves pilose abaxially; inflorescences compact, erect; corolla tubes inside white villous or hispid in upper part ..... 26b. var. *pilifera*

**26a. *Wendlandia scabra* var. *dependens*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 292. 1932.

悬花水锦树 xuan hua shui jin shu

Leaves glabrescent adaxially, sparsely strigose abaxially. Inflorescence lax, pendulous. Corolla tube inside glabrous or pubescent near middle; lobes glabrous outside. Fl. Mar–Apr.

• Forests or thickets on mountains; 500–1800 m. W Yunnan.

**26b. *Wendlandia scabra* var. *pilifera*** F. C. How ex W. C. Chen, Acta Phytotax. Sin. 21: 395. 1983.

毛粗叶水锦树 mao cu ye shui jin shu

Leaves glabrescent adaxially, pilose abaxially. Inflorescence compact, erect. Corolla tube white villous in upper part inside; lobes pubescent outside. Fl. Apr.

- Thickets on mountains. Guangxi (Shangsi).

**26c. *Wendlandia scabra* var. *scabra***

粗叶水锦树(原变种) *cu ye shui jin shu* (yuan bian zhong)

*Wendlandia paniculata* (Roxburgh) Candolle subsp. *scabra* (Kurz) Cowan; *W. zooi* F. C. How.

Leaves strigillose and/or scaberulous adaxially, tomentulose abaxially. Inflorescence erect, compact. Corolla tube inside sparsely pubescent in lower part or glabrous; lobes glabrous outside. Fl. Apr–May, fr. May–Jul.

Forests or thickets on mountains; 100–1600 m. Guangxi, Guizhou, Yunnan [Bangladesh, India, Myanmar, Nepal, Thailand, Vietnam].

**27. *Wendlandia speciosa* Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 254. 1932.**

美丽水锦树 *mei li shui jin shu*

*Wendlandia speciosa* var. *forrestii* Cowan.

Shrubs or trees, 1–12 m tall; branches flattened, strigillose to glabrescent. Leaves opposite; petiole 0.5–3 cm, strigillose to glabrescent; blade drying papery or subleathery, ovate, obovate, ovate-lanceolate, or elliptic, 6–19 × 2.5–11 cm, on both sides sparsely to moderately strigillose or hirtellous to glabrescent with pubescence often denser on principal veins, base acute or cuneate, apex acute or acuminate; secondary veins 5–12 pairs; stipules generally persistent, spatulate to pandurate, 4–7 mm, strigillose to glabrescent, apex spreading, rounded. Inflorescence paniculate, pyramidal, 20–30 × 20–30 cm, branched to 2 or 3 orders, densely strigillose, pedunculate; peduncle ca. 4.5 cm; bracts linear, spatulate, or lanceolate, 1–3 mm, acute. Flowers subsessile. Calyx strigillose; hypanthium portion turbinate, ca. 1 mm; limb lobed nearly to base; lobes lanceolate to triangular, 1–1.5 mm. Corolla white to cream, yellowish white, salverform or tubular, glabrous outside; tube 5–7 mm, white villous inside; lobes narrowly oblong to oblanceolate, 2–2.5 mm, obtuse to rounded. Anthers linear-lanceolate, exserted, 1.3–2 mm, at base 2-lobed; filaments ca. 1.5 mm. Stigma 2-lobed, 1–1.2 mm. Capsule subglobose, 2.5–3 mm in diam., pubescent. Fl. and fr. Mar–Nov.

Forests in ravines, forest margins; 1500–2800 m. Xizang (Mé-dog), Yunnan [Bhutan, India].

**28. *Wendlandia subalpina* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 142. 1916.**

高山水锦树 *gao shan shui jin shu*

Shrubs, tufted to prostrate, 0.3–1 m tall; branches subterete, puberulent. Leaves opposite, subsessile; petiole to ca. 1 mm, glabrescent; blade drying leathery, ovate or suborbicular, 0.4–1 × 0.3–0.6 mm, glabrescent on both surfaces, base obtuse to cuneate, apex obtuse, subacute, or shortly acuminate; secondary veins indistinct; stipules deciduous, triangular, ca. 1 mm, glabrescent, apex erect, apparently acute. Inflorescences paniculate to cymose, 6–12-flowered, 0.6–1 × 0.6–1 cm, branched to

2 orders, puberulent, pedunculate; peduncle ca. 0.2 cm; bracts ca. 1 mm; pedicels 2–3 mm. Flowers pedicellate. Calyx puberulent; hypanthium portion ellipsoid, ca. 1.5 mm; limb deeply lobed; lobes triangular or lanceolate, 1.5–2 mm. Corolla white or pale yellow, tubular, outside glabrous; tube ca. 2.5 mm; lobes linear-oblong, ca. 3.5 mm. Filaments ca. 3 mm; anthers linear-lanceolate, ca. 2 mm, exserted. Stigma 2-lobed, ca. 1.2 mm. Capsules subglobose, 2–2.5 mm in diam., pubescent. Fl. May–Jul, fr. Sep–Oct.

- Open spaces or thickets on mountain slopes; 1800–3100 m. Yunnan.

**29. *Wendlandia tinctoria* (Roxburgh) Candolle, Prodr. 4: 411. 1830.**

染色水锦树 *ran se shui jin shu*

*Rondeletia tinctoria* Roxburgh, Fl. Ind. 2: 134. 1824.

Shrubs or trees, to 6 m tall; branches somewhat flattened to terete or quadrangular, densely puberulent, velutinous, or hirtellous usually becoming glabrescent. Leaves opposite; petiole 0.5–2 cm, densely puberulent or strigillose to glabrous; blade drying papery to leathery, oblong-lanceolate, elliptic-ovate, or obovate, 5.5–20 × 2.5–10 cm, adaxially sparsely strigillose at least on principal veins to glabrous throughout, abaxially sparsely to moderately strigillose or tomentose to glabrescent, base acute to obtuse, apex acute to acuminate; secondary veins 10–12 pairs, occasionally with pubescent and/or foveolate domatia; stipules generally persistent, triangular to ovate, 3–5.5 mm, densely strigillose or puberulent to glabrescent, apex cuspidate, erect or slightly spreading with age. Inflorescences paniculate, pyramidal in outline, 9–17 × 9–22 cm, branched to 2–4 orders, densely strigillose, pilosulous, velutinous, tomentose, hirtellous, or villosulous, sessile and tripartite or pedunculate; peduncle 0.8–4 cm; bracts linear to narrowly elliptic, 1–5 mm; pedicels to 0.8 mm. Flowers sessile to shortly pedicellate. Calyx densely hirtellous or pilosulous to glabrous; hypanthium portion subglobose to ellipsoid or turbinate, 0.8–1 mm; limb lobed nearly to base; lobes spatulate, triangular, or lanceolate, 0.8–1 mm. Corolla white, tubular-funnelform, outside glabrous and/or variously densely villosulous or strigillose; tube 3–4 mm, pilose in throat; lobes elliptic to ovate, 0.8–1 mm. Anthers oblong, ca. 0.5 mm, subsessile, partially exserted. Stigma 2-lobed, 0.5–0.8 mm. Capsules ovoid, ca. 1.5 × 2–2.5 mm, hirtellous to glabrous. Fl. and fr. Jan–Dec.

Dry sparse forests, dense forests, or thickets in valleys, in ravines, or on mountain slopes; 200–2800 m. Guangxi, Guizhou, Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

Cowan recognized seven infraspecific taxa of this species, with five found in China; two additional infraspecific taxa from China were described by F. C. How. In Cowan's circumscription, *Wendlandia tinctoria* subsp. *tinctoria* was widespread in India and also found in Bhutan, Myanmar, Nepal, and Thailand but not known from China.

- 1a. Inflorescences glabrous or puberulent;  
calyx glabrous or sparsely pubescent.
- 2a. Corolla lobes strigose outside  
..... 29d. subsp. *floribunda*
- 2b. Corolla lobes glabrous outside  
..... 29g. subsp. *orientalis*

1b. Inflorescences densely pilosulous or tomentose.

3a. Calyx with hypanthium portion glabrous, glabrescent, or puberulent, lobes glabrous, glabrescent, or pilosulous.

4a. Corolla lobes pilosulous outside ..... 29b. subsp. *barbata*

4b. Corolla lobes glabrous outside ..... 29f. subsp. *intermedia*

3b. Calyx hirtellous or pilosulous.

5a. Corolla lobes villosulous outside ..... 29a. subsp. *affinis*

5b. Corolla lobes glabrous outside.

6a. Calyx densely hirtellous ..... 29c. subsp. *callitricha*

6b. Calyx pilosulous or sparsely hirtellous ..... 29e. subsp. *handelii*

**29a. *Wendlandia tinctoria* subsp. *affinis*** F. C. How ex W. C. Chen, Acta Phytotax. Sin. 21: 389. 1983.

毛冠水锦树 *mao guan shui jin shu*

Inflorescence densely tomentose. Calyx hirtellous or pilosulous. Corolla lobes villosulous outside. Fl. and fr. Feb–Jun.

• Forests or thickets in valleys or on mountain slopes; 700–1400 m. Guangxi (Longzhou), Yunnan.

In the protologue, this taxon is treated as “subsp.” in the text (both key and description) but its figure is labeled “var.”

**29b. *Wendlandia tinctoria* subsp. *barbata*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 268. 1932.

粗毛水锦树 *cu mao shui jin shu*

Inflorescence densely tomentose. Calyx with hypanthium portion glabrous or glabrescent, lobes glabrous or pilosulous. Corolla lobes pilosulous outside. Fl. and fr. Feb–Nov.

Thickets or forests in valleys; 1000–1800 m. Guangxi, Yunnan [Vietnam].

**29c. *Wendlandia tinctoria* subsp. *callitricha*** (Cowan) W. C. Chen, Acta Phytotax. Sin. 21: 389. 1983.

厚毛水锦树 *hou mao shui jin shu*

*Wendlandia tinctoria* var. *callitricha* Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 265. 1932.

Inflorescence densely tomentose. Calyx densely hirtellous. Corolla lobes glabrous outside. Fl. and fr. year-round.

Forests or thickets on mountain slopes or in ravines; 400–2800 m. Guangxi, Yunnan [Myanmar].

**29d. *Wendlandia tinctoria* subsp. *floribunda*** (Craib) Cowan in Craib, Fl. Siam. 2: 23. 1932.

多花水锦树 *duo hua shui jin shu*

*Wendlandia glabrata* Candolle var. *floribunda* Craib, Bull. Misc. Inform. Kew 1911: 386. 1911; *W. floribunda* (Craib) Craib.

Inflorescence glabrous or puberulent. Calyx glabrous or sparsely puberulent. Corolla lobes strigillose outside. Fl. Jul.

Dry sparse forests on mountain slopes; ca. 1100 m. Yunnan (Menglian) [Myanmar, Thailand].

**29e. *Wendlandia tinctoria* subsp. *handelii*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 267. 1932.

麻栗水锦树 *ma li shui jin shu*

Inflorescences densely pilosulous. Calyx pilosulous or sparsely hirtellous. Corolla lobes glabrous outside. Fl. and fr. Mar–Dec.

• Forests or thickets on mountain slopes or in ravines; 200–1900 m. Guangxi (Wuming), Guizhou (Wangmo), Yunnan.

**29f. *Wendlandia tinctoria* subsp. *intermedia*** (F. C. How) W. C. Chen, Acta Phytotax. Sin. 21: 390. 1983.

红皮水锦树 *hong pi shui jin shu*

*Wendlandia tinctoria* var. *intermedia* F. C. How, Sunyatsenia 7(1–2): 43. 1948.

Inflorescence densely tomentose. Calyx with hypanthium portion glabrous or puberulent, lobes pilosulous. Corolla lobes glabrous outside. Fl. and fr. Mar–May.

• Forests or thickets in valleys; 1400–1600 m. Yunnan.

**29g. *Wendlandia tinctoria* subsp. *orientalis*** Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 268. 1932.

东方水锦树 *dong fang shui jin shu*

Inflorescence glabrous or puberulent. Calyx glabrous or rarely sparsely puberulent. Corolla lobes glabrous outside. Fl. Mar–May, fr. Apr–Oct.

Thickets or forests on mountains; 200–2100 m. Guangxi, Yunnan [India, Myanmar, Thailand].

**30. *Wendlandia uvariifolia*** Hance, J. Bot. 8: 73. 1870.

水锦树 *shui jin shu*

Shrubs or trees, 2–15 m tall; branches terete to subquad-rangular, tomentulose, pilosulous, or hirsute, often with pubescence of two or more types. Leaves opposite; petiole 0.5–3.5 cm, densely ferruginous hirtellous or -pilosulous; blade drying papery, broadly elliptic, elliptic-oblong, ovate, or oblong-lanceolate, 7–26 × 4–14 cm, adaxially sparsely hirtellous, hispidulous, or scaberulous on lamina and moderately to densely tomentulose to strigillose along principal veins, abaxially moderately to densely hirtellous to pilosulous, base acute to obtuse, apex shortly to abruptly acuminate; secondary veins 8–12 pairs; stipules persistent or sometimes deciduous, obovate to pandurate, 5–12 × 5–12 mm, hispid, apex spreading to reflexed, rounded. Inflorescences paniculate, pyramidal in outline, 10–20 × 10–20 cm, branched to 2–4 orders, densely tomentulose, pilosulous, and/or hirtellous, sessile and tripartite or pedunculate; peduncle 1–4 cm; bracts linear-lanceolate to spatulate, 1–4 mm. Flowers sessile or subsessile. Calyx densely grayish pilose, -strigose, -hirtellous, -tomentose, or subglabrous (subsp. *pilosa*); hypanthium obconic, ca. 0.8 mm; limb lobed nearly to

base; lobes triangular to lanceolate, ca. 1 mm. Corolla white, tubular-funnelform, glabrous outside; tube 2.5–3 mm, inside upper part and throat white hirsute; lobes oblong to elliptic, ca. 1 mm. Anthers elliptic, ca. 0.8 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.3 mm. Capsules subglobose, 1–2 mm in diam., densely strigillose to strigose. Fl. Jan–May, fr. Apr–Oct.

Thickets, forests, or forest margins on mountains or hill slopes, in ravines, or at streamsides; below 100–1200 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Vietnam].

Cowan discussed in detail the wide morphological variability in this species, in both vegetative and flower characters.

- 1a. Calyx pilose or subglabrous ..... 30b. subsp. *pilosa*  
 1b. Calyx densely grayish white hirsute, -strigose, -tomentulose, or -strigillose.  
 2a. Leaves rather narrow, elliptic-oblong or oblong-lanceolate, pilosulous abaxially ..... 30a. subsp. *chinensis*  
 2b. Leaves wider, broadly elliptic or ovate, densely grayish brown pilosulous abaxially ..... 30c. subsp. *uvariifolia*

**30a. *Wendlandia uvariifolia* subsp. *chinensis*** (Merrill) Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 288. 1932.

中华水锦树 *zhong hua shui jin shu*

*Wendlandia chinensis* Merrill, Philipp. J. Sci. 15: 257. 1919.

Leaves rather narrow, elliptic-oblong or oblong-lanceolate, pilosulous abaxially. Calyx densely grayish white hirsute, -strigose, -tomentulose, or -strigillose. Fl. Mar–Apr, fr. Apr–Jul.

• Forests or thickets in ravines or on hill slopes; below 100–600 m. Guangdong, Guangxi, Hainan.

**30b. *Wendlandia uvariifolia* subsp. *pilosa*** W. C. Chen, Acta Phytotax. Sin. 21: 393. 1983.

疏毛水锦树 *shu mao shui jin shu*

Leaves densely pilosulous abaxially. Calyx pilose or subglabrous. Fl. Nov.

• Forests; ca. 900 m. Yunnan (Mengla).

**30c. *Wendlandia uvariifolia* subsp. *uvariifolia***

水锦树(原亚种) *shui jin shu* (yuan ya zhong)

*Wendlandia dunniana* H. Léveillé; *W. rotundifolia* Handel-Mazzetti; *W. uvariifolia* subsp. *dunniana* (H. Léveillé) Cowan; *W. uvariifolia* subsp. *rotundifolia* (Handel-Mazzetti) Cowan; *W. uvariifolia* subsp. *rufula* Cowan; *W. uvariifolia* subsp. *yunnanensis* Cowan.

Leaves broadly elliptic or ovate, densely grayish brown pilosulous abaxially. Calyx densely grayish white hirsute, -strigose, -tomentulose, or -strigillose. Fl. Jan–May, fr. Apr–Oct.

Thickets, forests, or forest margins on mountains or at streamsides; below 100–1200 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Vietnam].

**31. *Wendlandia villosa*** W. C. Chen, Acta Phytotax. Sin. 21: 388. 1983.

毛叶水锦树 *mao ye shui jin shu*

Shrubs or trees; branches densely villous becoming glabrescent. Leaves opposite; petiole 8–10 mm, villous becoming glabrescent; blade drying leathery, elliptic or elliptic-oblong, 4.5–13 × 2.5–6 cm, adaxially sparsely strigose or glabrous, abaxially densely yellowish brown villous, base cuneate, apex broad then shortly acuminate; secondary veins 7–9 pairs; stipules generally persistent, triangular to ovate, ca. 6 mm, villous, apex erect, cuspidate. Inflorescence paniculate, pyramidal in outline, 9–12 × 6–11 cm, branched to 2 or 3 orders, densely yellowish brown villosulous to -hirtellous, sessile and tripartite or pedunculate; peduncle ca. 3 cm; bracts lanceolate, ca. 1.5 mm. Flowers sessile or subsessile. Calyx densely hirtellous or villosulous; hypanthium portion ellipsoid, ca. 0.8 mm; limb lobed nearly to base; lobes lanceolate, 0.8–1 mm, ciliate. Corolla tubular-salverform; tube 3–4 mm, outside and inside glabrous; lobes elliptic to ovate, ca. 1 mm, densely villosulous or hirtellous outside. Anthers elliptic, ca. 0.7 mm, subsessile, partially exserted. Stigma 2-lobed, ca. 0.2 mm. Capsules not seen. Fl. Apr.

• Forests. Yunnan.

## 97. XANTHOPHYTUM Reinwardt ex Blume, Bijdr. 989. 1826–1827.

岩黄树属 *yan huang shu shu*

Chen Tao (陈涛); Charlotte M. Taylor

*Paedicalyx* Pierre ex Pitard; *Xanthophytopsis* Pitard.

Small trees, shrubs, or subshrubs, sometimes unbranched (i.e., monocaulous), unarmed, often fleshy; young growth usually densely sericeous to lanate, hirsute, or tomentose with trichomes drying golden yellow to ferruginous. Raphides present. Leaves opposite, isophyllous [or sometimes markedly anisophyllous], without domatia; stipules persistent or deciduous, interpetiolar, generally triangular or somewhat leaflike, sometimes markedly parallel-veined or -fibrous, entire or 2-lobed. Inflorescences axillary, cymose to paniculate or subcapitate, several to many flowered, sessile to pedunculate, bracteate or bracts reduced. Flowers sessile to pedicellate, bisexual, distylous or monomorphic, at least sometimes fragrant. Calyx limb shallowly to deeply 5-lobed; lobes sometimes unequal on an individual flower. Corolla white, yellow, or purple, tubular to funnelform, inside with pubescent ring in upper part of tube; lobes 5, valvate in bud. Stamens 5, exserted or included, inserted near middle to base of corolla tube; filaments reduced to developed; anthers apparently dorsifixed. Ovary 2-celled, ovules numerous in each cell on peltate placentas attached at middle of septum; stigmas clavate to 2-lobed, included or exserted. Infructescences often with peduncle, axes, and pedicels elongating notably. Fruit indehiscent, schizocarpous, or capsular, ovoid to subglobose, dry, with calyx limb persistent or deciduous, sometimes splitting

septicidally into 2 indehiscent mericarps or loculicidally dehiscent valves, these each 1-celled, ellipsoid to plano-convex, each with numerous seeds; seeds small, angled, smooth, often brown.

About 30 species: China, Indonesia (including Borneo, with most of the species), Laos, Malaysia, New Guinea, Pacific islands (Fiji), Philippines, Vietnam; four species in China.

*Xanthophytum* was reviewed for China by Chun and F. C. How (Sunyatsenia 4: 10–15. 1939, as *Paedicalyx*) and then by H. S. Lo (Bull. Bot. Res., Harbin 6(4): 21–33. 1986), who formally synonymized *Xanthophytopsis* and *Paedicalyx* in this region based on previous comments by Bakhuizen but making the necessary combinations. Axelius (Blumea 34: 425–497. 1990) provided the only comprehensive review of *Xanthophytum*. She recognized four types of trichomes characteristic of the genus (loc. cit.: 427, f. 1); also notable in *Xanthophytum* are the fruit with numerous tiny seeds apparently enclosed in drupaceous locules or mericarps, and the stamen filaments that are often fused to the corolla only at the base and appear free or nearly free. Several authors have described the fruit as drupaceous and splitting, but the fruit morphology apparently corresponds better to schizocarpous in the terminology used in this treatment. Axelius observed also that distyly in *Xanthophytum* was apparently not noted by Chinese authors, resulting in somewhat confused descriptions of floral morphology.

- 1a. Inflorescences subcapitate to congested-cymose, subsessile to shortly pedunculate, with peduncles to 0.5 cm in flower, sometimes to 1 cm at fruiting; leaves with secondary veins 9–16 pairs ..... 3. *X. kwangtungense*
- 1b. Inflorescences subcapitate to laxly cymose or paniculate, pedunculate with peduncles 0.5–11 cm; leaves with secondary veins 9–30 pairs.
  - 2a. Fruit septicidally dehiscent; inflorescences laxly cymose to paniculate; peduncles 4–11 cm; leaves with secondary veins 9–15 pairs ..... 2. *X. balansae*
  - 2b. Fruit indehiscent; inflorescences subcapitate to laxly cymose or paniculate; peduncles 0.5–6 cm; leaves with secondary veins 14–30 pairs.
    - 3a. Inflorescences subcapitate; corolla tube 2–2.2 mm ..... 1. *X. attopevense*
    - 3b. Inflorescences laxly cymose to paniculate; corolla tube 1.5–2 mm ..... 4. *X. polyanthum*

**1. *Xanthophytum attopevense*** (Pierre ex Pitard) H. S. Lo, Bull. Bot. Res., Harbin 6(4): 32. 1986.

琼岛岩黄树 qiong dao yan huang shu

*Paedicalyx attopevensis* Pierre ex Pitard in Lecomte, Fl. Indo-Chine 3: 88. 1922.

Shrubs or herbs, to 1 m tall; branches flattened to subterete, densely sericeous to pilose. Petiole 0.2–2 cm, densely sericeous; leaf blade drying membranous or thinly papery, narrowly elliptic or oblanceolate-oblong, 10–20 × 3.5–6 cm, adaxially moderately to sparsely villous to hirsute, abaxially rather densely hirtellous to hirsute on veins and densely sericeous on lamina, base acute and often decurrent, apex acuminate or shortly acuminate; secondary veins 17–30 pairs; stipules persistent, ovate or lanceolate, 12–17 × 4–8 mm, sericeous or pilose to glabrescent, longitudinally veined, caudate or acuminate. Inflorescences subcapitate, densely sericeous; peduncles 0.5–1.5 cm; heads subglobose, 0.5–1 cm in diam.; bracts triangular, 1.5–3 mm; bracteoles reduced; pedicels 0–1 mm. Calyx densely villous or strigose; ovary portion obconic, ca. 1.5 mm; lobes obovate, 1–2.5 mm, sometimes unequal, glabrescent. Corolla white, outside pilosulous at least on lobes; tube 2–2.2 mm; lobes oblong-lanceolate, ca. 1 mm. Fruit indehiscent, subglobose to didymous, ca. 2 × 2.5 mm, hirsute to sericeous. Fl. Jan–Mar, fr. May–Aug.

Dense forests. Hainan [Laos, Vietnam].

This species is circumscribed here following Axelius; many of the specimens that were included in this species by Chinese authors are here separated in *Xanthophytum polyanthum*.

**2. *Xanthophytum balansae*** (Pitard) H. S. Lo, Bull. Bot. Res., Harbin 6(4): 31. 1986.

长梗岩黄树 chang geng yan huang shu

*Xanthophytopsis balansae* Pitard in Lecomte, Fl. Indo-Chine 3: 90. 1922.

Shrubs, ca. 1 m tall; stems subterete, densely sericeous. Petiole 5–15 mm, puberulent to sericeous; leaf blade drying membranous or thinly papery, green above, pale brown below, elliptic or elliptic-oblong to lanceolate, 9–17.5 × 2.5–5 cm, adaxially glabrous or sparsely strigose, abaxially densely sericeous, base cuneate to acute and often decurrent, apex acute; secondary veins 9–15 pairs; stipules persistent, narrowly ovate, ca. 10 × 3 mm, acuminate. Inflorescence laxly cymose to paniculate, pilose to strigillose; peduncles flexuous, 4–11 cm; branched portion broadly pyramidal, 2–7 × 2–10 cm; bracts elliptic, up to 2.5 × 9 cm, acute; bracteoles reduced; pedicels 1–2 mm. Flowers unknown. Fruit septicidally dehiscent, subglobose to ovoid, ca. 2 mm in diam., densely strigillose to strigose, with persistent calyx lobes obovate or oblanceolate, 1–3 × ca. 1 mm, ciliate; seeds yellow. Fl. and fr. Jun–Oct.

Streamsides in dense forests. Guangxi (Shiwan Dashan) [N Vietnam].

**3. *Xanthophytum kwangtungense*** (Chun & F. C. How) H. S. Lo, Bull. Bot. Res., Harbin 6(4): 32. 1986.

岩黄树 yan huang shu

*Xanthophytopsis kwangtungensis* Chun & F. C. How, Sunyatsenia 4: 14. 1939.

Shrubs, 0.5–1 m tall; branches flattened to subterete, densely sericeous to tomentose-pilose. Petiole 0.5–3 cm, densely sericeous to pilose; leaf blade drying papery, elliptic, elliptic-oblong, or ovate, 5–20 × 2.5–7 cm, adaxially glabrous or sparsely pilose at least along veins, abaxially densely sericeous or sericeous-villous, base cuneate to acute and usually long decurrent, apex acuminate; secondary veins 9–16 pairs; stipules drying membranous, persistent, ovate to triangular, 9–15 × 5–7

mm, sericeous or pilose to glabrescent, parallel-veined, acute to acuminate or bilobed for up to 1/2, margins often ciliate. Inflorescences subcapitate to congested-cymose, many flowered, densely strigose to strigillose; peduncles 0.1–0.5 cm; flowering portion subglobose, ca. 1 cm in diam.; bracteoles linear-lanceolate, ca. 2 mm; pedicels 0–3 mm. Calyx densely strigillose to sericeous; ovary portion ellipsoid, 1.1–1.2 mm; limb lobed essentially to base, glabrous internally; lobes subspatulate to ovate or oblanceolate, 1.2–2.5 mm, obtuse to rounded, often ciliate. Corolla pale yellow, campanulate-funnelform, outside pilosulous at least on lobes; tube 2.2–2.3 mm; lobes ovate-triangular to spatulate, 1.2–1.3 mm, obtuse to acute. Infructescences often borne at lower leaf nodes or below leaves, with peduncles up to 1 cm, pedicels up to 2 mm. Fruit capsular, subglobose to ovoid, ca. 2 mm in diam., strigillose to sericeous. Fl. May, fr. Jul–Oct.

Wet places in forests. SE Guangxi, S Yunnan (Hekou) [Vietnam].

The calyx lobe measurements given here are based on Chinese specimens studied and on H. S. Lo (in FRPS 71(1): 24. 1999); Axelius (Blumea 34: 467–469. 1990) reported that these range up to 4.1 mm throughout the range of the species (i.e., in Vietnam). Several specimens of this species, in particular *W. T. Tsang* 23975 and 24532, were distributed as “*Xanthophyllum chinense* Merrill,” but that name has not been published.

**4. *Xanthophyllum polyanthum*** Pitard in Lecomte, Fl. Indo-Chine 3: 91. 1922.

多花岩黄树 duo hua yan huang shu

Low shrubs, ca. 0.5 m, little branched; branches weakly angled or subterete, sometimes rather stout, densely sericeous. Petiole 0.8–5 cm, densely sericeous; leaf blade drying papery, lanceolate to elliptic, elliptic-oblong, or oblanceolate, 9–30 × 3.5–8 cm, adaxially sparsely or moderately hirtellous to villous to subglabrous, abaxially densely pilose to sericeous, base cuneate to acute and usually decurrent, apex acute to acuminate; secondary veins 14–25 pairs; stipules persistent, lanceolate to ovate, 1.8–2.3 × 0.6–0.9 cm, sericeous to glabrescent, acuminate or lobed for up to 1/3. Inflorescences laxly paniculate or cymose, densely villous to hirtellous; peduncles 2–6 cm; branched portion pyramidal, 1.5–5 × 2–5 cm; bracts triangular, 2–5 mm; bracteoles narrowly triangular, 1–2 mm; pedicels 0–3 mm. Calyx densely villosulous; ovary portion subglobose to ellipsoid, ca. 0.5 mm; limb lobed nearly to base, glabrous inside; lobes spatulate to ovate or obovate, 0.6–2.1 mm, obtuse to rounded. Corolla tubular to funnelform, glabrous or with a few stout hairs outside; tube 1.5–2 mm; lobes 0.5–1.5 mm, acute. Fruit indehiscent or perhaps tardily splitting septically, ellipsoid to subglobose or didymous, 1.5–3 mm, villosulous to hirtellous. Fl. Feb, fr. Apr.

Wet forests; ca. 1400 m. Hainan (Jianfeng Ling) [N Vietnam].

The specimens described here were included by Chinese authors in *Xanthophyllum attopevense* but are here separated following Axelius (Blumea 34: 470–472. 1990).

## ACANTHACEAE

爵床科 jue chuang ke

Hu Jiaqi (胡嘉琪 Hu Chia-chi)<sup>1</sup>, Deng Yunfei (邓云飞)<sup>2</sup>, John R. I. Wood<sup>3</sup>, Thomas F. Daniel<sup>4</sup>

Prostrate, erect, or rarely climbing herbs (annual or perennial), subshrubs, shrubs, or rarely small trees, usually with cystoliths (except in following Chinese genera: *Acanthus*, *Blepharis*, *Nelsonia*, *Ophiorrhiziphyllon*, *Staurogyne*, and *Thunbergia*), isophyllous (leaf pairs of equal size at each node) or anisophyllous (leaf pairs of unequal size at each node). Branches decussate, terete to angular in cross-section, nodes often swollen, sometimes spinose with spines derived from reduced leaves, bracts, and/or bracteoles. Stipules absent. Leaves opposite [rarely alternate or whorled]; leaf blade margin entire, sinuate, crenate, dentate, or rarely pinnatifid. Inflorescences terminal or axillary spikes, racemes, panicles, or dense clusters, rarely of solitary flowers; bracts 1 per flower or dichasial cluster, large and brightly colored or minute and green, sometimes becoming spinose; bracteoles present or rarely absent, usually 2 per flower. Flowers sessile or pedicellate, bisexual, zygomorphic to subactinomorphic. Calyx synsepalous (at least basally), usually 4- or 5-lobed, rarely (*Thunbergia*) reduced to an entire cupular ring or 10–20-lobed. Corolla sympetalous, sometimes resupinate 180° by twisting of corolla tube; tube cylindric or funnelliform; limb subactinomorphic (i.e., subequally 5-lobed) or zygomorphic (either 2-lipped with upper lip subtire to 2-lobed and lower lip 3-lobed, or rarely 1-lipped with 3 lobes); lobes ascending or descending cochlear, quincuncial, contorted, or open in bud. Stamens epipetalous, included in or exserted from corolla tube, 2 or 4 and didynamous; filaments distinct, connate in pairs, or monadelphous basally via a sheath (*Strobilanthes*); anthers with 1 or 2 thecae; thecae parallel to perpendicular, equally inserted to superposed, spherical to linear, base muticous or spurred, usually longitudinally dehiscent; staminodes 0–3, consisting of minute projections or sterile filaments. Disk annular and nectar-producing at base of ovary. Ovary superior, 2-locular, placentation axile, with 2 to many ovules per locule; style filiform, simple; stigma funnel-shaped or 2-lobed (one lobe sometimes suppressed), one or both lobes sometimes recurved or recoiled. Fruit a loculicidal, stipitate or not, 2-valved, explosively dehiscent capsule [rarely drupaceous], 2- to many seeded, apex with or without a beak; septa remaining attached to or separating from inner wall of mature capsule. Seeds usually borne on hooklike retinacula (attached to septa of capsule), or retinacula lacking (*Nelsonia*, *Ophiorrhiziphyllon*, *Staurogyne*, *Thunbergia*), surface smooth or roughened, pubescent or lacking trichomes, sometimes with hygroscopic trichomes that expand when moistened.

About 220 genera and ca. 4,000 species: pantropical and subtropical, with a few species in temperate regions; 35 genera (one endemic) and 304 species (134 endemic, eight introduced) in China.

Pollen characters have traditionally been important in delimiting genera and higher taxa in the family; they are used sparingly in the key below.

*Avicennia* Linnaeus, usually placed in either Verbenaceae (and treated as such in Fl. China 17: 49. 1994) or Avicenniaceae, is now included in Acanthaceae on the basis of molecular phylogenetic studies (e.g., A. E. Schwarzbach & L. A. McDade, Syst. Bot. 27: 84–98. 2002).

The major economic importance of the family is horticultural. Species of *Acanthus*, *Aphelandra* R. Brown, *Barleria*, *Crossandra* Salisbury, *Eranthemum*, *Fittonia* Coemans, *Justicia*, *Odontonema* Nees, *Pachystachys* Nees, *Ruellia*, *Sanchezia* Ruiz & Pavon, *Thunbergia*, and numerous other genera are widely cultivated as ornamentals. Many species are cultivated in China but not treated in the present account. These include: *Aphelandra squarrosa* Nees, *Barleria lupulina* Lindley, *Crossandra infundibuliformis* (Linnaeus) Nees, *Eranthemum pulchellum* Andrews, *Fittonia albivenis* (Veitch) Brummitt, *Justicia betonica* Linnaeus, *J. brandegeana* Wasshausen & L. B. Smith, *J. carnea* Lindley, *Pachystachys lutea* Nees, *Ruellia elegans* Poir., *R. simplex* C. Wright, *Sanchezia parvibracteata* Sprague & Hutchinson, *Thunbergia erecta* (Bentham) T. Anderson, and *T. laurifolia* Lindley.

Hu Chiachi & Tsui Hongpin. 2002. Acanthaceae. In: Hu Chiachi, ed., Fl. Reipubl. Popularis Sin. 70: 1–309.

- 1a. Vines; calyx cupular with 10–20 lobes or reduced to an entire ring; capsule with a prominent apical sterile beak; seeds not borne on hooklike retinacula ..... 4. *Thunbergia*
- 1b. Prostrate or erect herbs, shrubs, or rarely small trees; calyx 4- or 5-lobed; capsule lacking a prominent apical sterile beak; seeds borne on hooklike retinacula or not.
  - 2a. Cystoliths absent; retinacula absent (except *Acanthus* and *Blepharis*).
    - 3a. Seeds laterally compressed, borne on hooklike retinacula; corolla 1-lipped (upper lip absent), lobes not with descending cochlear aestivation; anthers 1-thealous.
    - 4a. Leaves opposite; flowers not subtended by up to 5 pairs of bracts; seeds lacking hygroscopic trichomes; lower filaments without an apical appendage ..... 5. *Acanthus*
    - 4b. Leaves usually in pseudo-whorl of 4; flowers subtended by up to 5 pairs of bracts; seeds with hygroscopic trichomes; lower filaments with an apical appendage ..... 6. *Blepharis*
  - 3b. Seeds subspherical or blocky, not borne on hooklike retinacula; corolla 2-lipped, lobes with descending cochlear aestivation; anthers 2-thealous.

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- 5a. Prostrate herbs; bracteoles absent; calyx 4-lobed, anterior lobe 2-cleft at apex; stamens 2 ..... 1. *Nelsonia*
- 5b. Erect herbs; bracteoles present; calyx 5-lobed; stamens 2 or 4.
- 6a. Stamens 4, included or slightly exserted from mouth of corolla; anther thecae of a pair parallel; staminodes 0 or 1 ..... 2. *Staurogyne*
- 6b. Stamens 2, long exserted; anther thecae of a pair divergent toward apex; staminodes 2 ..... 3. *Ophiorrhizophyllum*
- 2b. Cystoliths present; retinacula present, hooklike.
- 7a. Calyx lobes heteromorphic, posterior lobe usually largest, anterior lobes connate to a greater degree than other lobes, lateral lobes smallest and innermost; corolla lobe aestivation quincuncial.
- 8a. Corolla large (mostly > 3 cm), upper lip usually appearing 4-lobed and lower lip appearing 1-lobed ..... 29. *Barleria*
- 8b. Corolla small (< 3 cm), upper lip 2-lobed and lower lip 3-lobed.
- 9a. Corolla to 1 cm; anther thecae usually lacking basal appendages; capsule 4–7 mm ..... 30. *Lepidagathis*
- 9b. Corolla ca. 2.5 cm; anther thecae spurred at base; capsule 12–16 mm ..... 31. *Chroesthes*
- 7b. Calyx lobes homomorphic (or nearly so; sometimes partially fused to form a bipartite or tripartite calyx in *Strobilanthes*), not as described above; corolla lobe aestivation not quincuncial.
- 10a. Corolla lobes contorted in bud; stamens (or stamens + staminodes) 4.
- 11a. Style held in place by trichomes on one side of corolla tube; stamens monadelphous (by a sheath) at base ..... 7. *Strobilanthes*
- 11b. Style not held in place by trichomes on one side of corolla tube; stamens not monadelphous at base.
- 12a. Inflorescence secund strobilate spikes with orbicular to reniform bracts; ovules 2 per locule; seeds to 4 per capsule; corolla ca. 0.6 cm; septa with attached retinacula separating from inner wall of mature capsule ..... 8. *Phaulopsis*
- 12b. Inflorescence not as described above; ovules 4 to many per locule; seeds 4 or more per capsule; corolla 0.6–5.5 cm; septa with attached retinacula not separating from inner wall of mature capsule (except in *Ruellia blechum*).
- 13a. Corolla limb distinctly 2-lipped, lobes usually not equal; calyx tube often rupturing in weak hyaline regions between lobes; pollen 4-colporate, interapertural regions multistriate with pseudocolpi ..... 9. *Hygrophila*
- 13b. Corolla limb nearly regular, lobes equal to subequal; mature calyx tube not rupturing in weak hyaline regions between lobes; pollen otherwise.
- 14a. Fertile stamens 2, staminodes 2 ..... 10. *Eranthemum*
- 14b. Fertile stamens 4.
- 15a. Anther thecae spurred at base ..... 11. *Echinacanthus*
- 15b. Anther thecae muticous at base.
- 16a. Stems short; leaves in a basal rosette; anther thecae usually widely separated by a broad connective ..... 12. *Pararuellia*
- 16b. Stems elongate; leaves cauline; anther thecae not separated by a broad connective ..... 13. *Ruellia*
- 10b. Corolla lobes ascending cochlear in bud; stamens 2 (except 4 in *Asystasia*), staminodes 0 or 2.
- 17a. Ovules 3 to many per locule; seeds 6 to many per capsule; pollen with apertural margins conspicuously thickened.
- 18a. Capsule compressed perpendicular to septum; seeds subglobose, glabrous ..... 33. *Andrographis*
- 18b. Capsule linear and 4-angled, not compressed perpendicular to septum; seeds strongly compressed, glabrous or pubescent.
- 19a. Staminodes 0 ..... 32. *Gymnostachyum*
- 19b. Staminodes 2.
- 20a. Corolla tube cylindric and slightly curved ..... 34. *Phlogacanthus*
- 20b. Corolla tube abruptly inflated near middle and usually bent ca. 90° ..... 35. *Cystacanthus*
- 17b. Ovules 2 per locule; seeds 4 per capsule; pollen with apertural margins not thickened.
- 21a. Stamens 4 ..... 14. *Asystasia*
- 21b. Stamens 2.
- 22a. Anthers 1-thecous.
- 23a. Flowers subtended by a single pair of bracteoles; corolla not resupinate 180° by a twisting of corolla tube (i.e., upper lip entire to 2-lobed and lower lip 3-lobed), or if position of lips reversed then this by geniculation (without twisting) of corolla tube ..... 18. *Clinacanthus*
- 23b. Flowers subtended by an involucre of 2 or more pairs of floral bracteoles; corolla resupinate 180° by twisting of corolla tube (i.e., lip in upper position 3-lobed and lip in lower position entire to 2-lobed) ..... 28. *Hypoestes*

- 22b. Anthers 2-theous.
- 24a. Flowers subtended by involucre of 2 or more pairs of floral bracteoles; corolla resupinate 180° (i.e., lip in upper position 3-lobed and lip in lower position entire to 2-lobed).
- 25a. Septa with attached retinacula separating from inner wall of mature capsule ..... 26. *Dicliptera*
- 25b. Septa with attached retinacula remaining attached to inner wall of mature capsule ..... 27. *Peristrophe*
- 24b. Flowers subtended by a single pair of bracteoles (or bracteoles rarely lacking); corolla not resupinate 180° (i.e., upper lip entire to 2-lobed and lower lip 3-lobed).
- 26a. Staminodes 2.
- 27a. Corolla ± salverform (i.e., tube slender and cylindric, limb spreading and inconspicuously 2-lipped), tube conspicuously longer than limb, not or only slightly widened distally ..... 15. *Pseuderanthemum*
- 27b. Corolla ± campanulate to strongly 2-lipped (not salverform), tube not longer than limb, gradually widened distally.
- 28a. Corolla 3–4 cm; anther thecae 4–5 mm ..... 16. *Mackaya*
- 28b. Corolla less than 2 cm; anther thecae less than 3 mm.
- 29a. Corolla campanulate, 6.5–10 mm, externally glabrous; pollen 4-aperturate ..... 22. *Codonacanthus*
- 29b. Corolla strongly 2-lipped, 10–15 mm, externally pubescent (to subglabrous); pollen 3-aperturate ..... 23. *Cosmianthemum*
- 26b. Staminodes absent.
- 30a. Upper lip of corolla lacking a stylar furrow on internal surface; anther thecae lacking basal appendages.
- 31a. Corolla 1.7–4.5 cm; anther thecae subequally to unequally inserted; pollen 2-aperturate ..... 17. *Isoglossa*
- 31b. Corolla less than 10 mm; anther thecae equally to subequally inserted; pollen 3–5-aperturate.\*
- 32a. Corolla glabrous outside ..... 19. *Kudoacanthus*
- 32b. Corolla pubescent outside ..... 21. *Leptostachya*
- 30b. Upper lip of corolla rugulate (i.e., with a furrow on inner surface of lip in which style resides); anther thecae (at least lower theca) usually with a basal appendage.
- 33a. Septa with attached retinacula separating from inner wall of mature capsule; inflorescence often dense with imbricate bracts 2- or 4-ranked (but only 2 ranks fertile) ..... 20. *Rungia*
- 33b. Septa with attached retinacula remaining attached to inner wall of mature capsule; inflorescence not as above.
- 34a. Corolla not with combination of characters noted below ..... 24. *Justicia*
- 34b. Corolla white or greenish white, tube narrowly cylindric, conspicuously longer than limb ..... 25. *Rhinacanthus*

# 1. NELSONIA R. Brown, Prodr. 480. 1810.

瘤子草属 liu zi cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, pubescent, without cystoliths. Leaves opposite, shortly petiolate; leaf blade pinnately veined, margin entire. Inflorescences axillary or terminal spikes; bracts overlapping. Flowers ± spirally arranged, sessile, subtended by a bract; bracteoles absent. Calyx 4-lobed to base; lobes unequal, anterior lobe apically 2-cleft. Corolla tube slender, sometimes widening into a throat; limb 2-lipped; lower lip 3-lobed, upper lip 2-lobed; lobes ± equal, descending cochlear in bud. Stamens 2, included or slightly exserted; filaments basally pubescent; anthers 2-theous; thecae subspherical, muticous, opening at base by a pore that has a small flap; stami-

nodes absent. Ovary with 8–28 ovules in 2–4 rows per locule; stigma usually unequally 2-lobed. Capsule conical; retinacula absent. Seeds subspherical, small, flattened on 1 face, lacking trichomes.

Five species or fewer: widely occurring in tropical Africa, Asia, Australia, and South America (introduced elsewhere); one species in China.

A single species, *Nelsonia canescens*, is sometimes recognized (e.g., A. B. M. E. Hossain, Willdenowia 14: 397–403. 1984), but Vollesen (e.g., K. Vollesen in J. H. Seyani & A. C. Chikuni, eds., Proceedings of the XIII Plenary Meeting of AETFAT, Zomba, Malawi, 2–11 Apr 1991, 315–325. 1994) presented arguments for recognizing up to five species.

**1. *Nelsonia canescens* (Lamarck) Sprengel, Syst. Veg. 1: 42. 1824.**

瘤子草 liu zi cao

*Justicia canescens* Lamarck, Tabl. Encycl. 1: 41. 1791.

Herbs 10–20 cm tall, annual, creeping, sprawling, prostrate, or decumbent. Stems subterete, villous, often rooting at nodes. Petiole 0.2–3(–4) cm, villous; leaf blade elliptic to ovate, 1–2.2 × 0.4–1.2 cm but basal ones sometimes 6–12 × 3.5–5 cm, both surfaces villous, secondary veins 3–7 on each side of midvein, base cuneate, margin entire, apex acute. Spikes 1.5–4 cm;

bracts elliptic, 6–7.5 × 3–4 mm, 5–7-veined. Calyx abaxial lobe ca. 2 × 0.6 mm, apex 2-lobed; adaxial lobe ca. 3 × 1 mm; lateral lobes ca. 2 × 0.5 mm. Corolla bluish purple or white, externally glabrous; tube cylindric for ca. 1.5 mm, contracted near midpoint then expanded into throat; lower lip ca. 2.3 mm; upper lip ca. 2 mm. Stamens inserted at base of throat; filaments ca. 0.5 mm, glabrous. Ovary glabrous; ovules 4–8 per locule. Capsule ca. 5 × 2 mm, 8–16-seeded. Seeds broadly ellipsoid, granulate. Fl. Oct–Mar, fr. Mar–May.  $2n = 34 + B, 36$ .

Wet places, open forests; 400–2000 m. Guangxi, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; Africa, Madagascar].

## 2. STAUROGYNE Wallich, Pl. Asiat. Rar. 2: 80. 1831.

叉柱花属 cha zhu hua shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Ebermaiera* Nees.

Annual or perennial herbs or small shrubs, without cystoliths. Stems very short or elongate. Leaves in a basal rosette or cauline, opposite (or alternate, especially apically), petiolate or sessile; leaf blade margin entire or nearly so. Inflorescences terminal or axillary, racemes or spikes; bracts opposite or alternate, leaflike or usually well differentiated from leaves; bracteoles present. Calyx 5-lobed almost to base; lobes equal or unequal. Corolla tube cylindric or basally cylindric and apically expanding into a campanulate throat; limb subactinomorphic to 2-lipped, 5-lobed; lobes subequal, patent, descending cochlear in bud. Stamens 4, didynamous, included or anterior pair slightly exerted; filaments usually hairy; anthers 2-theous; thecae parallel, usually equal; staminode 1 or more, sometimes absent. Ovary with usually 12–60 ovules arranged in 2 or 4 rows per locule; style glabrous; stigmas 2-lobed, sometimes repeatedly 2-lobed. Capsule oblong, many seeded; retinacula absent. Seeds minute, subspherical or cuboid.

About 140 species: tropical regions worldwide; 17 species (eight endemic) in China.

- 1a. Bracts pinnately veined.
  - 2a. Plants to 20 cm tall; leaf blade 2.5–6 × 1–2 cm; spikes ca. 1 cm ..... 7. *S. paotingensis*
  - 2b. Plants to 1 m tall; leaf blade 13–17 × 4.5–7 cm; racemes to 15 cm ..... 8. *S. rivularis*
- 1b. Bracts not pinnately veined.
  - 3a. Leaf blade base cordate ..... 5. *S. chapaensis*
  - 3b. Leaf blade base cuneate, rounded, or attenuate.
    - 4a. Stems very short; leaves forming a basal rosette.
      - 5a. Leaf blade oblanceolate, widest above middle ..... 10. *S. concinnula*
      - 5b. Leaf blade ovate-oblong, elliptic, oblong, ovate, or oblong-obovate, widest below middle.
        - 6a. Leaf blade adaxially villous; corolla ca. 2 cm ..... 6. *S. sinica*
        - 6b. Leaf blade adaxially strigose; corolla ca. 5.5 mm ..... 12. *S. strigosa*
    - 4b. Stems elongate; leaves cauline.
      - 7a. Calyx 1.8–2.4 cm; corolla 3–4 cm ..... 4. *S. sesamoides*
      - 7b. Calyx less than 1.5 cm; corolla less than 2.5 cm (corollas unknown in *S. sichuanica* and *S. yunnanensis*).
        - 8a. Leaf blade linear, 5–9 mm wide, length/width greater than 5 ..... 13. *S. stenophylla*
        - 8b. Leaf blade lanceolate, ovate-lanceolate, oblong, or elliptic, usually broader than 1 cm, length/width less than 3.
          - 9a. Calyx lobes spatulate ..... 15. *S. petelotii*
          - 9b. Calyx lobes linear, lanceolate, or triangular.
            - 10a. Longer pair of stamens slightly exerted ..... 1. *S. hypoleuca*
            - 10b. Stamens all included.

- 11a. Inflorescences all borne on axillary brachyblasts ..... 2. *S. longicuneata*
- 11b. Inflorescences not all borne on axillary brachyblasts.
  - 12a. Inflorescences terminal only; calyx lobes unequal.
    - 13a. Bracts adaxially densely pubescent ..... 14. *S. yunnanensis*
    - 13b. Bracts glabrous or subglabrous ..... 16. *S. vicina*
  - 12b. Inflorescences terminal and axillary; calyx lobes subequal or equal.
    - 14a. Stems suberect or ascending from a decumbent base ..... 17. *S. debilis*
    - 14b. Stems erect.
      - 15a. Filaments glabrous ..... 11. *S. hainanensis*
      - 15b. Filaments pubescent.
        - 16a. Peduncles, rachises, and pedicels puberulent ..... 3. *S. sichuanica*
        - 16b. Peduncles, rachises, and pedicels glabrous ..... 9. *S. brachystachya*

**1. *Staurogyne hypoleuca*** Benoist, Notul. Syst. (Paris) 2: 338. 1911.

灰背叉柱花 *hui bei cha zhu hua*

*Ophiorrhiziphyllon hypoleucum* (Benoist) Benoist.

Herbs to 1 m tall. Stems glabrous, lenticellate. Petiole 3–6 cm; leaf blade oblong, elliptic, or lanceolate, 13–17 × 4.5–7 cm, both surfaces glabrous, abaxially glaucous, adaxially green, secondary veins 8–11 on each side of midvein, base cuneate and slightly decurrent onto petiole, margin entire or undulate, apex acuminate to sometimes acute. Racemes terminal or in axils of apical leaves, to 15 cm, unbranched or branched at base; rachis gland-tipped pilose; bracts linear, 4–4.5 × ca. 0.8 mm, apex acuminate; bracteoles linear, ca. 2 mm. Flowers alternate. Pedicel 2–3.5 mm. Calyx ca. 5 mm, outside pubescent with gland-tipped trichomes; lobes triangular-ovate, ca. 4 × 1 mm, unequal with lateral 2 lobes smaller, margin ciliate with gland-tipped trichomes. Corolla white, funnel-shaped, ca. 7 mm; lobes suborbicular, ca. 1.5 × 1.3 mm, subequal. Stamens with longer pair ca. 3 mm and shorter pair ca. 2 mm; filaments glabrous; anther thecae ca. 1 mm, those of longer pair of stamens slightly exerted. Ovary ellipsoid, ca. 2 mm; ovules in 2 rows per locule, 12 in each row; style ca. 3 mm, glabrous; stigma 2-cleft. Capsule cylindric, 5–7 mm. Fl. Dec–Apr.

Forests; 300–1800 m. Yunnan [Vietnam].

**2. *Staurogyne longicuneata*** H. S. Lo, Bull. Bot. Res., Harbin 8(1): 2. 1988.

楔叶叉柱花 *xie ye cha zhu hua*

Herbs to 30 cm tall. Stems stout, 4-angled, pubescent. Petiole 2–5 cm, brown pubescent, soon glabrescent; leaf blade elliptic to elliptic-lanceolate, 10–20 × 5–7 cm, both surfaces brown or white pubescent, abaxially pale green, adaxially green, secondary veins 11–17 on each side of midvein, base cuneate and usually decurrent onto petiole, margin entire, apex acute to obtuse. Racemes borne on axillary brachyblasts, to 16 cm; rachis brownish pubescent with gland-tipped trichomes; bracts linear, 3–5 × ca. 1 mm; bracteoles linear, 3–4 × ca. 1 mm. Pedicels 2–5 mm. Calyx ca. 1 cm, outside brown pubescent, inside glabrous; lobes linear, ca. 9 × 1 mm, subequal. Corolla ca. 1.5 cm, outside pubescent; lobes oblong, ca. 2 × 1.5 mm, subequal. Staminal filaments pubescent; anther thecae ca. 1 mm. Style glabrous; stigma 3-lobed. Capsule ellipsoid, 5–6 mm. Seeds black, in 2 rows, pubescent. Fl. Mar–Apr.

• Forests or thickets by streams; 100–400 m. Yunnan.

**3. *Staurogyne sichuanica*** H. S. Lo, Bull. Bot. Res., Harbin 8(1): 2. 1988.

金长莲 *jin chang lian*

Herbs 10–30 cm tall. Stems purplish black, terete, sulcate, pubescent. Petiole purple, 1–2 cm, puberulent; leaf blade ovate-lanceolate to elliptic-lanceolate, 4–9 × 1.3–3 mm, both surfaces sparsely strigillose, secondary veins 6–11 on each side of midvein and abaxially inconspicuous, base cuneate to broadly cuneate and sometimes oblique, margin entire, apex acuminate. Racemes terminal or axillary, 3.5–6 cm, 2–5-flowered; peduncle and rachis slightly puberulent; bracts linear, ca. 5.5 × 0.5 mm, subglabrous, 1-veined, margin ciliate; bracteoles similar to bracts. Pedicel 4–7 mm. Calyx ca. 1.1 cm, subglabrous; lobes linear, 9–11 × 0.6–1.2 mm, subequal, 3-veined, margin ciliate. Corolla purplish blue in bud. Staminal filaments glabrous. Ovary glabrous. Capsule ca. 5 mm. Fl. Feb, fr. Jun–Jul.

• Forests; 500–600 m. Sichuan (Changning, Hejiang).

**4. *Staurogyne sesamoides*** (Handel-Mazzetti) B. L. Burtt, Notes Roy. Bot. Gard. Edinburgh 22: 310. 1958.

大花叉柱花 *da hua cha zhu hua*

*Loxostigma sesamoides* Handel-Mazzetti, Oesterr. Bot. Z. 85: 217. 1936; *Staurogyne dolichocalyx* E. Hossain.

Herbs to 40 cm tall, unbranched. Stems striate, tomentose, soon glabrescent. Petiole 1.5–4 cm, tomentose; leaf blade elliptic-lanceolate, 5–13 × 2–5.5 cm, abaxially pubescent along veins, adaxially glabrous, secondary veins 5–11 on each side of midvein, base cuneate, margin entire or sometimes irregularly undulate, apex acuminate to sometimes acute. Racemes terminal or axillary, densely flowered, elongated after flowering; peduncle and rachis pubescent; bracts lanceolate, 6–7 × 2–2.2 mm, pilose, 3-veined; bracteoles lanceolate, 8–8.5 × ca. 2 mm, pilose. Pedicel 0.8–1 mm but elongated to 5 mm in fruit, tomentose. Calyx 1.8–2.4 mm, outside sparsely pilose or glabrous; lobes lanceolate, 1.6–2.2 × 0.1–0.2 cm, subequal. Corolla white or pinkish on lobes, 3–4 cm; lobes suborbicular, ca. 1 cm in diam., subequal, 3-veined. Stamens with longer pair ca. 1.7 cm and shorter pair ca. 1.3 cm; filaments gland-tipped hairy and apically more densely hairy; anther thecae ca. 2.5 × 1.5 mm, with appendage, margin hispid. Ovary glabrous; ovules ca. 60 in 2 rows; style ca. 2 cm, sparsely pubescent; stigma triangular, 2-cleft; stigma lobes fimbriate on margin, posterior one

elliptic and ca.  $3 \times 2$  mm, anterior one ca.  $4 \times 4$  mm. Capsule narrowly ellipsoid. Seeds small, alveolate. Fl. Mar–May.

Moist places in forests; below 800 m. Guangdong, Guangxi [Vietnam].

**5. *Staurogyne chapaensis*** Benoist, Bull. Mus. Natl. Hist. Nat., sér. 2, 5: 172. 1933.

弯花叉柱花 wan hua cha zhu hua

Herbs to 10 cm tall. Stems short. Leaves in a basal rosette; petiole to 11 cm, brownish tomentose; leaf blade ovate to oblong,  $2.5\text{--}14.5 \times 2\text{--}6$  cm, abaxially glaucous and densely hairy, adaxially green and sparsely hairy, secondary veins 7–9 on each side of midvein, base cordate, margin entire or slightly undulate, apex obtuse. Racemes terminal or axillary; peduncle ca. 4 cm, villous; rachis villous; bracts obovate to linear-spatulate,  $2.5\text{--}3.5$  cm, abaxially villous, adaxially glabrous; bracteoles linear-spatulate, ca.  $5 \times 1.6$  mm, abaxially villous, adaxially glabrous, margin ciliate, apex obtuse. Pedicel  $1.5\text{--}7$  mm, villous. Calyx ca. 1 cm, outside villous, inside glabrous; lobes unequal, margins ciliate, posterior one spatulate and ca.  $8 \times 2$  mm, lateral 2 linear and ca.  $5 \times 0.5$  mm. Corolla light bluish purple, ca. 1.5 cm; lobes orbicular, subequal. Stamens with longer pair ca. 2 mm and shorter pair ca. 1.1 mm; filaments glabrous; anther thecae subequal, base with a rectangular appendage. Ovary ellipsoid, ca. 2 mm, glabrous; style ca. 5.5 mm, glabrous. Capsule obovoid-ellipsoid, ca. 6 mm. Fl. Mar–May, fr. Jul–Aug.

Forests; 1000–2000 m. Guangdong, Guangxi, Hunan, Yunnan [Vietnam].

**6. *Staurogyne sinica*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 590. 1974.

中华叉柱花 zhong hua cha zhu hua

*Titanotrichum parviflorum* X. B. Ye & W. T. Lin.

Herbs, annual. Stems very short, densely pubescent. Leaves in a basal rosette; petiole  $0.5\text{--}3$  cm; leaf blade ovate-oblong,  $4\text{--}9 \times 1\text{--}4.5$  cm, papery, abaxially pale green and villous along veins, adaxially green and villous, secondary veins 5–7 on each side of midvein, base rounded to broadly cuneate, margin entire, apex rounded. Racemes terminal or axillary, 3–12 cm; peduncle hispid; bracts linear-spatulate, 3–4 mm, pubescent on both surfaces, 3-veined, apex rounded; bracteoles similar to bracts. Pedicel 4–5 mm, hispid. Calyx 6–9 mm, outside villous; lobes linear-lanceolate, unequal, anterior and posterior ones 6–8 mm and lateral ones 5–7 mm, 3-veined. Corolla whitish purple, tubular-campanulate, ca. 2 cm; tube basally cylindric for ca. 8 mm; lobes oblong,  $1.8\text{--}2.5 \times 1.5\text{--}2$  mm, slightly unequal, apex rounded. Stamens with longer pair ca. 7 mm and shorter pair ca. 6 mm; filaments glabrous; anther thecae ca. 1.8 mm; staminode ca. 1 mm. Ovary ellipsoid, ca. 1.8 mm, glabrous; style ca. 8 mm, glabrous. Capsule oblong-ovoid, ca. 6 mm, glabrous. Fl. Mar–May, fr. Aug.

• Dense forests; 500–1200 m. Guangdong, Hainan.

**7. *Staurogyne paotingensis*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 589. 1974.

保亭叉柱花 bao ting cha zhu hua

Herbs 10–20 cm tall, annual. Stems erect, pubescent. Leaves cauline; petiole to 4 cm; leaf blade elliptic, elliptic-lanceolate, or rarely subovate,  $2.5\text{--}6 \times 1\text{--}2$  cm, papery, abaxially green and glabrous, adaxially pale green and glabrous except slightly pubescent along midvein, secondary veins 6–9 on each side of midvein, base cuneate, margin entire, apex obtuse to rounded. Spikes borne on axillary brachyblasts, ca. 1 cm; peduncle and rachis pubescent; bracts elliptic to spatulate-elliptic,  $6\text{--}7 \times$  ca. 3.5 mm, abaxially pubescent, pinnately veined, apex obtuse; bracteoles linear-oblong, ca.  $6 \times 1$  mm, abaxially pubescent, 1-veined, apex acute. Pedicel short or absent. Calyx ca. 1 cm, outside pubescent; lobes linear, 8–9 mm, unequal, margin ciliate. Corolla purple, ca. 9 mm, outside pubescent, inside pubescent at base; tube basally cylindric for ca. 2 mm; lobes suborbicular,  $1.7\text{--}2$  mm in diam., slightly unequal, apex rounded. Stamens with longer pair ca. 5 mm and shorter pair ca. 3 mm; filaments flattened, ciliate; anther thecae ca. 1 mm, base appendaged; staminode ca. 1 mm. Ovary oblong, glabrous; ovules ca. 24 in 2 rows per locule; style ca. 3 mm; stigma 2-lobed, lobes unequal with posterior one 2-dentate. Capsule ovoid-oblong, ca. 6 mm. Seeds orbicular, ca. 0.2 mm in diam. Fl. Dec.

• Wet places, paddy fields. Hainan (Baoting).

**8. *Staurogyne rivularis*** Merrill, Philipp. J. Sci., C, 7: 248. 1912.

瘦叉柱花 shou cha zhu hua

Herbs to 1 m tall, usually ascending from a decumbent base and rooting at nodes on lower portion. Stems striate and lenticellate, glabrous. Petiole 3–6 cm; leaf blade elliptic, oblong, or lanceolate,  $13\text{--}17 \times 4.5\text{--}7$  cm, both surfaces glabrous, secondary veins 8–11 on each side of midvein, base cuneate and slightly decurrent onto petiole, margin entire or undulate, apex acuminate to acute. Racemes terminal or axillary from apical leaves, to 15 cm, unbranched or with 2 branches at base; rachis gland-tipped pubescent; bracts linear,  $4\text{--}4.5 \times$  ca. 0.8 mm, pinnately veined, apex acuminate; bracteoles linear, ca.  $2 \times 0.5$  mm. Pedicel 2–3.5 mm. Calyx ca. 5 mm, outside pubescent with gland-tipped trichomes. Corolla white, funnel-shaped, ca. 7 mm; lobes suborbicular, ca.  $1.5 \times 1.3$  mm, subequal, apex rounded. Stamens with longer pair ca. 3 mm and shorter pair ca. 2 mm; filaments glabrous; anther thecae ca. 1 mm. Ovary ellipsoid, ca.  $2 \times 1$  mm, glabrous; ovules 12 in 2 rows per locule; style ca. 3 cm, glabrous; stigma 2-lobed. Capsule cylindric, 5–7 mm. Fl. Dec–May.

Forests along streams. Hainan, Yunnan [Vietnam].

**9. *Staurogyne brachystachya*** Benoist, Bull. Mus. Natl. Hist. Nat., sér. 2, 5: 174. 1933.

短穗叉柱花 duan sui cha zhu hua

Herbs to 80 cm tall. Stems subterete, sulcate, brown pubescent. Petiole  $0.5\text{--}2$  cm, brown pubescent; leaf blade lanceolate to ovate-lanceolate,  $3\text{--}8 \times 1\text{--}1.6$  cm, both surfaces glabrous, abaxially pale green but brown when dry, adaxially green, secondary veins 8–10 on each side of midvein, base narrowly cuneate, margin irregularly undulate, apex acute. Racemes axil-

lary or terminal, 2–4 cm, 3–5-flowered; peduncle and rachis glabrous; bracts linear, 2.3–5 mm, thickened, 1-veined, glabrous; bracteoles linear, 2.3–3 mm, glabrous, 1-veined. Pedicel 1.2–1.6 cm, glabrous. Calyx 0.9–1.1 cm, glabrous except margin slightly ciliate with gland-tipped trichomes; lobes linear, 7.5–9 × ca. 1 mm, subequal, apex acuminate. Corolla white, 1–1.4 cm, glabrous; lobes orbicular, ca. 2 mm in diam. Stamens with longer pair 7–9 mm and shorter pair 6–8 mm; filaments pubescent (especially apically); anther thecae with a long tie-shaped appendage, apex hirsute; staminode small. Ovary glabrous; style ca. 1 cm, glabrous; stigma 2-lobed. Capsule not seen. Fl. Mar–Apr.

Forests; 800–1200 m. Guangxi, Yunnan [Vietnam].

**10. *Staurogyne concinnula*** (Hance) Kuntze, Revis. Gen. Pl. 2: 497. 1891.

叉柱花 cha zhu hua

*Ebermaiera concinnula* Hance, J. Bot. 6: 300. 1868.

Herbs to 15 cm tall, perennial. Stems generally short, partially subterranean, 0.5–6 cm, usually simple, rarely few branched, terete, densely shortly pubescent. Leaves in a basal rosette; petiole 0.3–3 cm, pubescent; leaf blade oblanceolate, 1.5–7 × 0.5–1.5 cm, scarious, abaxially glaucous and pubescent along veins, adaxially green and sometimes pubescent along veins, secondary veins 5–8 on each side of midvein and abaxially prominent, base gradually attenuate, margin obscurely undulate, apex obtuse to rounded. Racemes 1–4, axillary, sometimes loosely branched and forming a panicle, 5–15 cm; branches slender, with 3–10 interrupted flowers; bracts linear to linear-oblanceolate, 2–4 mm, apex obtuse to subacute; bracteoles borne near middle of pedicel, linear, ca. 2 mm, apex obtuse. Pedicel 1–4 mm, pubescent. Calyx campanulate, 5-lobed almost to base, glabrous except for margin minutely pilose; lobes linear to linear-lanceolate, 5–6 mm but accrescent to 7 mm in fruit, unequal, apex acute. Corolla white, tubular-funnel-form, ca. 1 cm; tube ampliate, ca. 6 mm, ca. 4 mm wide; lobes orbicular, ca. 3 mm, subequal. Stamens with longer pair ca. 5 mm and shorter pair ca. 2.5 mm; filaments glabrous; anther thecae ca. 1.5 mm. Ovary ellipsoid, glabrous; style ca. 5 mm; stigma subulate. Capsule oblong, 4–5 × ca. 1.5 mm, glabrous, shorter than persistent calyx. Seeds suborbicular, ca. 0.2 mm. Fl. Mar–May, fr. Jul–Sep.

Forests along streams. Fujian, Guangdong, Hainan, Taiwan [Japan].

**11. *Staurogyne hainanensis*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 589. 1974.

海南叉柱花 hai nan cha zhu hua

Herbs to 30 cm tall, perennial. Stems terete, villous. Leaves cauline, crowded at apex of branches; petiole 1–3 cm, densely villous; leaf blade oblong to oblong-lanceolate, 3–10 × 1.3–3 cm, subleathery, abaxially adpressed villous, adaxially glabrous except midvein slightly villous, secondary veins 6–10 on each side of midvein, base cuneate to broadly cuneate, margins entire or irregularly undulate, apex rounded. Racemes terminal or axillary, to 16 cm; rachis pubescent; bracts linear-spat-

ulate to linear, ca. 2.5 mm, 1-veined; bracteoles similar to bracts. Pedicel ca. 3 mm. Calyx 6–7 mm, subglabrous; lobes linear, unequal, 3-veined, apex acuminate. Corolla purple, ca. 8 mm; lobes ovate-oblong, 1.2–1.4 × ca. 1 mm, apex rounded. Stamens with longer pair ca. 5 mm and shorter pair ca. 3 mm; filaments glabrous; anther thecae of longer stamens unequal and of shorter stamens equal; staminode ca. 0.7 mm. Ovary ovoid, ca. 1 mm, glabrous; style ca. 6 mm. Capsule ovoid-oblong, ca. 5 mm, glabrous. Fl. Feb–May, fr. Jul–Aug.

• Streamsides; 600–900 m. Hainan.

**12. *Staurogyne strigosa*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 590. 1974.

琼海叉柱花 qiong hai cha zhu hua

Herbs, annual. Stems very short, villous. Leaves in a basal rosette; petiole 0.5–2.2 cm, strigose; leaf blade elliptic, oblong, ovate, or oblong-obovate, 1–1.5 × 0.8–2.5 cm, papery, abaxially villous, adaxially strigose, secondary veins 5–7 on each side of midvein, base cuneate to rounded, margin entire, apex rounded to obtuse. Raceme terminal or axillary, to 6 cm, simple or rarely branched; peduncle villous; bracts spatulate-linear, ca. 6 mm, abaxially villous, apex obtuse, rounded, or acute; bracteoles similar to bracts. Pedicel 1–3 mm, villous. Calyx 6–8 mm, abaxially villous; lobes linear, 3-veined, apex acuminate. Corolla ca. 5.5 mm; lobes orbicular, ca. 1 mm in diam. Staminal filaments glabrous; anther thecae of longer stamens ca. 0.7 mm and of shorter stamens ca. 0.2 mm; staminode ca. 1 mm. Ovary glabrous; stigma 2-lobed. Capsule ovoid-oblong, ca. 6 mm, glabrous. Fl. Feb–Mar, fr. Jul–Aug.

• Forests; below 200 m. Hainan (Qionghai).

**13. *Staurogyne stenophylla*** Merrill & Chun, Sunyatsenia 2: 322. 1935.

狭叶叉柱花 xia ye cha zhu hua

Herbs, perennial. Stems short, densely villous. Leaves usually crowded at apex of branches (but not forming a basal rosette); petiole ca. 1 cm, pubescent; leaf blade linear to lanceolate-linear, 6–12 × 0.5–0.9 cm, papery, abaxially paler and villous especially along veins, adaxially dark green, densely white papillose, and subglabrous except for margin slightly pubescent, secondary veins 8–13 on each side of midvein, base attenuate, margin entire or undulate, apex obtuse. Racemes axillary, 5–10 cm, unbranched or with 1 or 2 branches at base; peduncle and rachis villous; bracts linear, 3.8–4.5 mm, abaxially pubescent, 1-veined; bracteoles linear, ca. 3.7 mm, abaxially pubescent. Pedicel 2–3.5 mm. Calyx ca. 6 mm, abaxially slightly villous; lobes linear-triangular, 4.5–5.1 × 0.5–0.6 mm, unequal, margin ciliate. Corolla pink, ca. 8 mm; tube basally cylindric for ca. 1.5 mm then gradually widened, convex at one side; lobes orbicular to suborbicular, 2.2–2.5 × ca. 2 mm, unequal. Stamens 4 with longer pair ca. 4.5 mm and shorter pair ca. 3 mm; filaments glabrous; staminode ca. 0.7 mm. Ovary ellipsoid, ca. 2 × 1 mm, glabrous; style unequally 3-lobed. Capsule ovoid-oblong, ca. 3 mm. Fl. Mar–May, fr. Aug–Sep.

• Dense forests; 1000–2000 m. Hainan.

**14. *Staurogyne yunnanensis*** H. S. Lo, Bull. Bot. Res., Harbin 8(1): 3. 1988.

云南叉柱花 *yun nan cha zhu hua*

Herbs to 0.7 m tall. Stems densely pubescent. Leaves cauline; petiole 1.5–2 cm; leaf blade ovate-lanceolate, elliptic-lanceolate, or lanceolate, 4.5–10.5 × 2–3.5 cm, abaxially villous along veins, adaxially glabrous, secondary veins 9–14 on each side of midvein, abaxially conspicuous, and adaxially inconspicuous, base cuneate, margin undulate or inconspicuously dentate, apex obtuse. Racemes terminal only, to 8–15 cm in fruit; peduncle and rachis densely hirsute; bracts linear, 2.5–3 × ca. 0.5 mm, adaxially densely pubescent, 1-veined, apex acuminate to acute; bracteoles linear, ca. 1.2 mm, glabrous, apex acuminate. Pedicel 2–3 mm in fruit. Calyx ca. 4 mm, glabrous; lobes extremely unequal, anterior one triangular, 2.5–3 × ca. 0.5 mm, and apex acuminate, posterior and lateral ones subtriangular and ca. 1 mm. Corolla not seen. Capsule ± oblong, 3.5–4 mm. Seeds light brown. Fr. Jul.

• Forests. Yunnan (Hekou).

**15. *Staurogyne petelotii*** Benoist, Arch. Bot. Bull. Mens. 4: 75. 1930.

中越叉柱花 *zhong yue cha zhu hua*

Herbs 10–30 cm tall, ascending from a decumbent base. Stems erect, densely pubescent, unbranched or rarely branched in apical part, base with 1.5–3 cm internodes. Leaves cauline; petiole 2–4 cm, pubescent; leaf blade ovate to oblong, 3–6 × 2–3.5 cm, membranous, abaxially glabrous, adaxially darker and sparsely pubescent, secondary veins 4–6 on each side of midvein, base broadly cuneate to rounded, margin entire, apex obtuse. Raceme terminal, ca. 5 cm; bracts obovate, ca. 8 × 4 mm, abaxially sparsely pubescent, base attenuate, margin distally ciliate, apex rounded; bracteoles oblong, ca. 6 × 1 mm, abaxially pubescent especially apically, base gradually attenuate, apex rounded. Calyx ca. 6 mm; lobes spatulate with apex slightly enlarged and rounded, unequal, anterior one ca. 5 × 0.5 mm and others ca. 3 × 0.2 mm. Corolla 1.5–1.7 cm, slightly curved; lobes orbicular, ca. 5 × 5 mm. Staminal filaments glabrous. Ovary glabrous; style 1.8–2 mm, glabrous; stigma 2-cleft. Capsule ellipsoid, ca. 7 mm, glabrous. Fl. Jan–Apr.

Forests along ravines or on slopes; 1400–1700 m. Yunnan [Vietnam].

**16. *Staurogyne vicina*** Benoist, Bull. Mus. Natl. Hist. Nat., sér. 2, 5: 171. 1933.

密花叉柱花 *mi hua cha zhu hua*

Herbs to 50 cm tall. Stems erect, 4-angled, sulcate, tuberculate on basal part, pubescent on apical part. Leaves cauline; petiole 2–4 cm, pubescent; leaf blade elliptic, 6–15 × 3–7 cm, both surfaces glabrous except for pubescence along veins, abaxially glaucous, adaxially green, secondary veins 10–12 on each side of midvein, base acute, margin entire or serrate, apex acute to shortly acuminate. Racemes terminal only, unbranched or sometimes branched, 10–16 cm; peduncle 2–5 cm, glabrous; bracts linear, 4–7 × ca. 1 mm, glabrous, apex acute; bracteoles lanceolate, 2–3 × ca. 1 mm, glabrous, apex acute. Pedicel 2–3 mm, glabrous. Calyx 5–7 mm, glabrous; lobes linear, unequal, apex obtuse. Corolla white, 1.8–2.2 cm, outside glabrous; lobes oblong, ca. 4 × 3 mm, subequal, apex rounded. Staminal filaments glabrous; anther thecae spherical, ca. 1 mm in diam. Ovary glabrous; style glabrous; stigma 2-cleft. Capsule oblong, ca. 8 mm, glabrous. Fl. Apr.

Yunnan [Vietnam].

**17. *Staurogyne debilis*** (T. Anderson) C. B. Clarke ex Merrill, Philipp. J. Sci., C, 2: 302. 1907.

菲律宾叉柱花 *fei lü bin cha zhu hua*

*Ebermaiera debilis* T. Anderson, J. Linn. Soc., Bot. 9: 452. 1866.

Herbs 10–15 cm tall, somewhat succulent. Stems terete, ascending, unbranched or rarely branched, pubescent. Leaves cauline; petiole 5–8 mm, pubescent; leaf blade elliptic, oblong, or oblong-ovate, 2.5–4 × 0.8–1.7 cm, abaxially pale green and glabrous except pubescent along veins, adaxially green and glabrous, secondary veins 6 or 7 on each side of midvein, base cuneate to rounded, margin undulate, apex obtuse. Racemes terminal or axillary, to 7 cm, 4–7-flowered; rachis sometimes branched at base, slightly pubescent; bracts linear, ca. 2 × 0.4 mm; bracteoles subulate, ca. 1 × 0.3 mm. Pedicel ca. 2 mm. Calyx 5–6 mm; lobes linear, subequal, margin sparsely hirsute. Corolla white, ca. 1 cm, glabrous; lobes oblong, ca. 2 × 2 mm, subequal. Stamens with longer pair ca. 3 mm and shorter pair ca. 2 mm; filaments strigose; anther thecae ellipsoid, ca. 1 × 0.7 mm. Ovary ca. 1.8 mm, glabrous; style ca. 8 mm, glabrous; stigma 2-cleft. Capsule oblong, ca. 6 mm, compressed, glabrous. Fl. Feb–Mar, fr. Aug.

Evergreen broad-leaved forests; 300–400 m. Taiwan [Philippines].

### 3. *OPHIORRHIZIPHYLLON* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40: 76. 1871.

蛇根叶属 *she gen ye shu*

Hu Jiaqi (胡嘉琪 *Hu Chia-chi*), Deng Yunfei (邓云飞); Thomas F. Daniel

*Phyllophiorhiza* Kuntze.

Herbs, erect, without cystoliths. Leaves opposite, petiolate; leaf blade pinnately veined, margin entire. Inflorescence terminal spikes to racemes, unbranched or branched at base; bracts subopposite to alternate; bracteoles present. Calyx subequally 5-lobed. Corolla tube expanded apically, annular hairy at throat or glabrous; limb 2-lipped; lower lip 3-lobed; upper lip 2-lobed; lobes descending cochlear in bud. Stamens 2, exserted; anthers 2-theous; thecae ellipsoid to oblong, divergent toward apex; staminodes 2. Ovary ovoid-spherical; ovules 13–18 per locule, arranged in 2 rows per locule; style exserted; stigma 2-lobed. Capsule ovoid, with numerous seeds; retinacula absent. Seeds subglobose.

Two species: China, Laos, Myanmar, Thailand, Vietnam; one species in China.

Other species previously treated in this genus pertain to other genera. *Ophiorrhizophyllon hypoleucum* (Benoist) Benoist = *Staurogyne hypoleuca* Benoist and *O. laxum* Lindau = *Justicia* sp., according to Hossain (A. B. M. E. Hossain, Studies in the Classification and Affinities of Acanthaceae (Ph.D. Dissertation), University of Edinburgh, United Kingdom. 1971).

**1. *Ophiorrhizophyllon macrobotryum*** Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40: 76. 1871.

蛇根叶 she gen ye

*Ophiorrhizophyllon poilanei* Benoist.

Herbs to 1 m tall, erect. Young branches terete to 4-angled, brown pubescent. Petiole 3–8 cm, sulcate, pubescent; leaf blade oblong-ovate, oblong-elliptic, or lanceolate, (8–)15–17 × (2–)5–7 cm, abaxially pale green and pubescent along veins, adaxially green and glabrous, secondary veins 7–10 on each side of mid-vein, base cuneate to subrounded and sometimes decurrent onto petiole, margin entire, apex acute. Rachises, peduncles, pedi-

cels, bracts, and bracteoles brown pubescent with gland-tipped trichomes. Spikes or racemes terminal, unbranched or branched at base; peduncle 0–2 mm; bracts subulate to lanceolate, ca. 4 × 1 mm; bracteoles linear, ca. 1 mm. Pedicel 0–1 mm. Calyx ca. 5 mm, outside sparsely pubescent with gland-tipped trichomes; lobes triangular, ca. 2 mm, margin ciliate with gland-tipped trichomes. Corolla yellowish white, ca. 7 mm; lobes suborbicular, ca. 2 × 2 mm. Staminal filaments ca. 8 mm, glabrous; staminodes included. Ovary glabrous; style ca. 8 mm, glabrous. Capsule 3.5–5.5 mm. Fl. Oct–Feb, fr. Mar.

Dense forests, along streams; 100–1300 m. S Yunnan [Laos, Myanmar, Thailand, Vietnam].

#### 4. **THUNBERGIA** Retzius, Physiogr. Sölsk. Handl. 1(3): 163. 1780, nom. cons., not Montin (1773).

山牵牛属 shan qian niu shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Vines [or shrubs], lacking cystoliths. Leaves petiolate; leaf blade margin entire to lobed to dentate. Flowers solitary or paired in leaf axils, or in terminal dichasiate thyrses, pedunculate; bracteoles leaflike, paired, enclosing calyx and most or all of corolla tube, distinct or fused along one side, persistent. Calyx much shorter than bracteoles, cupular with 10–20 subulate lobes or reduced to an entire ring. Corolla funnel-shaped, large; tube with short cylindric base then widened; limb ± equally 5-lobed. Stamens 4, often didynamous, inserted near base of corolla tube, included; anthers 2-theous; thecae oblong or ovoid, parallel, spurred or not at base, sometimes bearded. Disk shortly annular or pulvinate. Ovary fleshy; ovules 2 per locule, collateral; style glabrous or pubescent; stigma 2-cleft, entire, or fringed. Capsule basally subglobose, apically prominently beaked, 2–4-seeded; retinacula absent. Seeds compressed to spherical, lacking trichomes.

More than 100 species: Old World tropical regions; six species (one introduced) in China.

Some species of *Thunbergia* are naturalized in the New World tropics.

*Thunbergia erecta* (Benth.) T. Anderson and *T. laurifolia* Lindley, both cultivated in gardens, are not treated here.

1a. Calyx reduced to an entire ring.

2a. Leaves glabrous ..... 3. *T. eberhardtii*

2b. Leaves pubescent.

3a. Corolla bluish; capsule pubescent ..... 1. *T. grandiflora*

3b. Corolla red; capsule glabrous ..... 2. *T. coccinea*

1b. Calyx bearing 10–20 slender subulate lobes.

4a. Leaves pinnately veined ..... 4. *T. lutea*

4b. Leaves palmately 3–5-veined.

5a. Petiole conspicuously winged; corolla orange with throat dark purple internally ..... 5. *T. alata*

5b. Petiole wingless; corolla entirely white ..... 6. *T. fragrans*

**1. *Thunbergia grandiflora*** Roxburgh, Bot. Reg. 6: 495. 1820.

山牵牛 shan qian niu

*Thunbergia adenophora* W. W. Smith; *T. chinensis* Merrill; *T. lacei* Gamble.

Vines to 10 m or longer, woody. Stems 4-angled, sulcate, pubescent. Petiole 1–7 cm, grooved, pubescent; leaf blade ovate to triangular-ovate, 5–10 × 4–8 cm, papery, both surfaces pubescent, palmately 3–7-veined, base subcordate to truncate, mar-

gin undulate, irregularly angular on basal half, or rarely entire, apex acuminate to acute. Flowers solitary, paired in leaf axils, or arranged in terminal racemes with 2–4 flowers per node; peduncle 4–7 cm, sulcate, pubescent; rachis pubescent with large cyathiform glands; apical inflorescence bracts subulate to linear-subulate, 2–6 × 1–1.5 mm, pubescent; bracteoles oblong to ovate, 2.5–4 × 1.5–2.2 cm, both surfaces pubescent, 5–7-veined, base truncate, margin entire or ciliate, apex acute with a short mucro. Calyx ca. 2 mm, annular, unlobed, densely pubescent. Corolla bluish with a yellowish throat, 4–6 cm, outside

glabrous; tube basally cylindric and ca. 3 mm wide for ca. 7 mm then gradually widened to ca. 5 mm at throat; limb subactinomorphic; lobes ovate, ca.  $3 \times 2.5$  cm. Staminal filaments 7–9 mm; anther thecae pubescent, basally appendaged. Style glabrous; stigma with 2 subequal lobes. Capsule 1.2–1.5 cm, pubescent, basal part 1.3–1.8 cm in diam., beak ca. 2.5 cm. Seeds ovate in outline, compressed, verrucose. Fl. Aug–Jan, fr. Nov–Mar.  $2n = 56$ .

Thickets; 400–1500 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [India, Myanmar, Thailand, Vietnam].

*Thunbergia grandiflora* is naturalized in tropical regions worldwide.

## 2. *Thunbergia coccinea* Wallich, Tent. Fl. Nepal. 1: 48. 1826.

红花山牵牛 hong hua shan qian niu

*Hexacentris coccinea* (Wallich) Nees.

Vines, woody. Stems 9-angled, subglabrous, pubescent at nodes. Petiole 2–7 cm, grooved; leaf blade broadly ovate, ovate, or lanceolate,  $8\text{--}15 \times 3.5\text{--}11$  cm, both surfaces pubescent, palmately 3–5-veined, base rounded to cordate, margin undulate or remotely toothed, apex acuminate. Racemes axillary or terminal, to 35 cm, pendulous; peduncle 3–4 cm, pubescent; bracts lanceolate, abaxially pubescent, adaxially glabrous; bracteoles oblong,  $2.2\text{--}2.6 \times 1.1\text{--}1.5$  cm, apex acute. Calyx ca. 2 mm, reduced to a minute rim. Corolla red; tube basally cylindric for 5–6 mm, throat 1.5–1.6 cm; lobes suborbicular, ca. 7 mm in diam. Staminal filaments 1.2–1.5 cm, glabrous but with a tuft of trichomes at base; anther thecae parallel, unequal with longer one ca. 5.5 mm and shorter one ca. 4.5 mm, spurred at base. Ovary glabrous; style glabrous, exserted; stigma 2-cleft. Capsule glabrous, basal part  $1\text{--}1.2 \times 1.5\text{--}2$  cm, beak 1.5–2.3 cm. Seeds compressed, ovate in outline, verrucose. Fl. Sep–Jan, fr. Jan–May.  $2n = 20$ .

Forested montane slopes; 800–1000 m. SE Xizang, Yunnan [Laos, Myanmar, Thailand].

## 3. *Thunbergia eberhardtii* Benoist, Bull. Mus. Natl. Hist. Nat. 27: 543. 1921.

二色山牵牛 er se shan qian niu

Vines to 12 m, woody. Stems 4-angled, sulcate, pubescent, soon glabrescent, pilose at nodes. Petiole 3–4 cm; leaf blade broadly ovate to ovate-lanceolate, ca.  $10 \times 5$  cm, both surfaces glabrous, palmately 5–7-veined, base cordate, margin remotely dentate or sometimes entire, apex acuminate to acute. Racemes axillary or terminal, erect; peduncle pubescent; bracts lanceolate, pubescent, 1–3-veined, margin dentate, apex acute; bracteoles ovate-lanceolate,  $1\text{--}1.4 \times 0.8\text{--}1$  mm, abaxially tomentose, apex acuminate. Calyx annular, unlobed. Corolla to 2 cm; tube yellowish brown; lobes ovate-elliptic, ca. 1.1 cm, subequal, lower lobes red, upper lobes yellow. Anther thecae glabrous, those of lower pair of stamens long spurred at base, those of upper pair of stamens spurred at base of only one theca per anther. Ovary pubescent. Capsule basal part 1–1.5 cm in diam., beak ca. 1.6 cm. Seeds hemispherical, verrucose. Fl. Aug–Nov, fr. Jan–Apr.

Dense forests; 300–800 m. Hainan [Vietnam].

## 4. *Thunbergia lutea* T. Anderson, J. Linn. Soc., Bot. 9: 448. 1866.

羽脉山牵牛 yu mai shan qian niu

*Thunbergia salwenensis* W. W. Smith.

Vines to 5 m or longer, climbing. Stems glabrous except for a circle of trichomes on nodes. Petiole 5–7.5 cm, glabrous; leaf blade ovate to lanceolate-ovate,  $4\text{--}13 \times 2\text{--}6$  cm, abaxially subglabrous, adaxially pubescent or setose, base rounded to broadly cuneate and decurrent onto petiole, margins obscurely toothed to sometimes irregularly denticulate, apex acuminate. Flowers axillary, solitary; bracteoles elliptic,  $2.1\text{--}2.4 \times 1.5\text{--}1.7$  cm, abaxially glabrous, adaxially gland-tipped hairy, palmately 7-veined, apex mucronate. Calyx minute, 10-toothed. Corolla pinkish or white; tube basally cylindric for ca. 7 mm, throat ca. 3.5 cm; lobes orbicular, ca. 1.2 cm in diam., equal. Staminal filaments glabrous, ca. 1 cm; anther thecae ca. 7 mm, barbate, spurred at base, spurs hairlike. Ovary glabrous; style ca. 2.5 cm, glabrous; stigma funnel-shaped, 2-cleft. Capsule glabrous, basal part ca.  $1 \times 1.8$  cm, beak ca. 1.8 cm. Seeds reniform, ca.  $8 \times 5$  mm. Fl. Aug–Dec, fr. Mar–May.

Forests or thickets; 1000–2500 m. SE Xizang, Yunnan [Bhutan, India, Myanmar].

## 5. *Thunbergia alata* Bojer ex Sims, Bot. Mag. 52: t. 2591. 1825.

翼叶山牵牛 yi ye shan qian niu

Vines, herbaceous. Stems  $\pm$  4-angled to flattened, bisulcate, pubescent. Petiole 1.5–3 cm, winged, sparsely pubescent; leaf blade sagittate to deltoid ovate,  $2\text{--}7.5 \times 2\text{--}6$  cm, abaxially hirsute, adaxially sparsely strigose, palmately 5-veined, base hastate to cordate, margin entire or undulate, apex acute. Flowers axillary, solitary; peduncle 2.5–3 cm, sparsely strigose; bracteoles ovate,  $1.5\text{--}1.8 \times 1\text{--}1.4$  cm, abaxially hirsute, 5–7-veined, apex acute, acuminate, or obtuse. Calyx annular, unequally 10–13-lobed. Corolla orange with dark purple glandular “eye” in throat, 2.5–4.5 cm; tube basally cylindric for 2–4 mm, throat 1–1.5 cm; lobes obovate, apically truncate. Staminal filaments ca. 4 mm, glabrous; anther thecae 3.5–4 mm, unequal, pubescent at margin and base. Ovary glabrous; style ca. 8 mm, glabrous; stigma funnel-shaped, unequally 2-lobed, lower lobe spreading, upper lobe erect. Capsule pubescent, basal part ca.  $7 \times 10$  mm, 2-seeded; beak ca. 1.4 cm, ca. 3 mm wide at base. Seeds reticulate on dorsal surface. Fl. Oct–Mar, fr. Feb–May.  $2n = 18$ .

Cultivated in gardens and naturalized along roads. Guangdong, Yunnan [native to Africa].

*Thunbergia alata* is widely cultivated and naturalized in tropical regions.

## 6. *Thunbergia fragrans* Roxburgh, Pl. Coromandel 1: 47. 1795.

碗花草 wan hua cao

*Flemingia grandiflora* Rottler; *Thunbergia bodinieri* H. Lévillé; *T. fragrans* subsp. *hainanensis* (C. Y. Wu & H. S. Lo) H. P. Tsui; *T. hainanensis* C. Y. Wu & H. S. Lo.

Vines, herbaceous. Stems almost 4-angled to flattened, sulcate, hirsute. Petiole 0.5–4.5 cm, hirsute; leaf blade oblong-ovate to ovate to broadly ovate to oblong-lanceolate to lanceolate, 3–14 × 1.8–7 cm, both surfaces puberulent to subglabrous except for trichomes along veins or rarely glabrous, palmately 3–5-veined, base rounded to sometimes cuneate or cordate, margin entire, irregularly sinuate, or shallowly coarsely dentate, apex acute to acuminate. Flowers axillary, solitary; peduncle 1.5–5.5 cm; bracteoles ovate, 1.5–2.5 × 0.8–1.5 cm, puberulent, apex acute. Calyx 3–5 mm, unequally 10–17-dentate, glabrous. Corolla white, 3–5 cm, sparsely puberulent; tube basally cylindric for 4–7 mm, throat 1.8–2.3 cm; lobes obovate, 1.3–2.5 × 1.5–2.3 cm. Stamens included; filaments 6–10 mm, glabrous;

anther thecae ca. 3 mm, divergent, glabrous. Ovary glabrous; style 1.5–2 cm, exserted; stigma funnel-shaped, ca. 2 mm. Capsule glabrous, basal part ca. 7 × 10–13 mm, beak 1.5–1.9 cm. Seeds 4–5 mm in diam., smooth or with scales. Fl. Aug–Jan, fr. Nov–Mar.

Thickets, roadsides; 800–2300 m. Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Cambodia, India, Indonesia, Laos, Philippines, Sri Lanka, Thailand, Vietnam].

Variation in the shape, size, pubescence, and margin form of the leaves is extensive in *Thunbergia fragrans*, and taxa have been recognized based on these characters. Additional studies of the species from throughout its range are needed to determine whether these should be accorded formal taxonomic status.

## 5. ACANTHUS Linnaeus, Sp. Pl. 2: 639. 1753.

老鼠簕属 *lao shu le shu*

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Acanthodius* Rafinesque.

Shrubs or perennial herbs, erect or decumbent, without cystoliths. Leaves opposite [whorled or in a basal cluster], petiolate; leaf blade margin entire, pinnatifid, or spinously toothed. Inflorescences in terminal [or axillary], uninterrupted spikes; bracts imbricate, ovate, growing in size as plant matures, margin spiny; bracteoles 2 or sometimes absent. Calyx 4-lobed, posterior and anterior lobes larger, lateral pair of lobes smaller. Corolla tube very short, horny; limb of a single (lower) lip (upper lip sometimes rudimentary); lip elongate, obtusely 3-lobed. Stamens 4, paired, inserted at top of corolla tube, exserted; filaments stout, thickened, bony; anthers 1-theous; theca linear-oblong, usually densely bearded, lacking basal appendages; staminodes absent. Ovary with 2 ovules per locule; style slender; stigma 2-cleft. Capsule not stipitate, ellipsoid, shiny, 4-seeded; retinacula present. Seeds ± compressed.

About 20–25 species: tropical and subtropical regions of Old World; three species in China.

*Acanthus mollis* Linnaeus is cultivated in Chinese gardens so is not treated here.

- 1a. Bracteoles absent ..... 1. *A. ebracteatus*  
 1b. Bracteoles 2.  
   2a. Bracts broadly ovate, margin entire ..... 2. *A. ilicifolius*  
   2b. Bracts ovate to obovate, margin apically spiny ..... 3. *A. leucostachyus*

### 1. *Acanthus ebracteatus* Vahl, Symb. Bot. 2: 75. 1791.

小花老鼠簕 *xiao hua lao shu le*

*Acanthus ilicifolius* Linnaeus var. *ebracteatus* (Vahl) Benoist; *Dilivaria ebracteata* (Vahl) Persoon.

Shrubs 1–3 m tall. Stems terete, stout, glabrous, often with stipulelike spines at nodes. Petiole 1–4 cm, glabrous; leaf blade oblong to obovate-oblong, 5–12 × 3–5 cm, rigid, subleathery, glabrous, secondary veins 3 or 4 on each side of midvein and spreading to spinose teeth, base cuneate, margin 3- or 4-toothed or irregularly pinnatifid, apex truncate to slightly mucronate and obtuse. Inflorescences terminal spikes to 4 cm; bracts broadly ovate, 6–7 × 4–5 mm; bracteoles absent. Calyx posterior and anterior lobes broadly ovate and 8–12 × 5–9 mm, lateral lobes elliptic and ca. 10 × 4 mm. Corolla white [blue or purplish], ca. 2.5 cm; tube basally cylindric and ca. 2.5 mm wide for 5–8 mm; lip oblong, ca. 2.2 cm; lobes oblong, outside glabrous, inside appressed pubescent. Stamens subequal; filaments ca. 9 mm; anther theca oblong, ca. 8 mm, with a line of trichomes on both sides of suture. Capsule ca. 1.8 cm. Seeds yellow, ca. 10 × 7 mm, rugose. Fl. Apr–May, fr. Aug–Sep.  $2n = 44$ .

Mangrove swamps; near sea level. Guangdong, Hainan [Cambodia, India, Indonesia, Myanmar, Papua New Guinea, Thailand, Vietnam; Australia, Pacific islands].

### 2. *Acanthus ilicifolius* Linnaeus, Sp. Pl. 2: 639. 1753.

老鼠簕 *lao shu le*

*Acanthus ebracteatus* Vahl var. *xiamenensis* (R. T. Zhang) C. Y. Wu & C. C. Hu; *A. ilicifolius* var. *xiamenensis* (R. T. Zhang) Y. F. Deng, N. H. Xia & Heng B. Chen; *A. xiamenensis* R. T. Zhang; *Dilivaria ilicifolia* (Linnaeus) Jussieu.

Shrubs to 2 m tall, erect. Stems stout, scarcely branched, glabrous, often with stipulelike spines at nodes. Petiole 3–6 mm, thick, glabrous; leaf blade oblong to oblong-lanceolate, 6–14 × 2–5 cm, glabrous, secondary veins 5–7 on each side of midvein, base cuneate, margin pinnatifid and with few large spines, serrate, or subentire, apex truncate. Spikes terminal, to 16.5 cm; bracts broadly ovate, 7–8 mm, caducous; bracteoles ovate, ca. 5 mm, leathery. Calyx posterior and anterior lobes 1–1.3 cm, margin scarious and sometimes crispate, apex emarginate; lateral lobes ovate, ca. 1 cm, margin entire. Corolla

white [bluish to pinkish], 3–4 cm; tube ca. 6 mm; lip obovate, 2.2–3 cm, thinly leathery, outside with soft trichomes, apex 3-cleft. Stamens equal; filaments ca. 1.5 cm; anther theca with a line of trichomes on both sides of suture. Style ca. 2.2 cm. Capsule 2.5–3 cm. Seeds light yellow, reniform. Fl. Feb–Mar, fr. Aug–Sep.  $2n = 44, 48$ .

Mangrove swamps, marshes; near sea level. Fujian, Guangdong, Guangxi, Hainan [Cambodia, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

This species is used medicinally.

**3. *Acanthus leucostachyus*** Wallich ex Nees, Pl. Asiat. Rar. 3: 98. 1832.

刺苞老鼠簕 ci bao lao shu le

Herbs to 1 m tall, erect, unbranched. Stem brown, ca. 4 mm in diam., hairy. Petiole 0.8–2.5 cm; leaf blade elliptic, ovate-lanceolate, oblanceolate, or lanceolate, 9–23 × 2–4.5 cm, abaxially glabrescent or brown pubescent along veins, adaxially glabrous, secondary veins 5–8 on each side of midvein and

netted near margin, tertiary veins inconspicuous, base rounded to subcordate, margin slightly spinose-dentate but sometimes inconspicuously dentate or occasionally entire, apex acute. Inflorescences terminal spikes, to 16 cm, 4-ranked; rachis grayish pubescent; bracts ovate to obovate, 1–1.5 × 0.5–0.8 cm, abaxially pubescent, palmately veined, base rounded, margins apically spiny, apex acute to acuminate; bracteoles lanceolate to oblanceolate, 1.3–2 × 0.2–0.4 cm, abaxially pubescent, base rounded, margin entire and ciliate, apex rounded with a short tip. Calyx ca. 2 cm, pubescent; lobes unequal, margin ciliate, anterior lobe ca. 1.7 × 0.4 cm, lateral lobes lanceolate and ca. 1.5 × 2.5 mm, posterior lobe oblong-lanceolate and ca. 2 × 0.5 cm. Corolla white, ca. 2.1 cm, villous; lobes orbicular, ca. 5 × 5 mm, apex emarginate. Staminal filaments ca. 8 mm, glabrous, upper pair curved (S-shaped); anther theca ca. 4.5 mm, pilose. Ovary ca. 3 mm; style ca. 1.1 cm. Capsule ca. 10 × 3 mm, glabrous. Seeds reniform, ca. 2 × 2.5 mm, glabrous. Fl. Feb–May, fr. Aug–Sep.

Dense forests, wet places; 600–1200 m. Yunnan [India, Laos, Myanmar, Thailand, Vietnam].

## 6. BLEPHARIS Jussieu, Gen. Pl. 103. 1789.

百箭花属 bai le hua shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, perennial [annual herbs or shrubs], without cystoliths, anisophyllous. Leaves usually in pseudo-whorls of 4 [or opposite], sessile to subsessile; leaf blade margin entire to dentate. Flowers axillary and solitary or many in terminal dense headlike spikes; bracts often clustered in up to 5 pairs, imbricate, leathery, margin often bristly dentate with bristles barbed; bracteoles absent [or 2]. Calyx included in bracts or ± exserted, 4-lobed; lobes in 2 unequal opposite pairs, thickened-horny at base, posterior and anterior lobes larger and 2–7-veined, lateral pair smaller and 1-veined. Corolla tube shorter than limb, expanded from base and constricted near apex; limb a single (lower) lip; lip elongate, 3[–5]-lobed. Stamens 4, didynamous, inserted at or near apex of corolla tube; filaments bony, with lower pair straight and upper pair curved, broad, flattened, usually bifurcate apically into a branch bearing an anther and a toothlike appendage; anthers 1-theous; theca bearded. Ovary glabrous, with 2 ovules per locule; style linear; stigma 2-cleft. Capsule not stipitate, oblong to ellipsoid, 2(–4)-seeded; retinacula present. Seeds discoid, covered with long branched hygroscopic trichomes.

About 130 species: Old World tropical and subtropical regions; one species in China.

*Blepharis* was recently revised by K. Vollesen (*Blepharis* (Acanthaceae): A Taxonomic Revision, 1–342. 2000).

**1. *Blepharis maderaspatensis*** (Linnaeus) B. Heyne ex Roth, Nov. Pl. Sp. 320. 1821.

百勒花 bai le hua

*Acanthus maderaspatensis* Linnaeus, Sp. Pl. 2: 639. 1753; *Blepharis boerhaviifolia* Persoon, nom. illeg. superfl.; *B. boerhaviifolia* var. *maderaspatensis* (Linnaeus) Nees.

Herbs to 30 cm tall, perennial. Stems trailing or scrambling to decumbent, sometimes elongate, scabrous or pubescent. Leaves usually 4 per pseudo-whorl of 2 unequal pairs; petiole ca. 2 mm, puberulent; leaf blade elliptic to obovate-lanceolate, 2.5–5 × 1–2 cm, puberulent, secondary veins 3–5 on each side of midvein, base cuneate, margin undulate or dentate, apex acute. Flowers axillary and solitary or in clusters of few-

flowered spikes; bracts paired, broadly spatulate to obovate-oblong, 4–13 × 2–6 mm, unequal with inner pairs larger than outer ones, strongly 3-veined, margin bristly ciliate. Calyx puberulent, unequally lobed; posterior and anterior lobes oblong, 1.2–1.8 × 0.4–0.6 cm, 3-veined, apex of anterior lobe often 2-cleft; lateral lobes linear-lanceolate, 9–12 × 2–3 mm, margin ciliate. Corolla whitish, often with pink or purple; lip obovate, 1.6–1.7 × ca. 0.8 cm, spreading; lobes ovate-oblong. Staminal filaments ca. 5 mm. Style ca. 1.2 cm. Capsule ellipsoid, ca. 8 mm, glabrous. Seeds ca. 3 × 2 mm. Fl. Dec.  $2n = 16, 22, 24, 26, 28, 30$ .

Limestone cliffs or rocks; ca. 800 m. Hainan [Bangladesh, Cambodia, India, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; tropical and subtropical Africa, SW Asia, Madagascar].

## 7. STROBILANTHES Blume, Bijdr. 781, 796. 1826.

马蓝属 *ma lan shu*

Hu Jiaqi (胡嘉琪 *Hu Chia-chi*), Deng Yunfei (邓云飞); John R. I. Wood

*Adenacanthus* Nees; *Aechmanthera* Nees; *Apolepsis* (Blume) Haasskarl; *Baphicacanthus* Bremekamp; *Championella* Bremekamp; *Diflugossa* Bremekamp; *Goldfussia* Nees; *Gutzlaffia* Hance; *Hemigraphis* Nees; *Hymenochlaena* Bremekamp; *Lepidagathis* sect. *Apolepsis* Blume; *Parachampionella* Bremekamp; *Paragutzlaffia* H. P. Tsui; *Perilepta* Bremekamp; *Pseudaechmanthera* Bremekamp; *Pseudostenosiphonium* Lindau; *Pseudostonium* Kuntze; *Pteracanthus* (Nees) Bremekamp; *Pteroptychia* Bremekamp; *Pyrrothrix* Bremekamp; *Semnostachya* Bremekamp; *Sericocalyx* Bremekamp; *Strobilanthes* subg. *Pteracanthus* Nees; *S.* subg. *Sympagis* Nees; *Sympagis* (Nees) Bremekamp; *Tarphochlamys* Bremekamp; *Tetraglochidium* Bremekamp; *Tetragoga* Bremekamp.

Herbs, subshrubs, shrubs, [or small trees], isophyllous or weakly to strongly anisophyllous, woody species commonly pliestesial (living for several years then dying after flowering and fruiting). Stems and branches usually 4-angled, often sulcate, basally becoming woody and hollow with age. Leaves opposite, petiolate or sessile; leaf blade adaxially usually with prominent linear cystoliths and sometimes also abaxially, margin variously dentate, serrate, crenate, undulate, or entire. Inflorescences axillary and/or terminal, bracteate heads, headlike clusters, spikes (sometimes distinctly secund), or less commonly of pedicellate flowers forming an open panicle; sterile bracts usually resembling reduced leaves and often present in compound inflorescences; floral bracts usually different from leaves, persistent or caducous as flowers open, very variable in size and shape, sometimes of two types with basal sterile bracts (outermost bracts in a capitate inflorescence) differing from inner or apical fertile ones; bracteoles 2 per pedicel, usually small, sometimes absent. Calyx usually 5-lobed to base, commonly accrescent in fruit; lobes equal or with middle one distinctly longer than others, sometimes partially fused to form a bipartite or tripartite calyx. Corolla nearly always bluish, rarely white, yellow, or pink, tubular or funnel-shaped, inside glabrous apart from trichomes retaining style except in *Strobilanthes parvifolia*, *S. oresbia*, and related species; tube either gradually widened from base or narrowly cylindric and then abruptly widened, campanulate or gibbous; limb 5-lobed; lobes usually ovate, equal or subequal, spreading, contorted in bud. Stamens usually 4 and didynamous (rarely 2, 2 fertile with 2 staminodes, or 4 fertile with a central staminode), basally monadelphous; usually 2 filaments distinctly longer than other 2; anthers included or exerted, 2-theous; thecae oblong or subspherical, parallel, erect or incurved, glabrous, basally mucous, rarely with connective extended to a mucronate tip; pollen spherical or ellipsoid, echinulate and/or variously ribbed, usually tricolporate. Ovary oblong to obovoid, 2-locular, with 2(–8) ovules per locule; style filiform, long, slender, simple, sometimes persistent after corolla falls, retained in place by trichomes on one side of corolla tube; stigma 2-cleft with one branch longer. Capsule characteristically oblong to narrowly obovoid but sometimes fusiform to narrowly ellipsoid, (2–)4(–16)-seeded; retinacula strong, curved. Seeds usually ovate or orbicular in outline and lenticular by being flattened, usually pubescent with appressed mucilaginous trichomes which become spreading when wetted, trichomes caducous in a very few species with seed glabrescent; areola usually very small but occasionally extending as a glabrous area over much of seed surface.

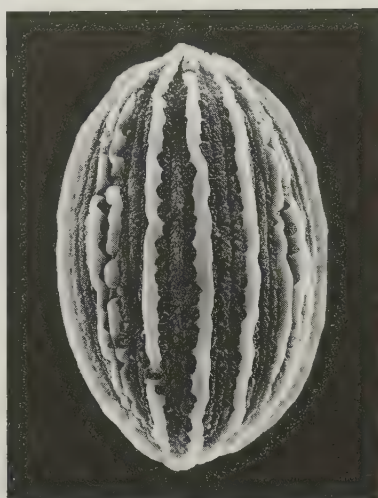
About 400 species: tropical Asia; 128 species (57 endemic) in China.

Note on indumentum: in many species the young inflorescence, even when a few capsules are present, is glabrous or nearly so. As the inflorescence matures, sessile glands become stipitate and older inflorescences become gland-tipped pilose, a process parallel to the development of glands and trichomes as the ovary matures into the capsule. The calyx is also accrescent in many species and the apex appears to continue growing, so calyx lobes, which are linear-oblong at anthesis, may become subspatulate in fruit. There is also a tendency for the corolla indumentum to fall as the corolla opens. Corolla indumentum is most easily observed on buds.

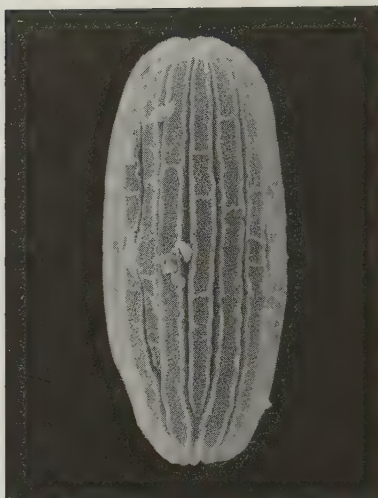
Note on pollen: fig. 1 and fig. 2 show 18 pollen types found in Chinese *Strobilanthes*. It should be noted that the pollen of some 20% of Chinese species is unknown and the types shown here could be construed as an oversimplification. However, the images do show the range of variation found in the genus. Two important caveats should be taken into account. Many publications illustrating *Strobilanthes* pollen from China are marred by the use of misidentified material. This is the explanation for cases where a different pollen type is given to that in a published source. A second problem relates to the degree of infraspecific variation in pollen morphology. This is largely unstudied but it is known that some of the more widespread and variable species are somewhat diverse in their pollen morphology although all plants sampled have pollen of one general type. Species known to have somewhat variable pollen include *S. atropurpurea*, *S. echinata*, *S. speciosa*, and *S. tomentosa*.

Attempts to divide *Strobilanthes* (*Strobilanthininae* sensu Bremekamp) into segregate genera have proved unsatisfactory largely because the level of homoplasy displayed by morphological characters has to date rendered subdivision impossible. Molecular studies have not yet greatly clarified the situation because of insufficient sampling, and this too is likely to prove problematic because many species are known only from the type collection or from material inadequate for molecular study. Clusters of related species are clearly discernible, but insufficient information is currently available to produce a satisfactory infrageneric classification. Species in the following account are grouped with morphologically similar and presumably related species, but the linear sequence and lack of adequate data implies that the order of species is at least partially arbitrary.

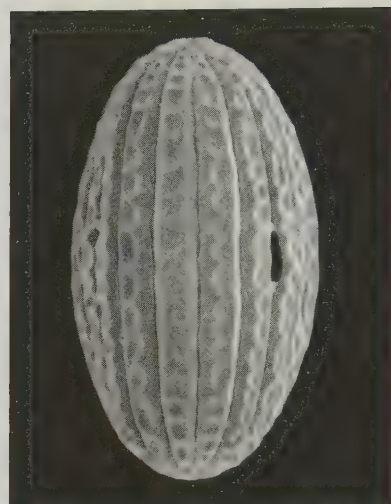
*Strobilanthes lactucifolia* H. Léveillé is not treated in the present account because no material has been traced. It is probably not a species of *Strobilanthes*. *Strobilanthes straminea* W. W. Smith (*Goldfussia straminea* (W. W. Smith) C. Y. Wu & C. C. Hu) from N Myanmar, included in FRPS (70: 169. 2002), is excluded from the present account because no Chinese specimen can be traced. *Strobilanthes deutzifolia* H. Léveillé is *Abelia macrotera* (Graebner & Buchwald) Rehder in the Linnaeaceae (see p. 645). *Strobilanthes gentiliana* H. Léveillé is *Sesamum indicum* Linnaeus in the Pedaliaceae (see Fl. China 18: 226. 1998). *Strobilanthes hypericifolia* H. Léveillé is *Abelia uniflora* R. Brown in the Linnaeaceae (see p. 645).



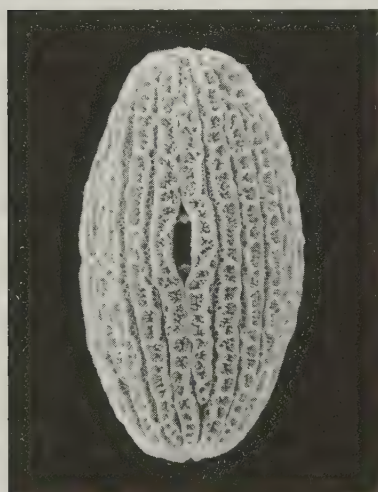
Type 1. *S. bantonensis* from Balansa 4273.



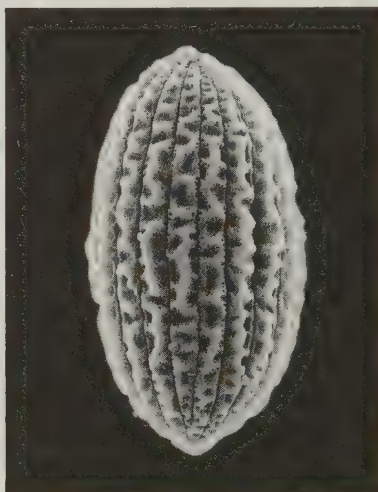
Type 2. *S. anamitica* from Machure 8578.



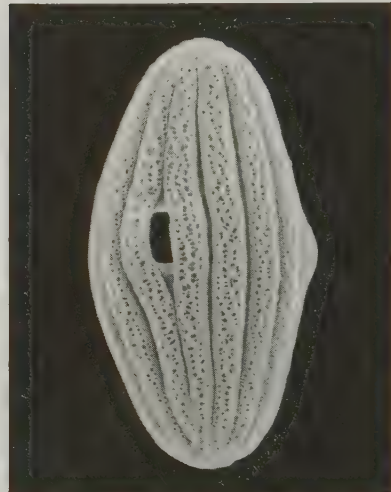
Type 3. *S. hupehensis* from Wilson 6627.



Type 4. *S. cusia* from Kingdon Ward 21622.



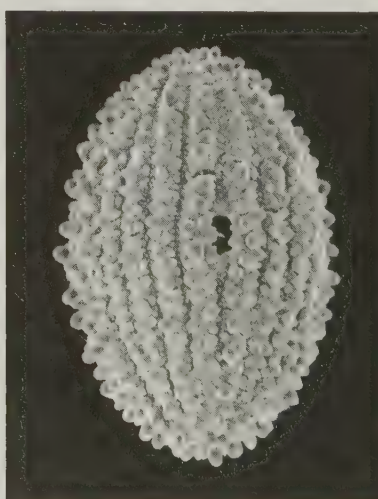
Type 5. *S. pinetorum* from Forrest 8385.



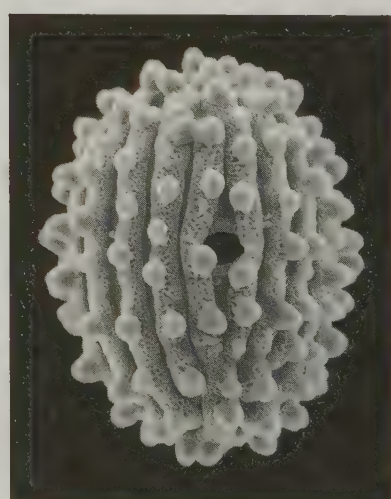
Type 6. *S. tomentosa* from Polunin 3304.



Type 7. *S. reptans* from Alston 16886.

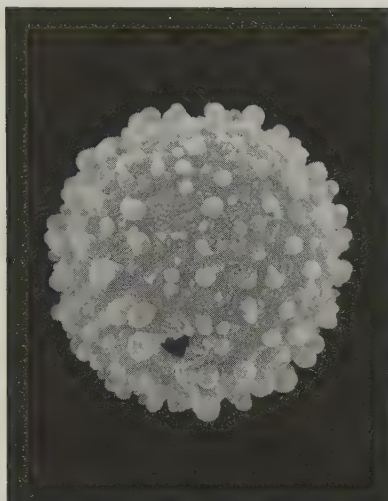


Type 8. *S. cumingiana* from Merrill 9510.

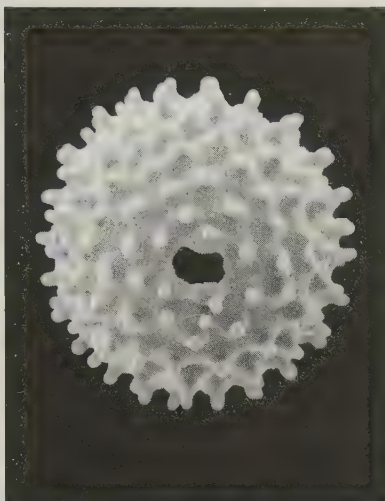


Type 9. *S. vallicola* from Xuan Xujie 74.

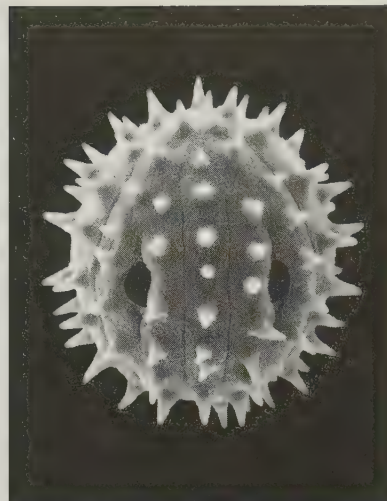
Figure 1. *Strobilanthes* pollen. SEM images of species with prolate (ellipsoid) pollen types.



Type 10. *S. tetrasperma* from Li Zhiyu 1218.



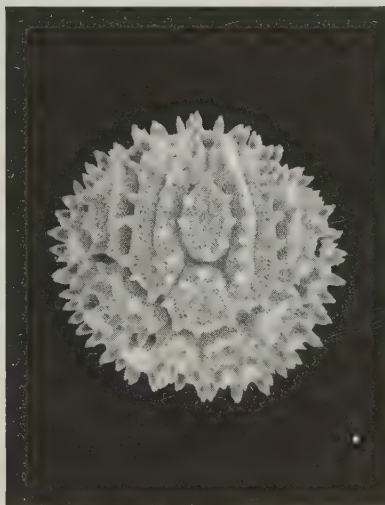
Type 11. *S. labordei* from Henry 7421.



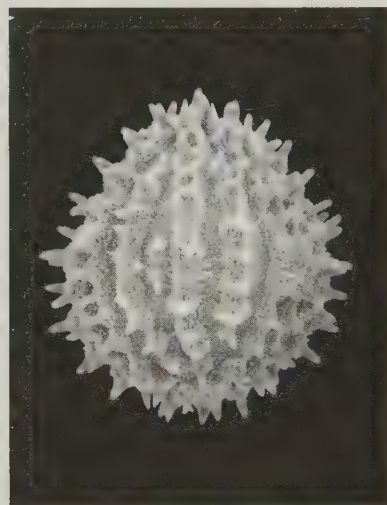
Type 12. *S. truncata* from Qin Dehai 79901.



Type 13. *S. dalzielii* from Ying Hu-Shiu 12402.



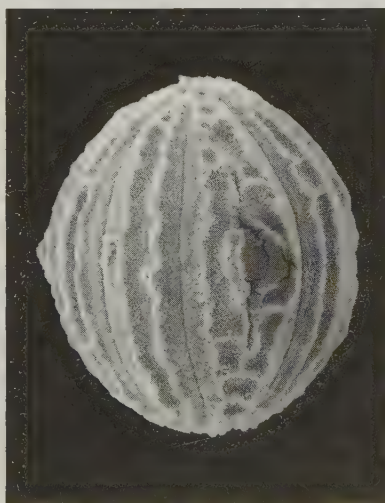
Type 14. *S. affinis* from Wilson 4302.



Type 15. *S. henryi* from Hancock 57.



Type 16. *S. parvifolia* from Kingdon Ward 8718.



Type 17. *S. cyclus* from Maire 730.



Type 18. *S. serrata* from Lace 6019.

Figure 2. *Strobilanthes* pollen. SEM images of species with spheroidal (globose) pollen types.

- 1a. Low herbs, sometimes trailing, always isophyllous; corolla less than 2.5 cm and often less than 2 cm, not obviously curved.
- 2a. Inflorescences of solitary flowers in leaf axils.
- 3a. Calyx 2-lipped, upper 3 calyx lobes partially fused ..... 43. *S. rankanensis*
- 3b. Calyx not 2-lipped, subequally 5-lobed to base.
- 4a. Leaf blade oblong to lanceolate, 7 mm wide or less; capsule glabrous ..... 7. *S. sinica*
- 4b. Leaf blade ovate to obovate, 8 mm wide or more; capsule apically pilose ..... 8. *S. szechuanica*
- 2b. Inflorescences of terminal or sometimes axillary heads or spikes.
- 5a. Corolla outside glabrous; capsule 6–16-seeded.
- 6a. Leaves sessile; corolla yellow ..... 4. *S. fluviatilis*
- 6b. Leaves petiolate; corolla blue or white.
- 7a. Leaf blade pubescent, base abruptly truncate to slightly cordate; corolla blue ..... 5. *S. reptans*
- 7b. Leaf blade subglabrous, base cuneate to rounded; corolla white ..... 6. *S. cumingiana*
- 5b. Corolla outside pubescent; capsule 4-seeded.
- 8a. Stems, leaves, and inflorescences white pilose ..... 10. *S. labordei*
- 8b. Stems, leaves, and inflorescences glabrous or very sparsely hirsute.
- 9a. Corolla less than 1 cm ..... 9. *S. wilsonii*
- 9b. Corolla 1.5–2 cm.
- 10a. Leaf blade ovate to oblong-elliptic, 2–3 × as long as broad; ovary and capsule apically pubescent ..... 11. *S. tetrasperma*
- 10b. Leaf blade lanceolate, ca. 4 × as long as broad; ovary and capsule glabrous ..... 12. *S. japonica*
- 1b. Herbs or subshrubs, never trailing, usually greater than 50 cm tall, anisophyllous or isophyllous; corolla greater than 2 cm, often strongly curved.
- 11a. Inflorescences subcapitate or capitellate, with flowers densely clustered in groups of 4 or more, heads occasionally becoming subspicate in fruit.
- 12a. Anthers incurved but shorter ones sometimes reflexed, ± as broad as long so subspherical or ellipsoid; bracts and bracteoles if present caducous except in *S. cuneata*, *S. kingdonii*, *S. glomerata*, and sometimes *S. capitata* and *S. speciosa*.
- 13a. Bracts greater than 1.5 cm, outermost commonly infertile, persistent, or if caducous then ovate.
- 14a. Plants isophyllous; flowers in subsessile axillary clusters; leaf blade ovate ..... 100. *S. cuneata*
- 14b. Plants anisophyllous; flowers in pedunculate heads; leaf blade ovate to oblong-elliptic.
- 15a. Indumentum of somewhat rigid purplish trichomes ..... 101. *S. glomerata*
- 15b. Indumentum of soft whitish trichomes.
- 16a. Outermost bracts linear-oblong to lanceolate, margin often dentate, apex obtuse; isolated flowers sometimes present below main head ..... 104. *S. kingdonii*
- 16b. Outermost bracts lanceolate or ovate, margin entire, apex acute or acuminate; inflorescences strictly capitate.
- 17a. Bracts ovate, equaling or shorter than head; heads relatively stout, 1–3 cm broad; plants weakly anisophyllous ..... 102. *S. capitata*
- 17b. Bracts lanceolate, commonly overtopping head; heads relatively slender, 1–1.5 cm broad; plants usually strongly anisophyllous ..... 103. *S. speciosa*
- 13b. Bracts less than 1 cm, all normally flower-bearing, often scarious and early caducous.
- 18a. Corolla outside glabrous even on lobes and in bud.
- 19a. Leaf blade abaxially whitish; bracts fugacious; calyx in fruit with lobes subequal ..... 114. *S. discolor*
- 19b. Leaf blade abaxially paler but not whitish; bracts usually present at anthesis; calyx in fruit with one lobe longer than others.
- 20a. Calyx without gland-tipped trichomes ..... 107. *S. ningmingensis*
- 20b. Calyx with gland-tipped trichomes.
- 21a. Apex of bracts acute to acuminate ..... 108. *S. dimorphotricha*
- 21b. Apex of bracts rounded or obtuse.
- 22a. Bracts glabrous; inflorescences strictly capitellate; plants weakly anisophyllous ..... 106. *S. penstemonoides*
- 22b. Bracts gland-tipped pubescent; some flower pairs usually present below capitulum; plants strongly anisophyllous ..... 116. *S. multidentis*
- 18b. Corolla pubescent or gland-tipped pubescent at least on lobes or in bud.
- 23a. Inflorescences subterminal, arising only from apical leaf axils; leaf blade abaxially whitish, falcate ..... 117. *S. oligocephala*
- 23b. Inflorescences not subterminal; leaf blade if abaxially whitish then not falcate.
- 24a. Bracts fugacious, usually absent at anthesis; calyx lobes subequal.
- 25a. Plants isophyllous or weakly anisophyllous; leaves petiolate; leaf blade apex acuminate; corolla tube and lobes gland-tipped pubescent ..... 113. *S. oxycalycina*

- 25b. Plants strongly anisophyllous; leaves sessile; leaf blade apex acute; corolla pilose only on lobes ..... 115. *S. rhombifolia*
- 24b. Bracts usually present; calyx with one lobe longer than others.
- 26a. Apex of bracts obtuse or rounded.
- 27a. Peduncle longer so inflorescence exceeding subtending leaves ..... 110. *S. formosana*
- 27b. Peduncle very short so inflorescence shorter than subtending leaves ..... 111. *S. ovatibracteata*
- 26b. Apex of bracts acute or acuminate.
- 28a. Bracts gland-tipped pubescent ..... 109. *S. glandibracteata*
- 28b. Bracts not gland-tipped pubescent.
- 29a. Plants anisophyllous ..... 108. *S. dimorphotricha*
- 29b. Plants isophyllous ..... 112. *S. hupehensis*
- 12b. Anthers erect, oblong, ca.  $2 \times$  as long as broad; bracts persistent at least until fruit is formed.
- 30a. Flowers arranged in small clusters along an axis forming a spike or panicle of capitula.
- 31a. Capsule 6–8-seeded; calyx lobes linear-lanceolate; anthers apiculate with an excurrent connective ..... 1. *S. tomentosa*
- 31b. Capsule 4-seeded; calyx lobes ovate and abruptly narrowed to an apiculate apex; anthers muticous ..... 70. *S. congesta*
- 30b. Flowers arranged in axillary or terminal capitula.
- 32a. Capsule 6-seeded or more; calyx hirsute inside at least near apex.
- 33a. Corolla blue, bracts obtuse to acute ..... 2. *S. quadrifaria*
- 33b. Corolla yellow, bracts apically beaked ..... 3. *S. chinensis*
- 32b. Capsule 2–4-seeded; calyx glabrous inside (except in *S. cruciata*, *S. oligantha*, and *S. wangiana*).
- 34a. Calyx 2-lipped, upper 3 lobes partially fused.
- 35a. Fertile stamens 2; leaf blade margin entire ..... 38. *S. aprica*
- 35b. Fertile stamens 4; leaf blade margin serrate.
- 36a. Lower calyx lip with 2 lobes, lobes distinct to base; capsule 2-seeded ..... 30. *S. cyclus*
- 36b. Lower calyx lip 2-dentate, lobes connate for most of length; capsule 4-seeded ..... 95. *S. bipartita*
- 34b. Calyx subequally 5-lobed to base.
- 37a. Corolla completely glabrous even on lobes and tube and in bud.
- 38a. Isophyllous herbs; corolla purple ..... 16. *S. sarcorrhiza*
- 38b. Anisophyllous subshrubs; corolla white or rarely blue.
- 39a. Stems winged; leaves sessile; anthers muticous ..... 96. *S. retusa*
- 39b. Stems unwinged; leaves petiolate; anthers apiculate.
- 40a. Outer bracts sessile, ovate ..... 99. *S. echinata*
- 40b. Outer bracts with a broad petiolar base, pandurate in outline.
- 41a. Petiolar base of bracts forming a rigid involucre, lamina spreading and ovate ..... 97. *S. cruciata*
- 41b. Petiolar base not forming an involucre, bracts pandurate, apical portion narrowly lanceolate ..... 98. *S. simonsii*
- 37b. Corolla pubescent at least on lobes or tube or in bud.
- 42a. Bracts oblanceolate, obovate, subrhomboidal, or spatulate, broadest near apex, pilose with reddish or white trichomes.
- 43a. Bracts with reddish or brownish trichomes.
- 44a. Leaves and stem reddish brown setose ..... 20. *S. hossei*
- 44b. Leaves and stem without reddish brown trichomes.
- 45a. Bracts subrhomboidal-obovate, tips erect; pollen type 3 ..... 21. *S. torrentium*
- 45b. Bracts obovate, tips commonly recurved; pollen type 2 ..... 22. *S. anamitica*
- 43b. Bracts with white trichomes.
- 46a. Bracts distinct from leaves, obovate, with gland-tipped trichomes, apex rounded ..... 18. *S. lihengiae*
- 46b. Bracts oblanceolate to obovate, with a few marginal teeth, densely white pilose, without gland-tipped trichomes, apically narrowed to an obtuse apex.
- 47a. Corolla 2.2–2.8 cm; plants drying dark green; inflorescences often becoming spicate in fruit ..... 15. *S. austrosinensis*
- 47b. Corolla 2.8–3.2 cm; plants not drying dark green; inflorescences not becoming spicate in fruit ..... 17. *S. procumbens*
- 42b. Bracts linear, lanceolate, or oblong-elliptic, widest below middle.
- 48a. Bracts commonly yellowish, overtopping capitula and giving a characteristic eared appearance ..... 19. *S. esquirolii*
- 48b. Bracts with white trichomes, not overtopping capitula which do not have an eared appearance.
- 49a. Heads strictly terminal; calyx lobes with trichomes apically on inner surface.
- 50a. Leaf blade abaxially glabrous except on veins; corolla 3.5–4 cm ..... 13. *S. wangiana*
- 50b. Leaf blade usually pubescent or rarely glabrous; corolla less than 3.5 cm ..... 14. *S. oligantha*

- 49b. Heads arising from apical leaf axils; calyx glabrous inside.
- 51a. Leaf blade glabrous ..... 24. *S. fengiana*
- 51b. Leaf blade pilose or pubescent on both surfaces.
- 52a. Corolla straight or nearly so; heads clearly axillary; plants isophyllous ..... 23. *S. yunnanensis*
- 52b. Corolla strongly bent; heads from apical leaf axils only; plants anisophyllous.
- 53a. Heads slightly elongate; floral bracts lanceolate to oblong, pilose but margin not ciliate ..... 25. *S. lamium*
- 53b. Heads very compact; floral bracts elliptic, margin ciliate ..... 26. *S. cyphantha*
- 11b. Inflorescences spicate or flowers in leaf axils or arranged singly or in opposite pairs in a panicle.
- 54a. Leaf blade pinnatifid ..... 34. *S. pinnatifida*
- 54b. Leaf blade margin dentate or serrate but never pinnatifid.
- 55a. Bracts decurrent as a wing on peduncle ..... 48. *S. pteroclada*
- 55b. Bracts not decurrent on peduncle.
- 56a. Anthers incurved and shorter ones sometimes reflexed, subspherical or ellipsoid,  $\pm$  as broad as long; bracts and bracteoles if present caducous except in *S. longgangensis* and cultivated forms of *S. hamiltoniana* and sometimes in *S. lamiifolia*.
- 57a. Inflorescences an open panicle; flowers not arranged in opposite pairs.
- 58a. Corolla arcuate, less than 3 cm; inflorescence branches with non-glandular trichomes ..... 126. *S. euantha*
- 58b. Corolla straight, greater than 3 cm; inflorescence branches glabrous or with gland-tipped trichomes.
- 59a. Inflorescences branching at a narrower angle from axis, ultimate branches relatively stout and similar to primary branches ..... 124. *S. hamiltoniana*
- 59b. Inflorescences branches at 90° from axis, ultimate branches very slender ..... 125. *S. tenuiflora*
- 57b. Inflorescences spicate; flowers in opposite pairs, sometimes aggregated into a panicle.
- 60a. Inflorescences a terminal panicle of spikes.
- 61a. Leaf blade ovate, base rounded to broadly cuneate; basal leaves shortly petiolate, apical ones sessile ..... 122. *S. mastersii*
- 61b. Leaf blade narrowly oblong-elliptic, base narrowly cuneate; leaves all petiolate ..... 123. *S. tenax*
- 60b. Inflorescences terminal or axillary but spikes never paniculate.
- 62a. Inflorescences terminal or from apical leaf axils only.
- 63a. Inflorescences a short terminal spike; bracts mostly 1.5–2.5 cm, relatively persistent ..... 105. *S. lamiifolia*
- 63b. Inflorescences of flower pairs scattered along axis but often crowded and subcapitellate near apex; bracts mostly less than 1.5 cm, caducous.
- 64a. Corolla glabrous; bracts gland-tipped pilose ..... 116. *S. multident*
- 64b. Corolla gland-tipped pubescent on lobes; bracts not gland-tipped pilose ..... 117. *S. oligocephala*
- 62b. Inflorescences axillary spikes.
- 65a. Corolla outside pubescent.
- 66a. Calyx less than 1.3 cm; bracts often present at least on young parts; leaf blade margin serrate ..... 119. *S. thomsonii*
- 66b. Calyx 1.6–2 cm; bracts very caducous; leaf blade margin entire or sinuate ..... 121. *S. secunda*
- 65b. Corolla outside glabrous.
- 67a. Leaf blade ovate, base rounded to cordate; anthers slightly exerted ..... 118. *S. medogensis*
- 67b. Leaf blade narrowly elliptic, base cuneate; anthers included ..... 120. *S. longgangensis*
- 56b. Anthers erect, oblong, ca. 2  $\times$  as long as broad; bracts persistent at least until fruit is formed.
- 68a. Corolla outside glabrous but pubescent inside; leaves subentire; inflorescences leafy or 1–3-flowered axillary spikes.
- 69a. Leaf blade abaxially whitish; inflorescences paniculate ..... 127. *S. parvifolia*
- 69b. Leaf blade abaxially reddish brown; inflorescences 1–3-flowered axillary spikes ..... 128. *S. ferruginea*
- 68b. Corolla pubescent, or if outside glabrous then also inside glabrous except for trichomes retaining style; inflorescences not as above.
- 70a. Flowers in axillary spikes, with basal persistent expanded leaflike bracts; flowers not imbricate; spikes sometimes reduced so flowers are solitary in leaf axils, not aggregated into a terminal panicle.
- 71a. Calyx 2-lipped with upper three calyx lobes distinctly connate for half their length.
- 72a. Corolla blue, not resupinate ..... 62. *S. flexicaulis*
- 72b. Corolla white, resupinate ..... 63. *S. lanyuensis*
- 71b. Calyx subequally 5-lobed to base.
- 73a. Corolla outside glabrous.
- 74a. Leaf blade large with some greater than 10 cm, drying blackish; corolla straight, 3.5–5 cm ..... 61. *S. cusia*
- 74b. Leaf blade mostly less than 6 cm, not drying blackish; corolla bent at mouth, 2.5–3.5 cm.

- 75a. Calyx lobes linear, 1–1.5 mm wide, apex acute or rarely obtuse ..... 64. *S. atropurpurea*  
 75b. Calyx lobes ovate-elliptic, 3–5 mm wide, apex obtuse ..... 65. *S. latisejala*  
 73b. Corolla outside pubescent.  
 76a. Rachis of inflorescences strongly winged.  
 77a. Calyx less than 2 cm; capsule glabrous ..... 66. *S. tibetica*  
 77b. Calyx 2.5–3.6 cm; capsule comose ..... 67. *S. pterygorrhachis*  
 76b. Rachis of inflorescences not winged.  
 78a. Bracts margin entire, apex obtuse; plants subglabrous ..... 68. *S. urophylla*  
 78b. Bracts margin dentate, apex acuminate; plants usually densely hirsute or rarely  
 (in *S. inflata* var. *gongshanensis*) subglabrous ..... 69. *S. inflata*  
 70b. Flowers in axillary or terminal spikes but if axillary without leaflike bracts (except sometimes  
*S. oresbia*); flowers imbricate or not; spikes aggregated into a terminal panicle or not.  
 79a. Flowers in axillary leafless spikes (sometimes from apicalmost axils); bracts distinct from leaves,  
 often inconspicuous and merging into bracteoles and calyx lobes; spikes not aggregated into a  
 leafless panicle except in *S. nobilis* and *S. rostrata*; corolla outside glabrous.  
 80a. Calyx glabrous or with gland-tipped trichomes, margin never ciliate or ciliolate.  
 81a. Inflorescences with flowers solitary on one side of spike; bracts linear, persistent.  
 82a. Spikes strictly axillary; inflorescences glabrous ..... 54. *S. helicta*  
 82b. Spikes aggregated into a terminal panicle; inflorescences with gland-tipped trichomes ..... 55. *S. rostrata*  
 81b. Inflorescences with flowers paired and on two sides of spike; bracts ovate to  
 oblong-elliptic, somewhat caducous.  
 83a. Corolla bent; leaf blade abaxially whitish, margin entire to crenate ..... 52. *S. rubescens*  
 83b. Corolla straight; leaf blade abaxially green, margin coarsely serrate.  
 84a. Apex of bracts acute to obtuse; stems winged ..... 41. *S. pateriformis*  
 84b. Apex of bracts truncate; stems not winged ..... 42. *S. truncata*  
 80b. Calyx lobes sometimes also with gland-tipped trichomes, margin ciliate or ciliolate.  
 85a. Bracts with a recurved tip; inflorescences reddish brown ..... 92. *S. brunnescens*  
 85b. Bracts with an erect tip; inflorescences greenish or rarely reddish brown.  
 86a. Bracts ovate, obovate, or broadly elliptic, distinctly shorter than calyx.  
 87a. Bracts abaxially with 2 raised eyelike structures ..... 84. *S. biocullata*  
 87b. Bracts abaxially without raised eyelike structures although sometimes with large  
 sessile glands.  
 88a. Spikes from apical axils; bracts obovate-spatulate ..... 80. *S. pseudocollina*  
 88b. Spikes not restricted to apical axils; bracts ovate to elliptic.  
 89a. Bracts not abruptly narrowed and without a mucronate apex.  
 90a. Spikes commonly branched; flower pairs close along rachis; calyx 2-lipped  
 with 3 upper lobes partially fused ..... 81. *S. longzhouensis*  
 90b. Spikes simple; flower pairs distant along rachis; calyx subequally 5-lobed  
 to base ..... 82. *S. cystolithigera*  
 89b. Bracts abruptly narrowed with a mucronate and sometimes caducous apex.  
 91a. Plant drying olive-green; bracts abaxially with sessile glandular area, apex  
 not fimbriate, lacking reddish brown trichomes ..... 83. *S. abbreviata*  
 91b. Plant drying blackish green; bracts abaxially without glandular area, apex  
 often fimbriate with reddish brown trichomes ..... 91. *S. fimbriata*  
 86b. Bracts lanceolate, ovate, or oblong, usually equaling or exceeding calyx.  
 92a. Leaf blade often pandurate, base rounded; apical leaves sessile; spikes elongating  
 beyond leaves and inflorescence often of paniculate spikes in fruit ..... 93. *S. nobilis*  
 92b. Leaf blade not pandurate, base cuneate; all leaves petiolate; inflorescence not paniculate  
 in fruit.  
 93a. Spikes only from terminal leaf axils.  
 94a. Spikes 1–3 per axil; bracts abaxially with sessile black glands ..... 89. *S. heteroclita*  
 94b. Spikes 1 per axil; bracts abaxially lacking black glands ..... 90. *S. mucronatoproducta*  
 93b. Spikes not restricted to terminal axils.  
 95a. Spikes 1–5 per leaf axil ..... 94. *S. polyneuros*  
 95b. Spike usually 1 per leaf axil.  
 96a. Bracts 2–3 cm, much exceeding calyx ..... 88. *S. compacta*  
 96b. Bracts less than 1.5 cm,  $\pm$  equaling calyx.  
 97a. Stems, leaves, and bracts pubescent ..... 87. *S. guangxiensis*  
 97b. Plant completely glabrous except for ciliolate margin of calyx lobes.

- 98a. Spikes often branched, robust; leaf blade oblong, some greater than 15 cm ..... 85. *S. longespicata*
- 98b. Spikes simple, slender; leaf blade elliptic, less than 12 cm ..... 86. *S. myura*
- 79b. Inflorescences terminal or terminal and axillary, sometimes forming a panicle of spikes, branches bearing leaves below spikes, if apparently axillary then corolla outside pubescent or bracts expanded and clearly different from calyx.
- 99a. Fertile stamens 2.
  - 100a. Spikes simple; capsule glabrous apart from a few apical glands ..... 29. *S. henryi*
  - 100b. Spikes branched forming a terminal panicle of spikes; capsule pubescent.
    - 101a. Bracts broadly oblong-ovate to oblong-obovate, not imbricate so flowers clearly separate ..... 31. *S. serrata*
    - 101b. Bracts obovate, imbricate ..... 32. *S. tubiflos*
- 99b. Fertile stamens 4.
  - 102a. Bracts imbricate.
    - 103a. Bracts greater than 1.5 cm.
      - 104a. Bracts distinct from apical leaves, ca. 3 cm, margin without prominent white cilia.
        - 105a. Bracts not sticky glandular; capsule 12-seeded ..... 2. *S. quadrifaria*
        - 105b. Bracts sticky glandular; capsule 4-seeded ..... 60. *S. cognata*
      - 104b. Bracts indistinct from apical leaves, less than 2 cm, margin with prominent white cilia.
        - 106a. Bracts ovate to elliptic; corolla 3–3.5 cm ..... 14. *S. oligantha*
        - 106b. Bracts obovate; corolla 2.2–2.8 cm ..... 15. *S. austrosinensis*
    - 103b. Bracts less than 1.5 cm.
      - 107a. Leaves sessile; leaf blade oblong; spikes axillary as well as terminal ..... 35. *S. auriculata*
      - 107b. Leaves petiolate; leaf blade ovate or elliptic; spikes all terminal on leafy branches or main stem.
      - 108a. Anthers strongly exerted from corolla ..... 33. *S. affinis*
      - 108b. Anthers included in corolla.
        - 109a. Corolla outside glabrous.
          - 110a. Bracts linear-spatulate, broadest at apex ..... 57. *S. tonkinensis*
          - 110b. Bracts oblong or elliptic, broadest in middle or base.
            - 111a. Bracts elliptic, 5–6 mm wide ..... 27. *S. strigosa*
            - 111b. Bracts oblong, 2–3 mm wide ..... 58. *S. stolonifera*
        - 109b. Corolla outside pubescent.
          - 112a. Leaves glabrous ..... 28. *S. longiflora*
          - 112b. Leaves pubescent.
            - 113a. Calyx 2-lipped, 3 upper lobes partially fused ..... 36. *S. mogokensis*
            - 113b. Calyx subequally 5-lobed to base ..... 37. *S. argentea*
    - 102b. Bracts not imbricate so flowers clearly separate apart from basalmost.
      - 114a. Inflorescences a 15–25 cm uninterrupted spike from apicalmost leaf axils ..... 59. *S. vallicola*
      - 114b. Inflorescences a much shorter spike but if similar in length then basalmost flowers widely spaced.
        - 115a. Corolla outside glabrous.
          - 116a. Calyx subequally 5-lobed to base.
            - 117a. Stems and leaves sparsely pubescent ..... 51. *S. taoana*
            - 117b. Stems and leaves completely glabrous.
              - 118a. Inflorescences branched; calyx glabrous; leaf blade broadly ovate to suborbicular; floral bracts 7–11 mm ..... 53. *S. pinetorum*
              - 118b. Inflorescences of simple terminal spikes; calyx gland-tipped pilose; leaf blade elliptic; floral bracts 5–6.5 mm ..... 56. *S. chrysodelta*
          - 116b. Calyx 2-lipped, 3 upper lobes partially fused.
            - 119a. Bracts 2–3 cm, much longer than calyx ..... 46. *S. adpressa*
            - 119b. Bracts less than 1.4 cm, equaling or shorter than calyx.
              - 120a. Bracts ovate ..... 49. *S. ovata*
              - 120b. Bracts linear-lanceolate or oblong.
                - 121a. Spikes with 1–3 flower pairs; bracts greater than 10 mm ..... 47. *S. atroviridis*
                - 121b. Spikes with 1–7 flower pairs; bracts less than 8 mm.
                  - 122a. Bracts linear-lanceolate; rachis unwinged; plant drying blackish green ..... 44. *S. longispica*
                  - 122b. Bracts oblong-ovate; rachis winged; plant not drying blackish green ..... 45. *S. dryadum*

- 115b. Corolla outside pubescent at least in bud, on lobes, or tube.
- 123a. Plants strongly anisophyllous; corolla densely white pubescent in bud; capsule glabrous.
- 124a. Bracts linear, attenuate; calyx lobes finely acute ..... 39. *S. dalzielii*
- 124b. Bracts oblanceolate; calyx lobes obtuse ..... 40. *S. bantonensis*
- 123b. Plants not strongly anisophyllous; corolla not densely white pubescent in bud; capsule gland-tipped pubescent at apex.
- 125a. Leaves sessile.
- 126a. Leaf blade ovate to suborbicular,  $\pm$  as long as broad, abaxially whitish; bracts orbicular to obovate, 5–8 mm ..... 50. *S. tamburensis*
- 126b. Leaves narrowly ovate, ca. 3  $\times$  as long as broad, abaxially green; bracts lanceolate, 7–10 mm ..... 75. *S. forrestii*
- 125b. Leaves petiolate.
- 127a. Corolla ventricose and strongly bent just below mouth, pubescent over its whole length.
- 128a. Corolla inside pubescent especially on lobes.
- 129a. Bracts oblong, margin entire or with a few apical teeth; spikes 2-sided ..... 71. *S. larium*
- 129b. Bracts broadly to narrowly ovate to lanceolate, margin mostly serrate; spikes often secund ..... 72. *S. oresbia*
- 128b. Corolla inside glabrous even on lobes.
- 130a. Bracts much reduced even at base of spike; leaf blade mostly greater than 5 cm; petiole 2–5 cm ..... 73. *S. flexa*
- 130b. Bracts leaflike almost to spike apex; leaf blade mostly less than 5 cm; petiole (0–)1–3 cm ..... 74. *S. versicolor*
- 127b. Corolla gradually widened above base, curved but not very strongly so, pubescent on lips only.
- 131a. Spikes extremely lax, with apical flower pairs commonly separated by greater than 1 cm along rachis; bracts ovate; calyx lobes conspicuously spatulate in fruit ..... 78. *S. extensa*
- 131b. Spikes apically relatively dense, with flower pairs becoming imbricate along rachis; bracts linear to lanceolate; calyx lobes not usually conspicuously spatulate.
- 132a. Inflorescences mostly of simple terminal spikes; leaf blade glabrous ..... 79. *S. spiciformis*
- 132b. Inflorescences a panicle of spikes; leaf blade pubescent at least when young.
- 133a. Leaf blade ovate, obovate, or broadly elliptic, ca. 2  $\times$  as long as broad ... 76. *S. lachenensis*
- 133b. Leaf blade narrowly oblong-elliptic, 3–4  $\times$  as long as broad ..... 77. *S. nemorosa*

**1. *Strobilanthes tomentosa* (Nees) J. R. I. Wood, Kew Bull. 64: 16. 2009.**

尖药花 jian yao hua

*Aechmanthera tomentosa* Nees in Wallich, Pl. Asiat. Rar. 3: 87. 1832; *A. gossypina* (Wallich) Nees; *A. tomentosa* var. *wallichii* C. B. Clarke; *A. wallichii* Nees, nom. illeg. superfl.; *A. wallichii* var. *gossypina* (Wallich) Nees; *A. wallichii* var. *tomentosa* (Nees) Nees; *Ruellia gossypina* Wallich; *Strobilanthes blinii* H. Léveillé; *S. bodinieri* H. Léveillé; *S. cavaleriei* H. Léveillé.

Subshrubs to 1 m tall, erect, isophyllous. Stems usually gray tomentose but sometimes thinly pilose and greenish. Petiole 1–3 cm, with yellow multicellular gland-tipped trichomes; leaf blade elliptic-ovate to elliptic-oblong, 3–13  $\times$  2–6.5 cm, abaxially sericeous, adaxially densely covered with linear cystoliths, secondary veins 7–10 on each side of midvein, base subrounded, cuneate, or cordate and sometimes shortly decurrent onto petiole, margin crenate, apex acute. Inflorescences usually paniculate, to 30 cm, with 3–8-flowered clusters commonly on 3–8 cm axillary branches in axils of leaflike sterile

bracts, clusters sometimes aggregated to form axillary thyrses or more distant and forming an open panicle; floral bracts linear-ligulate, 0.8–1.2 cm, abaxially and marginally gland-tipped pubescent, apex obtuse; bracteoles narrowly ligulate, ca. 5 mm, similar to and smaller than or equaling calyx lobes. Calyx 0.8–1.2 cm, deeply 5-lobed to base; lobes linear, unequal with 2 longer and 3 shorter, slightly gland-tipped pilose, apex obtuse. Corolla blue, funnel-shaped, 2.5–3.5 cm, straight, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for 4–8 mm then gradually widened to ca. 1 cm at mouth; lobes ca. 5 mm, subequal, apex obtuse. Stamens 4, included; shorter filament pair ca. 6 mm, glabrous; longer filament pair 1.1–1.2 cm, pilose; anther thecae oblong, apex mucronate; connective minutely excurrent; pollen type 6. Ovary comose; style sparsely hairy. Capsule oblong, 7–10 mm, pubescent, 6–8-seeded. Seeds discoid, densely hairy, sometimes glabrescent. Fl. Jun–Dec, fr. Aug–Dec.  $2n = 30$ .

Grassy mountain slopes, open forests in relatively dry areas; 500–2300 m. Guangxi, Guizhou, Yunnan [Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Pakistan].

This is a distinctive and apparently isolated species on account of the excurrent anther connective combined with the 6–8-seeded capsule and seeds with caducous trichomes.

*Strobilanthes tomentosa* was incorrectly reported as *S. glutinosa* Nees (*Pseudaechmanthera glutinosa* (Nees) Bremekamp) by Handel-Mazzetti (Symb. Sin. 7: 894. 1936).

**2. *Strobilanthes quadrifaria*** (Wallich ex Nees) Y. F. Deng, Acta Phytotax. Sin. 45: 849. 2007.

四列马蓝 si lie ma lan

*Ruellia quadrifaria* Wallich ex Nees in Wallich, Pl. Asiat. Rar. 3: 83. 1832; *Hemigraphis quadrifaria* (Wallich ex Nees) T. Anderson; *Sericocalyx quadrifarius* (Wallich ex Nees) Bremekamp.

Subshrubs (0.2–)1–1.5 m tall, isophyllous. Stems hirsute with large-celled trichomes. Petiole (0.3–)1.5–4 cm, hirsute; leaf blade elliptic to ovate, 5–18 × 2–7 cm, both surfaces scabrous and rather sparsely pilose with large pustulose white trichomes especially on veins, adaxially darker and with cystoliths, base attenuate, margin crenate-dentate, apex acute. Inflorescences axillary or terminal, subcapitate to shortly spicate, 2–5 × ca. 2 cm, very compact, densely covered with long silky white large-celled trichomes; peduncle 0.5–1.5 cm, hirsute; bracts ovate, elliptic, or broadly lanceolate, 1.5–2.5 × 0.6–1 cm, pilose with white large-celled trichomes, apically obtuse to acute; bracteoles linear-lanceolate, ca. 10 × 2 mm, pilose with white large-celled trichomes. Calyx 8–11 mm, outside pilose, inside sericeous toward apex, subequally 5-lobed; lobes linear, apex acuminate. Corolla pale purple with a whitish tube, 3–3.2 cm, straight, subglabrous except for pubescent lobes; tube basally cylindric and narrow for 8–10 mm then gradually widened to 8–9 mm at mouth; lobes ovate, ca. 4 × 4 mm, apex rounded. Stamens 4, included; shorter filament pair 2–3 mm, glabrous; longer filament pair 4–7 mm, pilose; anther thecae oblong, ca. 2 × 0.8 mm; pollen type 6. Ovary oblong, comose; style 2–2.2 cm, pilose. Capsule oblong, 1–1.2 cm, sparsely pubescent near apex, 12-seeded. Seeds ca. 1 mm in diam., pubescent. Fl. Oct–Jan.

Moist shaded places in forests; 500–900 m. Yunnan [Laos, Myanmar, Thailand].

**3. *Strobilanthes chinensis*** (Nees) J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 388. 2006.

黄球花 huang qiu hua

*Ruellia chinensis* Nees in A. Candolle, Prodr. 11: 147. 1847; *Hemigraphis chinensis* (Nees) T. Anderson ex Hemsley; *Sericocalyx chinensis* (Nees) Bremekamp.

Herbs or subshrubs, 30–50(–150) cm tall, isophyllous. Stems often procumbent and rooting at base, 4-angled when young, hirsute, basally slightly woody. Petiole 4–10 mm; leaf blade obovate, obovate-elliptic, or sometimes oblong-elliptic, 1.5–11 × 1–4.5 cm, both surfaces sparsely hispid, adaxially densely covered with cystoliths, midvein impressed, secondary veins 5 on each side of midvein, purplish, and scabrous, base attenuate and decurrent onto petiole, margin crenate to slightly dentate, apex acute to shortly acuminate. Inflorescences axillary

or terminal, subcapitate; bracts imbricate, broadly to narrowly ovate, 1.5–2 cm, hirsute, usually 3-veined, apically beaked to a subobtusate point; bracteoles linear, ca. 9 mm, resembling calyx lobes. Calyx 5–11 mm, subequally 5-lobed to base; lobes linear-lanceolate, ca. 10 × 0.5 mm, outside gland-tipped pilose, inside apically pubescent, apex attenuate. Corolla yellow, 1.6–2 cm, straight; tube basally cylindric and ca. 1 mm wide for ca. 5 mm then gradually widened to ca. 1 cm at mouth, outside pubescent, inside villous; lobes orbicular, ca. 4 mm in diam. Stamens 4, included or longer pair slightly exerted; shorter filament pair ca. 2 mm; longer filament pair ca. 5 mm; anther thecae oblong, ca. 2 mm. Ovary pilose; style ca. 2 cm, villous; stigma pilose. Capsule ca. 1 cm, pubescent, 8-seeded. Seeds yellowish, broadly ovate in outline, ca. 2 × 2 mm, subglabrous; areole large. Fl. Oct–Mar, fr. Jun–Jul.

Moist hollows along streams; near sea level to 1300 m. Guangdong, Guangxi, Hainan [Cambodia, Laos, Vietnam].

**4. *Strobilanthes fluviatilis*** (C. B. Clarke ex W. W. Smith) Moylan & Y. F. Deng, Bot. J. Linn. Soc. 150: 389. 2006.

溪畔黄球花 xi pan huang qiu hua

*Hemigraphis fluviatilis* C. B. Clarke ex W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 182. 1918; *Sericocalyx fluviatilis* (C. B. Clarke ex W. W. Smith) Bremekamp.

Herbs to 20 cm tall, isophyllous. Stems decumbent, hirsute, basally woody. Petiole 1–5 mm, coarsely pilose; leaf blade oblong, narrowly oblong-elliptic, or elliptic, 1.5–5 × 1–1.5 cm, abaxially subglabrous to thinly but coarsely pilose with pustulose trichomes, adaxially darker green with prominent linear cystoliths and glabrous or strigose-pilose, secondary veins 4 or 5 on each side of midvein, base cuneate, margin crenulate, apex obtuse. Inflorescences terminal, spikes, ca. 2.5 cm; bracts oblong, 1–1.5 cm, persistent, pilose, base cuneate, apex obtuse; bracteoles narrowly linear-elliptic, ca. 7 × 1 mm, pilose. Calyx ca. 8 mm, pilose, subequally 5-lobed almost to base; lobes linear, apex acute. Corolla yellow, 0.9–1.1 cm, glabrous; tube basally cylindric and narrow for ca. 3 mm then gradually widened to ca. 3 mm at mouth; lobes orbicular, ca. 2 mm in diam., spreading. Stamens 4, included; filaments with a few scattered trichomes, shorter pair ca. 1 mm, longer pair ca. 2 mm; anther thecae oblong; pollen type 6. Ovary oblong, comose; style glabrous or with a few trichomes. Capsule oblong, ca. 8 mm, comose, 8–14-seeded. Seeds ca. 0.8 mm, pubescent; areola large. Fl. Feb–May.

Along streams on rocks; 200–800 m. Guangxi, Guizhou, Yunnan [Myanmar, Thailand].

**5. *Strobilanthes reptans*** (G. Forster) Moylan ex Y. F. Deng & J. R. I. Wood, **comb. nov.**

匍匐半插花 pu fu ban cha hua

Basionym: *Ruellia reptans* G. Forster, Fl. Ins. Austr. 44. 1786; *Hemigraphis okamotoi* Masamune; *H. pacifica* Hosokawa; *H. primulifolia* (Nees) Fernández-Villar; *H. reptans* (G. Forster) T. Anderson ex Hemsley; *H. tawadana* Ohwi; *R. primulifolia* Nees.

Herbs to 50 cm tall, perennial, isophyllous. Stems some-

times rosette-forming but usually prostrate and rooting at nodes, sparsely to densely covered with multicellular trichomes. Petiole 0.5–8 cm, pubescent, glabrescent; leaf blade oblong, elliptic, oblong-ovate, or suborbicular, 1.5–8 × 1–4 cm, both surfaces pubescent with multicellular trichomes, secondary veins 4 or 5 on each side of midvein, base abruptly truncate to slightly cordate, margin crenate to subentire, apex acute to obtuse. Inflorescences terminal, spikes, elongating to 6–8 cm at maturity; bracts oblanceolate to elliptic, 8–12 × 2–5 mm, persistent, pubescent on veins, margin entire and ciliate; bracteoles absent. Calyx 6.5–10 mm, 5-lobed to base; lobes linear-lanceolate, ciliate and pubescent along veins, apex finely attenuate. Corolla white or pale violet with darker veins, 1.3–1.5 cm, glabrous; tube basally cylindric for 4–6 mm; lobes orbicular, 2–5 mm, glabrous. Stamens 4, included; shorter filament pair ca. 1 mm, glabrous; longer filament pair ca. 2 mm, base slightly villous; anther thecae ca. 1 mm; pollen type 7. Ovary apex pubescent; style sparsely villous. Capsule 7–9 mm, apically pubescent, 8–16-seeded. Seeds orbicular in outline, ca. 1 mm in diam., pubescent. Fl. Apr–Sep, Dec.

Weed of roadsides, ponds, and streamsides; near sea level to 400 m. Taiwan [Indonesia, Japan, Malaysia, Papua New Guinea, Philippines; Australia, Pacific islands (New Caledonia)].

The apparent earlier homonym, "*Strobilanthes reptans* Bojer" (Nees in Candolle, Prodr. 11: 368. 1847) was merely cited as a synonym and was therefore not validly published (*Vienna Code*, Art. 34.1(c)); hence it does not preclude valid publication of the new combination made here. The apparent new combination "*Strobilanthes primulifolia*" (Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 483. 2010), based on *Ruellia primulifolia* Nees, was not validly published because a full and direct reference to the place of valid publication of the basionym was not provided (Art. 33.4; "in DC., Prodr. 11: 144. 1847" was cited, but that publication cited the actual place: Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1): 382. 1843).

*Strobilanthes reptans* is an ornamental plant.

**6. *Strobilanthes cumingiana* (Nees) Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 483. 2010.**

直立半插花 zhi li ban cha hua

*Ruellia cumingiana* Nees in A. Candolle, Prodr. 11: 148. 1847; *Hemigraphis cumingiana* (Nees) Fernández-Villar.

Herbs to 50 cm tall, erect, isophyllous. Stems 4-angled, thinly pubescent with multicellular trichomes. Petiole 0.8–2.5 cm, sulcate, pubescent; leaf blade ovate-lanceolate, ovate, or elliptic, 4–10 × 1.5–5 cm, both surfaces densely covered with cystoliths, abaxially strigose along veins, adaxially darker and glabrous, secondary veins 5 or 6 on each side of midvein, base cuneate to rounded and often oblique, margin shallowly crenate, apex shortly acuminate. Inflorescences axillary or terminal, spikes, to 4 cm; peduncle 0.3–2 cm, pubescent to puberulent; rachis glabrous; bracts ovate, persistent, margin slightly ciliate, apex obtuse; basalmost bracts sterile, leaflike, 1.5–2 × 0.6–1 cm, margin undulate; apical bracts fertile, ca. 10 × 6 mm, margin entire; bracteoles absent. Calyx 6.5–9.5 mm, subequally 5-lobed to base; lobes lanceolate, margin ciliate, apically attenuate. Corolla white, 1.3–1.8 cm, glabrous; tube basally cylindric for 4–6 mm; lobes orbicular, ca. 2.5 mm in diam. Stamens 4,

included; shorter filament pair 1–1.5 mm, glabrous; longer filament pair 2–3 mm, villous; anther thecae oblong, ca. 1.5 mm; pollen type 8. Ovary comose; style ca. 1 cm, hirsute. Capsule ca. 9 mm, apically pubescent, 6–8-seeded. Seeds ca. 2 × 1.2–2 mm, pubescent. Fl. Feb–May.

Forests; 100–300 m. Taiwan (Lan Yu) [Indonesia, Malaysia, Philippines].

**7. *Strobilanthes sinica* (H. S. Lo) Y. F. Deng, comb. nov.**

安龙马蓝 an long ma lan

Basionym: *Dyschoriste sinica* H. S. Lo, Acta Phytotax. Sin. 17(4): 85. 1979.

Herbs to 10 cm tall, isophyllous. Stems prostrate, 4-angled, glabrous, internodes usually less than 1 cm, rooting at basal nodes. Leaves shortly petiolate or sessile; leaf blade oblong-lanceolate, 0.7–3 × 0.3–0.7 cm, both surfaces glabrous, secondary veins ca. 3 on each side of midvein, base cuneate, margin entire or apically inconspicuously serrate, apex obtuse. Flowers axillary, solitary. Bracts similar to leaves but smaller; bracteoles linear-spatulate, 4.5–5 mm, apex obtuse. Calyx 5.5–6 mm, 5-lobed almost to base; lobes lanceolate, margin sparsely ciliate. Corolla purple, ca. 1.1 cm, straight; tube basally cylindric and narrow for ca. 4 mm then widened to ca. 4.5 mm at throat, outside reported, perhaps erroneously, to be glabrous; lobes ?obcordate, 2–2.5 mm, subequal. Stamens 4, included; filaments glabrous, shorter pair ca. 1.2 mm, longer pair ca. 3.5 mm; anther thecae parallel; pollen type 10. Ovary glabrous; style ca. 8 mm, slightly hairy. Capsule oblong, ca. 6.5 mm, glabrous, 4-seeded. Seeds ovate in outline, ca. 2 × 2 mm, densely appressed pubescent. Fl. Aug–Sep.

● Grassy slopes; ca. 1300 m. Guizhou (Anlong).

**8. *Strobilanthes szechuanica* (Batalin) J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 375. 2006.**

四川马蓝 si chuan ma lan

*Hemigraphis szechuanica* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 384. 1894.

Herbs to 20 cm tall, isophyllous. Stems decumbent, 4-angled, subglabrous, rooting at basal nodes. Petiole 3–5 mm, puberulent; leaf blade ovate to obovate, becoming suborbicular toward branch tips, 1–2 × 0.8–1 cm, glabrous or margin with a few scattered cilia, both surfaces densely covered with whitish cystoliths, secondary veins 3 or 4 on each side of midvein, base broadly cuneate and decurrent onto petiole, margin entire, apex obtuse to rounded. Flowers axillary, solitary; bracteoles oblanceolate, 5–7 × ca. 1 mm, pilose and with abundant cystoliths, margin thinly ciliate. Calyx 8–10 mm, with abundant cystoliths, 5-lobed almost to base; lobes linear to linear-lanceolate, margin ciliate, apex obtuse. Corolla pale lilac, funnel-shaped, 1.8–2.3 cm, outside pubescent; tube basally cylindric and narrow for ca. 5 mm then gradually widened to ca. 8 mm at mouth; lobes suborbicular, ca. 3 × 3 mm, margin ciliate. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 5 mm, pilose; anther thecae oblong, ca. 2 × 1.2 mm; pollen type 10 (requires confirmation). Ovary oblong, comose; style

1.4–1.8 cm, pilose. Capsule ca. 1 cm, pilose at tip, 4-seeded. Seeds ca. 2 mm in diam., pilose. Fl. Jul–Sep.

• Streamsides, on rocks; 700–1500 m. Sichuan.

**9. *Strobilanthes wilsonii*** J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 371. 2006.

乐山马蓝 le shan ma lan

Herbs to 30 cm tall, perennial, isophyllous. Stems procumbent, sulcate, glabrous, rooting at nodes; flowering branches arising in pairs from nodes, apparently erect, 3–20 cm, sparsely bifariously pilose especially apically, with reflexed whitish large-celled trichomes. Petiole 0.5–2 cm, bifariously hirsute with short reflexed whitish trichomes; leaf blade narrowly elliptic, broadly elliptic, or obovate-spatulate, 1.5–3 × 1–1.5 cm, glabrous except for a few marginal trichomes near petiole, adaxially with prominent cystoliths, secondary veins 3–5 on each side of midvein, base attenuate, margin serrate, apex very shortly acuminate to obtuse. Inflorescences axillary or terminal, headlike spikes, 1–1.5 cm, few flowered; peduncle 0.2–1.8 cm, pilose; bracts obovate-spatulate, 4–10 × 2–6 mm, apically diminishing in size, abaxially glabrous, adaxially with a few trichomes toward base, margin basally entire and ciliate with thick white spreading trichomes and apically toothed and not ciliate, apex ± obtuse; bracteoles oblanceolate to obovate-spatulate, 2–3 × ca. 0.5 mm, margin ciliate with a few large white trichomes to 2 mm, apex ± rounded. Calyx ca. 4 mm, subequally 5-lobed to ca. 1 mm above base; lobes pale but with a green tip, linear-oblong, ca. 3.2 × 1 mm, pilose with large-celled but mostly marginal trichomes, apex obtuse. Corolla blue, 7–8 mm, funnel-shaped, outside pilose; tube basally cylindric and ca. 1 mm wide for ca. 2 mm then gradually widened to ca. 5 mm at mouth; lobes ovate, ca. 1.5 × 1.5 mm, apex acute. Stamens 4; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 4 mm and slightly exserted; anther thecae oblong, ca. 0.5 × 0.2 mm; central staminode present, ca. 1 mm; pollen type 9. Ovary pilose; style ca. 8 mm. Capsule (immature) ca. 2.5 mm, pilose with large-celled trichomes, 4-seeded. Seeds ovate in outline, lenticular, ca. 2 × 2 mm, densely covered with appressed trichomes; areola small, glabrous. Fl. Sep–Oct.

• Moist shaded places; 800–1100 m. Sichuan.

**10. *Strobilanthes labordei*** H. Lévillé, Repert. Spec. Nov. Regni Veg. 12: 20. 1913.

薄叶马蓝 bao ye ma lan

*Acanthopale debilis* C. B. Clarke ex S. Moore; *A. labordei* (H. Lévillé) Handel-Mazzetti; *Championella debilis* Bremekamp; *C. labordei* (H. Lévillé) E. Hossain; *Strobilanthes debilis* Hemsley (1890), not C. B. Clarke (1885).

Herbs, creeping, branched, isophyllous. Stems white villous, rooting at nodes. Petiole 5–10 mm; leaf blade ovate, 2–3 × 1.5–2 cm, both surfaces white hirsute, abaxially glaucous, adaxially green and sometimes purplish dotted, secondary veins 4 or 5 on each side of midvein, base broadly cuneate to rounded, margin sparsely crenulate, apex acuminate. Inflorescences terminal, abbreviated to headlike spikes, ca. 1 cm, densely covered with large-celled white trichomes; bracts leaflike, 1–2 cm;

bracteoles linear, ca. 5 mm. Calyx 5–7 mm, 5-lobed almost to base; lobes linear-lanceolate, densely white hirsute. Corolla purplish blue to violet, 1.5–1.8 cm, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow then gradually widened to ca. 1.2 cm at mouth; lobes oblong, ca. 3 × 3 mm, subequal, apex rounded. Stamens 4; shorter filament pair ca. 3 mm; longer filament pair ca. 7 mm, exserted; anther thecae ca. 1.8 × 1 mm, weakly exserted; pollen type 11. Ovary pilose at tip; style ca. 1.2 cm, pilose. Capsule narrowly obovoid, 6–8 mm, 4-seeded, apex pilose. Seeds ovate in outline, ca. 2 × 2 mm, pubescent. Fl. Aug–Dec.

• Valleys, moist places; 400–1800 m. Chongqing, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan.

**11. *Strobilanthes tetrasperma*** (Champion ex Benth) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 1916: 649. 1917.

四子马蓝 si zi ma lan

*Ruellia tetrasperma* Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 5: 132. 1853; *Acanthopale radicans* (T. Anderson ex Benth) C. B. Clarke ex Benoist; *A. tetrasperma* (Champion ex Benth) Handel-Mazzetti; *Championella tetrasperma* (Champion ex Benth) Bremekamp; *Strobilanthes radicans* T. Anderson ex Benth.

Herbs 30–50 cm tall, isophyllous. Stems often procumbent and rooting at base, 4-angled, sulcate, retrorsely pubescent along sulci, glabrescent, basally slightly woody. Petiole 0.5–2.5 cm, sulcate, glabrous; leaf blade ovate, elliptic, or oblong, 1.5–11 × 1–4.5 cm, glabrous, adaxially darker and densely covered with cystoliths, secondary veins ca. 5 on each side of midvein, base attenuate or decurrent onto petiole, margin serrate to dentate, apex acuminate to acute. Inflorescences terminal or (sometimes) axillary, short often headlike spikes, few flowered, often reduced to a single flower pair; bracts leaflike, obovate to spatulate, 1–1.5 × 0.4–0.5 cm, sparsely pilose, pinnately veined; bracteoles linear, 5–6 × ca. 1 mm, abaxially glabrous or sparsely pilose and densely covered with cystoliths. Calyx 5-lobed almost to base; lobes linear, 5–7 × ca. 1 mm, accrescent to ca. 8 mm in fruit, glabrous except for large-celled trichomes on margin, densely covered with cystoliths. Corolla purple to purplish blue, funnel-shaped, 1.5–2 cm, straight, outside pubescent, inside villous; tube basally cylindric and ca. 2 mm wide for ca. 5 mm then gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 4 × 5 mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 5 mm, sparsely pubescent; anther thecae oblong, ca. 2 mm; pollen type 10. Ovary ovoid, ca. 3 mm, hispid at tip, with 4 ovules per locule; style ca. 1.5 cm, hirsute; stigma 2-lobed, lobes unequal. Capsule oblong, 7–10 mm, apically pubescent, 4-seeded. Seeds ovate in outline, ca. 2 × 2 mm, pubescent. Fl. Jul–Dec.

Forests, shaded grasslands, rocks by streams, roadsides; 100–1000 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan [Vietnam].

**12. *Strobilanthes japonica*** (Thunberg) Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 124. 1866.

日本马蓝 ri ben ma lan

*Ruellia japonica* Thunberg in Murray, Syst. Veg., ed. 14,

576. 1784; *Acanthopale japonica* (Thunberg) C. B. Clarke ex S. Moore; *Championella japonica* (Thunberg) Bremekamp; *Strobilanthes bonatiana* H. Lévillé.

Herbs 20–50 cm tall, isophyllous. Stems slender, herbaceous, much branched; branchlets purplish red, 4-angled then terete, glabrous. Petiole 2–5 cm, white pubescent; leaf blade narrowly elliptic to lanceolate, 2–5 × 0.5–1.8 cm, both surfaces glabrous and densely covered with prominent linear cystoliths, secondary veins 3–5 on each side of midvein, base cuneate to broadly cuneate, margin crenulate, apex long acuminate. Inflorescences terminal, spikes, 1–3(–5) cm, sometimes reduced to a single flower pair; bracts imbricate, oblanceolate to oblong-lanceolate, 7–10 × 2–3 mm, as long as corolla tube, glabrous except for pubescence at base, apically densely covered with cystoliths, margin entire, apex obtuse; bracteoles linear, ca. 5 mm. Calyx equally 5-lobed almost to base; lobes linear, 6–7 mm, margin ciliate, apex rounded. Corolla purplish white or white, funnel-shaped, ca. 1.5 cm, straight, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric for 5–6 mm; lobes oblong-elliptic, 5–6 mm, equal. Stamens 4, included; shorter filament pair ca. 8 mm; longer filament pair ca. 1.2 cm; anther thecae oblong, ca. 1.5 mm; pollen type 10. Ovary glabrous; style filiform, ca. 1.2 cm, pilose; stigma 2-cleft. Capsule oblong, ca. 7 mm, presumably glabrous, 4-seeded. Seeds ovate in outline, ca. 3 mm, densely appressed pubescent. Fl. Aug–Sep, fr. Oct–Nov.  $2n = 30$ .

Often near temples and religious sites; 500–1100 m. Chongqing, Guizhou, Hubei, Hunan, Sichuan [Japan].

*Strobilanthes japonica* differs from *S. tetrasperma* in its lanceolate leaves and glabrous ovary. We have seen two collections intermediate between these two species (*Yu Xunlin 91690* from Hunan and *Exped. To Flora of Yunnan, Guizhou and Guangxi 50124* from Guizhou).

"*Dyschoriste grandiflora* H. S. Lo" (C. C. Hu, FRPS 70: 79. 2002) belongs here but is a nomen nudum and was therefore not validly published (*Vienna Code*, Art. 32.1(d)).

**13. *Strobilanthes wangiana*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 473. 2010.

启无马蓝 qí wú mǎ lán

Herbs to 1 m tall, perennial, isophyllous. Stems sulcate, obscurely bifariously pubescent, glabrescent; nodes pustulose, sparsely pubescent. Petiole 4–5(–20) mm, almost glabrous; leaf blade elliptic to ovate-elliptic, 2.5–6 × 1.1–2.8 cm, both surfaces glabrous except for large-celled trichomes adaxially along midvein, cystoliths prominent, secondary veins 5–7 on each side of midvein, base cuneate and attenuate onto petiole, margin crenate, apex obtuse. Inflorescences terminal, subcapitate spikes, 2–4 cm, few flowered; bracts leaflike; basal bracts elliptic, 2–4 × 1–1.4 cm, apically diminishing in size, margin serrate; apical bracts oblong, 1.4–2 × 0.4–0.6 cm, abaxially sparsely pubescent, adaxially glabrous, margin ciliate and entire except for a few teeth near apex; bracteoles linear-lanceolate, 9–11 × ca. 1 mm, abaxially silky pubescent, adaxially glabrous, margin ciliate. Flowers imbricate on rachis, sessile. Calyx 1–1.3 cm, 5-lobed to ca. 3 mm above base; lobes linear-oblanceolate, 10–14 × 0.6–1 mm, outside silky pubescent, inside silky pubescent from middle apically and glabrescent toward base, margin ciliate. Corolla purplish, 3.5–4 cm,

ventricose and bent to ca. 90° at mouth, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then gradually widened to ca. 1 cm at mouth; lobes ovate, 4–5 × 4–5 mm, apex obtuse. Stamens 4, included; filaments pubescent, shorter pair 1–2 mm, longer pair 3–4 mm; anther thecae oblong, ca. 1.5 mm. Ovary ca. 2 mm, glabrous except for a few trichomes at tip. Capsule oblong, ca. 10 × 3 mm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, compressed, pubescent; areola small. Fl. Aug–Sep, fr. Nov.

• Forests; 1200–2300 m. Yunnan.

**14. *Strobilanthes oligantha*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 124. 1866.

少花马蓝 shǎo huā mǎ lán

*Acanthopale oligantha* (Miquel) C. B. Clarke ex S. Moore; *Championella oligantha* (Miquel) Bremekamp.

Herbs 40–50 cm tall, isophyllous. Stems 4-angled, sulcate, sparsely and retrorsely white hairy. Petiole 3.5–4 cm, thinly pilose; leaf blade broadly ovate to elliptic, 4–7(–10) × 2–4 cm, both surfaces with prominent white cystoliths, abaxially thinly pilose on veins, adaxially glabrous to thinly pubescent, secondary veins 4–6 on each side of midvein, base broadly cuneate, margin remotely serrate, apex acuminate. Inflorescences short spikes, elongating to ca. 4 cm in fruit, sometimes reduced to a single flower pair; bracts leaflike; outer bracts ca. 1.5 cm; inner bracts smaller, densely covered with white large-celled trichomes; bracteoles linear-spatulate, ca. 1 cm, densely covered with white large-celled trichomes. Flowers imbricate on rachis. Calyx ca. 8 mm, subequally 5-lobed almost to base; lobes linear, subequaling bracteoles, inside apically with trichomes. Corolla bluish purple, 3–3.5 cm, usually bent, outside sparsely pubescent on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 1.5 cm then gradually widened to ca. 1.3 cm at mouth, expanded part campanulate and ca. 2.5 cm; lobes ca. 5 mm, subequal. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 5 mm, pilose; anther thecae oblong, ca. 2 × 1 mm; pollen type 10. Ovary pubescent at tip; style ca. 3.2 cm, pilose. Capsule narrowly obovoid, ca. 1 cm, pubescent at tip, 4-seeded. Seeds ovate in outline, ca. 2.5 × 2 mm, pubescent. Fl. Jul–Sep, fr. Oct–Nov.  $2n = 60$ .

Forests, shaded moist grasslands; 100–800 m. Anhui, Fujian, Jiangxi, Zhejiang [Japan, Korea].

**15. *Strobilanthes austrosinensis*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 470. 2010.

华南马蓝 huá nán mǎ lán

Herbs to 50 cm, perennial, drying a distinct dark green color, isophyllous. Stems basally procumbent and rooting at nodes but eventually ascending, sulcate, bifariously pubescent especially apically, with reflexed whitish large-celled trichomes. Petiole 0–2 cm, bifariously hirsute with reflexed whitish large-celled trichomes; leaf blade elliptic to suborbicular, 2–8 × 1–4.5 cm, abaxially pilose along veins, adaxially pilose and hirsute especially toward base and densely covered

with white cystoliths, secondary veins 3–5 on each side of midvein, base attenuate, margin serrate but becoming subentire toward base, apex acute to obtuse. Inflorescences terminal, headlike spikes, 1–2 cm, often elongating at maturity, leafy, few flowered; rachis densely whitish pilose; bracts shortly petiolate, leaflike, broadly obovate-spatulate,  $1.5\text{--}1.8 \times 0.5\text{--}0.8$  cm, abaxially densely covered with whitish multicellular trichomes toward base, adaxially subglabrous, margin basally entire and apically 1–3-dentate, apex rounded to obtuse; bracteoles spatulate,  $8\text{--}11 \times 1\text{--}2.5$  mm, abaxially toward base densely covered with whitish multicellular large-celled trichomes, adaxially whitish pilose. Calyx 1–1.2 cm, 5-lobed almost to base; lobes oblong-lanceolate, outside pilose, inside subglabrous, midvein prominent, margin ciliate with thick white apically spreading cilia, apex obtuse. Corolla bluish purple, funnel-shaped, 2.2–2.8 cm, ventricose, straight to slightly curved, outside pilose when young but glabrescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for 1.2–1.5 cm then gradually widened to ca. 1.5 cm at mouth; lobes ovate-elliptic, ca. 5 mm. Stamens 4, included; filaments hirsute, shorter pair ca. 6 mm, longer pair ca. 8 mm; anther thecae oblong, ca.  $1.2 \times 0.4$  mm; pollen type 10. Ovary ovoid, ca. 2 mm, glabrous except for comose tip; style ca. 1.5 cm, hirsute; stigma unequally 2-cleft. Capsule oblong,  $9\text{--}10 \times$  ca. 3 mm, glabrous except for pilose tip and along suture, 4-seeded. Seeds ovate in outline, ca.  $2.5 \times 2$  mm, densely pilose; areola small, glabrous. Fl. Jul–Sep, fr. Oct–Nov.

• Thickets, forest margins; 100–1500 m. Guangdong, Guangxi, Hunan, Jiangxi.

**16. *Strobilanthes sarcorrhiza*** (C. Ling) C. Z. Zheng ex Y. F. Deng & N. H. Xia, *Novon* 17: 154. 2007.

菜头肾 *cai tou shen*

*Championella sarcorrhiza* C. Ling, *Acta Phytotax. Sin.* 13(3): 93. 1975.

Herbs 20–40 cm tall, unbranched, isophyllous. Rhizomes swollen, fleshy. Stems 4-angled, sulcate, densely pubescent. Petiole 0–3 mm; leaf blade oblong-lanceolate,  $4\text{--}18 \times 1.5\text{--}3$  cm, abaxially pubescent along veins, adaxially glabrous and densely covered with acerose cystoliths, secondary veins 5–9 on each side of midvein, base narrowly cuneate, margin dentate to undulate, apex acuminate. Inflorescences terminal, subcapitate spikes, 2–4(–5) cm, 4–10-flowered; rachis pubescent; bracts leaflike, obovate-elliptic,  $1\text{--}2 \times 0.3\text{--}1$  cm, glabrous; bracteoles linear-lanceolate, ca. 8 mm, glabrous except for large-celled trichomes on margin, abaxially densely covered with white clavate cystoliths. Calyx ca. 1 cm, 5-lobed almost to base; lobes linear, unequal, glabrous except for large-celled trichomes on margin, outside densely covered with white clavate cystoliths. Corolla purple, funnel-shaped, 3.5–4.5 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 7 mm then gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca.  $4 \times 3$  mm, subequal, apex emarginate. Stamens 4, included; filaments pilose, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 1.5 mm; pollen type 3. Ovary glabrous; style filiform, ca. 3.2 cm, pubescent. Capsule glabrous, 4-

seeded. Seeds ovate in outline, ca.  $2.5 \times 2$  mm, densely pubescent. Fl. Aug–Sep, fr. Nov.

• Forests in valleys; 200–600 m. Zhejiang.

This species is used medicinally.

**17. *Strobilanthes procumbens*** Y. F. Deng & J. R. I. Wood, *J. Trop. Subtrop. Bot.* 18: 476. 2010.

金佛山马蓝 *jin fo shan ma lan*

Herbs to 70 cm tall, perennial, isophyllous. Stems at first procumbent and rooting at nodes then erect, sulcate, densely pubescent with multicellular trichomes. Petiole 3–11 mm, sulcate, densely pubescent with multicellular trichomes; leaf blade ovate to rhomboidal,  $0.8\text{--}3 \times 0.3\text{--}2$  cm, both surfaces pubescent with multicellular trichomes, adaxially with numerous cystoliths, secondary veins 3–5 on each side of midvein, abaxially elevated, and adaxially impressed, base cuneate and slightly decurrent onto petiole, margin crenate, apex acute. Inflorescences terminal, subcapitate spikes, ca. 1 cm; bracts leaflike, oblanceolate,  $4\text{--}12 \times 2\text{--}4$  mm, apically diminishing in size, abaxially pubescent, adaxially pubescent with white to slightly yellowish multicellular trichomes, margin entire or with 1 or 2 teeth and silky ciliate, apex obtuse; bracteoles linear-spatulate, ca.  $5 \times 1$  mm, indumentum as for bracts. Calyx subequally 5-lobed to base, white pilose; lobes linear, apex obtuse. Corolla white, funnel-shaped, 2.8–3.3 cm, straight to slightly curved, outside pubescent especially on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1 mm wide for ca. 6 mm then gradually widened to ca. 1 cm at mouth; lobes oblong, ca.  $2 \times 2$  mm. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 4 mm, pubescent; anther thecae oblong, ca. 1.3 mm; pollen type ?4. Ovary glabrous except for comose tip; style ca. 1 cm, glabrous. Capsule oblong, ca. 0.8 cm, glabrous except for comose tip, 4-seeded. Seeds elliptic in outline, ca.  $1 \times 1$  mm, pubescent; areola small. Fl. Aug–Sep, fr. Nov.

• Streamsides; 800–1000 m. Chongqing (Nanchuan).

**18. *Strobilanthes lihengiae*** Y. F. Deng & J. R. I. Wood, *Bot. J. Linn. Soc.* 150: 379. 2006.

李恒马蓝 *li heng ma lan*

Herbs to 40 cm tall, perennial, isophyllous. Stems rounded to slightly sulcate, apparently ascending, bifariously pubescent to subglabrous. Petiole 0.2–4 cm, pilose with large white multicellular trichomes; leaf blade ovate to ovate-elliptic,  $1.5\text{--}11 \times 0.5\text{--}6$  cm, both surfaces pilose with large-celled trichomes especially on veins but adaxially sparser, secondary veins 4 on each side of midvein, base cuneate, margin dentate to crenate, apex shortly acuminate. Inflorescences terminal on main stem and on small axillary branchlets, headlike spikes, very compact; bracts obovate,  $8\text{--}11 \times 6\text{--}9$  mm, shortly and densely greenish tomentose and also pilose with long large-celled white gland-tipped and non-glandular trichomes, margin entire, apex rounded; bracteoles oblong-oblanceolate, ca.  $6 \times 1.5\text{--}2$  mm, margin long ciliate. Calyx subequally 5-lobed to ca. 1 mm from base; lobes green-tipped, lanceolate-oblong,  $8\text{--}9 \times$  ca. 1.3 cm, exceeding bracteoles, margin long ciliate, apex obtuse. Corolla

with a whitish tube base and blue apical part of tube and lobes, 3.2–4 cm, ventricose, sparsely pilose on lobes; tube basally cylindric and ca. 1 mm wide for 8–10 mm then bent and expanded gradually to ca. 1.5 cm wide at mouth; lobes ovate, ca. 5 × 5 mm, apex acute. Stamens 4, included; filaments coarsely pilose, shorter pair ca. 3 mm, longer pair ca. 5 mm; anther thecae narrowly oblong, ca. 3 × 0.5 mm; pollen type 3. Ovary villous; style 2.5–3 cm, basally sparsely pilose. Capsule cylindric, ca. 12 × 3 mm, comose, 4-seeded. Seeds ovate-elliptic in outline, ca. 2.5 × 2 mm, pilose. Fl. Nov–Dec.

• Disturbed evergreen broad-leaved forests; ca. 2000 m. Yunnan (Tengchong).

**19. *Strobilanthes esquirolii*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 18. 1913.

白头马蓝 *bai tou ma lan*

*Pyrrothrix heterochroa* (Handel-Mazzetti) C. Y. Wu & C. C. Hu; *Strobilanthes heterochroa* Handel-Mazzetti; *S. leucocephala* Craib; *Tetragoga angustiphylla* Q. H. Chen; *T. esquirolii* (H. Léveillé) E. Hossain.

Subshrubs 0.5–2 m tall, much branched, anisophyllous. Stems 4-angled, basally glabrescent, apically rust-colored retrorsely setose. Petiole 1–3 cm, hispid-pilose; leaf blade ovate-elliptic to oblong-elliptic, 4–17 × 2–8 cm, smaller of pair ca. 3/4 size of larger one, roughly hirsute, abaxially paler, adaxially with prominent cystoliths, secondary veins 7–10 on each side of midvein, abaxially prominent, and adaxially impressed, base cuneate and attenuate, margin serrulate and ciliate, apex acute to caudate. Inflorescences terminal, heads, often yellowish, 2–3 × ca. 2 cm, 8–10-flowered; rachis densely white sericeous with gland-tipped trichomes; bracts oblong-lanceolate, 1–3 × 0.5–0.7 cm, outer ones longer with caudate tips giving inflorescences an eared appearance, inner ones smaller, indumentum variable, white sericeous, with gland-tipped or non-glandular trichomes, and apically often becoming brownish; bracteoles oblanceolate, 7–9 × ca. 2 mm, abaxially basally white sericeous, trichomes apically often slightly rust-colored. Flowers imbricate on rachis. Calyx 7–10 mm, 5-lobed almost to base; lobes linear-oblan-ceolate, densely white sericeous toward base but slightly rust-colored toward apex, apex acute. Corolla violet, 3–3.5 cm, curved, ventricose, outside densely white pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 4 mm wide for ca. 6 mm then gradually widened to ca. 1 cm at mouth; lobes ovate, ca. 4 × 5 mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 4 mm, glabrous; longer filament pair ca. 7 mm, white pilose; anther thecae oblong, ca. 3 × 1 mm; pollen type 3. Ovary densely white pilose; style ca. 2.8 cm, white pilose. Capsule oblong, 7–10 mm, apically white pilose, 4-seeded. Seeds ovate in outline, ca. 3.5 × 2 mm, densely pubescent; areola small. Fl. Sep–Dec.

Mountain slopes; 200–800 m. Guizhou, Yunnan [Laos, Thailand, Vietnam].

**20. *Strobilanthes hossei*** C. B. Clarke, Bot. Jahrb. Syst. 41: 67. 1907.

红毛马蓝 *hong mao ma lan*

*Championella fulvihilspida* (D. Fang & H. S. Lo) C. C. Hu & C. Y. Wu; *Pyrrothrix hossei* (C. B. Clarke) C. Y. Wu & C. C. Hu; *P. rufohirta* (C. B. Clarke ex W. W. Smith) C. Y. Wu & C. C. Hu; *Strobilanthes fulvihilspida* D. Fang & H. S. Lo; *S. rufohirta* C. B. Clarke ex W. W. Smith.

Herbs or subshrubs 20–30(–100) cm tall, much branched, anisophyllous. Stems slender, erect, 4-angled, basally glabrescent, apically reddish brown setose. Petiole 1.5–2.5 cm, densely reddish setose; leaf blade ovate to ovate-lanceolate, 8–9 × 3.5–4 cm, both surfaces reddish brown setose on veins, abaxially whitish, adaxially dark green, cystoliths absent or obscure, secondary veins ca. 5 on each side of midvein, base broadly cuneate to subrounded, margin crenate, apex acuminate. Inflorescences axillary, spikes, 2–4 cm; rachis densely reddish setose; bracts spatulate, 1.3–1.6 × ca. 0.3 cm, persistent, basal claw pale reddish setose, expanded apex green and leaflike; bracteoles linear-spatulate, 0.8–1.2 cm, reddish setose. Calyx ca. 1.3 cm, 5-lobed almost to base; lobes linear-spatulate, reddish setose. Corolla pale blue, 4–5 cm, straight, outside puberulent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then gradually widened to ca. 1.2 cm at mouth; lobes orbicular, 6–7 mm in diam. Stamens 4, included; filaments white villous, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2 × 1 mm; pollen type 3. Capsule light brown, fusiform, ca. 1 cm, gland-tipped pubescent, 4-seeded, apex apiculate. Seeds brown, ovate in outline, ca. 2 × 2 mm, compressed, pubescent, apex shortly apiculate; areola absent. Fl. Aug–Dec, fr. Nov–Feb.

Thickets, mountain slopes; 1000–1800 m. Guangxi, Yunnan [Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**21. *Strobilanthes torrentium*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 188. 1922.

急流马蓝 *ji liu ma lan*

Subshrubs to 1 m tall, isophyllous or slightly anisophyllous. Stems dark green, erect, 4-angled, sulcate, bifariously pubescent. Petiole 0.5–3 cm, pubescent and slightly hispid; leaf blade ovate to elliptic, 3–13 × 1.5–5.5 cm, abaxially densely yellow pilose along veins, adaxially sparsely pubescent, hispid, and with numerous cystoliths, secondary veins 5–7 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin serrate, apex acuminate and slightly falcate. Inflorescences axillary or terminal, headlike spikes, 1.5–3 cm, very compact, densely covered with long silky rufous trichomes; bracts imbricate, somewhat variable in size and shape; outer bracts leaflike, obovate to subrhombic, 1.5–1.7 × 0.5–0.7 cm, distinctly angled, densely villous, apex acute; inner bracts obovate, ca. 10 × 5 mm, angled, villous, apex subacute; bracteoles oblanceolate, ca. 7 mm, margin ciliate, apex obtuse. Calyx 1–1.1 cm, villous, 5-lobed to ca. 3 cm from base; lobes linear-oblong 7–8 × ca. 1 mm, with 2 slightly shorter than others, margin ciliate, apex obtuse. Corolla with a white tube and blue to mauve lobes, 3–4.5 cm, curved, outside sparsely pubescent on tube and on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for 8–10 mm then gradually widened to 1–1.2 cm at mouth; lobes ovate, ca. 3 × 5 mm, apex obtuse. Stamens 4, included; filaments pilose,

shorter pair ca. 2 mm, longer pair ca. 5 mm; anther thecae oblong, ca. 2.5 mm; pollen type 3. Ovary villous; style ca. 3.3 cm, basally glabrous, apically pubescent. Capsule oblong, ca. 9 mm, pilose at tip, 4-seeded. Seeds unknown. Fl. Aug–Nov.

Forests by streams; 1900–2300 m. Yunnan [India, Myanmar].

**22. *Strobilanthes anamitica*** Kuntze, Revis. Gen. Pl. 2: 498. 1891.

海南马蓝 hai nan ma lan

*Championella machurei* (Merrill) C. Y. Wu & H. S. Lo;  
*Strobilanthes machurei* Merrill.

Herbs 50–100 cm tall, isophyllous. Stems reddish, stout, erect or procumbent and rooting at nodes, hirsute when young, glabrescent. Petiole 1–2 cm; leaf blade oblong-ovate, 3–13 × 1.5–5.5 cm, both surfaces golden to brown hirsute, adaxially densely covered with cystoliths, secondary veins ca. 5 on each side of midvein, base cuneate to subrounded, margin crenulate, apex acuminate to shortly acuminate. Inflorescences axillary or terminal, headlike spikes, 1–3 cm, very compact, elongated after flowering; bracts obovate, ca. 1 cm, brown hirsute, pinnately veined, apex reflexed; bracteoles spatulate-linear, ca. 10 × 1 mm, abaxially hirsute on apical half, adaxially subglabrous, margin ciliate. Calyx 6–8 mm, hirsute, 5-lobed almost to base; lobes linear, ca. 1 mm wide, outside hirsute on apical half, margin ciliate. Corolla light blue or white, ca. 3 cm, outside pubescent on tube, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 0.2 mm wide for ca. 1.2 cm then gradually widened to ca. 1 cm at mouth; lobes oblong, ca. 6 mm. Stamens 4, included; filaments pilose, shorter pair ca. 3 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2 × 1 mm; pollen type 2. Ovary pubescent at tip; style ca. 2.5 cm, hirsute. Capsule light brown, ca. 7 mm, pubescent at tip, 4-seeded. Seeds ovate in outline, ca. 2.5 × 2 mm, pubescent. Fl. Sep–Jan, fr. Dec–Mar.

Forests, on rocks by streams; 400–1800 m. Guangxi, Hainan, Yunnan [Vietnam].

**23. *Strobilanthes yunnanensis*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 164. 1912.

云南马蓝 yun nan ma lan

*Pteracanthus hygrophiloides* (C. B. Clarke ex W. W. Smith) H. W. Li; *P. hygrophiloides* var. *brachytrichus* (Handel-Mazzetti) C. Y. Wu; *P. mekongensis* (W. W. Smith) C. Y. Wu & C. C. Hu; *P. yunnanensis* (Diels) C. Y. Wu & C. C. Hu; *Strobilanthes hygrophiloides* C. B. Clarke ex W. W. Smith; *S. hygrophiloides* var. *brachytricha* Handel-Mazzetti; *S. hygrophiloides* var. *subnuda* Benoist; *S. limprichtii* Diels; *S. mekongensis* W. W. Smith.

Subshrubs 0.5–2.5 m tall, much branched, isophyllous. Stems 4-angled, bifariously whitish pubescent, sometimes glabrescent. Petiole 2–4 cm, whitish pubescent; leaf blade ovate, elliptic, or elliptic-ovate, 3–11 × 2–5 cm, abaxially pale green and sparsely pubescent, adaxially dark green and pubescent, cystoliths abundant on both surfaces, secondary veins 4–7 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin crenate-serrate, apex acuminate and sometimes falcate. Inflorescences axillary or terminal, subcapitate spikes,

rarely reduced to a single flower; peduncle 0–4 mm, densely white pubescent; bracts persistent, hirsute; outermost sterile bracts leaflike, petiolate, lanceolate to ovate-lanceolate, 1.5–2.5 × 0.3–0.4 cm; inner floral bracts linear-oblong, 1.2–1.6 cm, with 1 reddish brown vein; bracteoles linear to oblanceolate, ca. 10 × 2 mm, pilose, apex obtuse. Flowers usually only one sterile per node. Calyx 1.2–1.6 cm, 5-lobed almost to base; lobes linear-lanceolate, 11–15 × 1–1.5 mm, subhyaline, pilose especially on midvein, margin ciliate, apex finely acuminate. Corolla pale blue to pinkish, 3.5–4.5 cm, straight, outside densely white pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and 8–9 mm wide for 1–1.5 cm then gradually widened to ca. 2 cm at mouth; lobes orbicular, 6–8 mm in diam. Stamens 4, included; filaments pilose, shorter pair ca. 2 mm, longer pair 4–7 mm; anther thecae oblong, ca. 4 × 1 mm; pollen type 3. Ovary whitish comose; style 2.8–3.4 cm, sparsely pilose. Capsule oblong, 11–13 × ca. 2.5 mm, apically sparsely gland-tipped pubescent, 4-seeded. Seeds ovate in outline, 2.5–3.5 × 2–2.5 mm, densely appressed pilose. Fl. Jul–Sep, fr. Oct–Nov.

• Moist open shady places in thickets; 800–2800 m. Gansu (Wenxian), Sichuan, Xizang (Mêdog, Zayü), Yunnan.

**24. *Strobilanthes fengiana*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 481. 2010.

冯氏马蓝 feng shi ma lan

Subshrubs to 50 cm tall, perennial, weakly anisophyllous. Stems 4-angled, sulcate, glabrescent. Petiole 1–2 cm, sulcate, bifariously pubescent; leaf blade ovate, smaller of pair 6–8 × 3–4 cm and larger one 10–14 × 4–6 cm, abaxially glabrous except pilose along midvein, adaxially glabrous and with prominent cystoliths, secondary veins 4–7 on each side of midvein, base rounded to broadly cuneate, margin undulate and ciliate, apex acuminate. Inflorescences terminal, subcapitate spikes, 1.5–3 cm; rachis pubescent; bracts lanceolate, 10–15 × ca. 2 mm, abaxially glabrescent, adaxially sparsely pubescent; bracteoles lanceolate, 8–10 × ca. 2 mm, abaxially glabrous, adaxially densely covered with multicellular large-celled trichomes. Calyx ca. 1.2 cm, 5-lobed almost to base; lobes linear-spatulate, outside apically covered with multicellular large-celled trichomes, margin ciliate with multicellular large-celled trichomes, apex acute. Corolla purple, 3–3.5 cm, outside pilose with large-celled trichomes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.5 cm then bent to ca. 90° above middle and gradually widened to ca. 1.3 cm at mouth; lobes rounded. Stamens 4, included; filaments pilose, shorter pair ca. 6 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 2 mm. Capsule oblong, 12–14 × 3–4 mm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, pubescent; areola small. Fl. Sep–Dec, fr. Nov–Feb.

• Forests; 1200–1800 m. Yunnan (Xichou).

**25. *Strobilanthes lamium*** C. B. Clarke ex W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 195. 1918.

野芝麻马蓝 ye zhi ma ma lan

*Pteracanthus lamium* (C. B. Clarke ex W. W. Smith) C. Y. Wu & C. C. Hu.

Herbs 30–80 cm tall, unbranched, anisophyllous. Stems 4-angled, sulcate, basally glabrescent, apically whitish gland-tipped pubescent. Leaves apically denser; petiole 3–10 mm, hirsute; leaf blade ovate to ovate-lanceolate, 4–5 × 2.5–3 cm, both surfaces with very small conspicuous cystoliths, abaxially paler, sparsely pilose, and setose along veins, adaxially dark green, sparsely hirsute, and yellowish brown setose along midvein, secondary veins 7 or 8 on each side of midvein, base broadly cuneate and decurrent onto petiole, margin coarsely serrate, apex acute. Inflorescences terminal, subcapitate spikes, 3–5 cm, 4–8-flowered; bracts oblong to lanceolate, resembling reduced leaves, 1.4–1.6 × 0.6–0.7 cm, persistent, abaxially hirsute especially on veins; bracteoles narrowly oblong-elliptic, ca. 1.2 cm, abaxially gland-tipped pilose. Flowers imbricate on rachis. Calyx ca. 1.1 cm, gland-tipped pilose, 5-lobed almost to base; lobes linear-lanceolate, subequal, pilose, apex acute. Corolla purple, ca. 3.5 cm, bent at mouth, outside sparsely pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 6 mm then gradually widened to ca. 1 cm at mouth; lobes orbicular, ca. 6 mm in diam. Stamens 4, included; filaments densely pilose, shorter pair ca. 5 mm, longer pair ca. 7 mm; anther thecae oblong, ca. 2.3 × 1.3 mm, erect. Ovary pilose at tip; style pilose. Capsule not seen. Fl. Jul–Aug.

- Forests, slopes; 800–1500 m. Chongqing, Hubei, Hunan.

**26. *Strobilanthes cyphantha*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 162. 1912.

弯花马蓝 wan hua ma lan

*Pteracanthus cyphanthus* (Diels) C. Y. Wu & C. C. Hu.

Subshrubs 45–60 cm tall. Stems 4-angled. Petiole 2–5 cm; leaf blade ovate, 3–7 × 1.5–4.5 cm, both surfaces pilose, adaxially with numerous obscure cystoliths, secondary veins 6–8 on each side of midvein, base decurrent onto petiole, margin serrate, apex acute. Inflorescences terminal or in apical leaf axils, subcapitate, dense, sessile or with peduncle to 5 mm, white pilose; outer sterile bracts leaflike; inner floral bracts elliptic, ca. 12 × 5 mm, white pilose, margin dentate and ciliate; bracteoles linear, ca. 16 × 1 mm, thinly pilose. Calyx 1–1.3 cm, 5-lobed almost to base; lobes linear, ca. 11 × 1 mm, subequal, thinly pilose. Corolla blue, 3–4 cm, strongly bent and ventricose, outside thinly pilose, inside pubescent on lobes and glabrous in tube except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1 cm then bent to ca. 90° at middle and widened to ca. 1.2 cm at mouth; lobes oblong, ca. 5 × 4 mm. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 3 mm, glabrous except for a few trichomes basally; anther thecae oblong, ca. 2 × 1–1.5 mm; pollen type 3. Ovary comose; style 2.7–3.2 cm, pubescent. Capsule ca. 1.4 cm, pilose at tip, 4-seeded. Seeds ovate in outline, ca. 2.5 × 2 mm, densely covered with appressed trichomes. Fl. Jul–Oct, fr. Nov–Dec.

- Mixed forests; 1200–3200 m. Gansu (Wenxian), Sichuan, SE Xizang, Yunnan.

"*Strobilanthes curviflorus* [sic!] C. B. Clarke" (C. Y. Wu, Index Fl. Yunnan. 2: 1685. 1984) belongs here but was not validly published because it was merely cited as a synonym (*Vienna Code*, Art. 34.1(c)).

**27. *Strobilanthes strigosa*** D. Fang & H. S. Lo, Guihaia 17: 36. 1997.

糙毛马蓝 cao mao ma lan

Subshrubs 30–60 cm tall, isophyllous. Stems black when dry, 4-angled, sulcate, bifariously pubescent and hirsute. Petiole 5–12 mm, pubescent and hirsute; leaf blade elliptic to broadly ovate, 3.5–8 × 2–5 cm, both surfaces sparsely hispid pilose and with conspicuous cystoliths, secondary veins ca. 7 on each side of midvein and prominent, base cuneate to attenuate, margin serrate, apex acute. Inflorescences terminal or in apical leaf axils, spikes, 2–3 cm; bracts elliptic, 9–10 × 5–6 mm, persistent, pinnately veined, margin gland-tipped ciliate, apex acute; bracteoles oblanceolate, ca. 9 mm, densely covered with linear cystoliths, margin gland-tipped ciliate. Flowers imbricate on rachis. Calyx ca. 1.2 cm, 5-lobed to base; lobes falcately spatulate, ca. 2 mm wide, unequal, margin gland-tipped ciliate. Corolla purplish, ca. 4.5 cm, slightly bent, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric for ca. 1.5 cm then gradually widened to ca. 1 cm at mouth; lobes ovate, ca. 7 mm, apex rounded. Stamens 4, included; shorter filament pair ca. 2.5 mm, glabrous; longer filament pair ca. 5 mm, pilose; anther thecae oblong, ca. 2 × 1.3 mm; pollen type 4. Ovary comose; style ca. 2.8 cm, sparsely pilose. Capsule not seen. Fl. Dec.

- Limestone slopes; 400–600 m. Guangxi (Jingxi).

*Strobilanthes strigosa* is a poorly understood species whose placement is uncertain.

**28. *Strobilanthes longiflora*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 94. 1922.

长花马蓝 chang hua ma lan

*Championella longiflora* (Benoist) C. Y. Wu & C. C. Hu.

Herbs to 50 cm tall, isophyllous. Stems sulcate, glabrous. Petiole 2–4 mm, pubescent; leaf blade broadly lanceolate to ovate, to ca. 10 × 5 cm, glabrous, cystoliths very prominent on both surfaces, secondary veins 3–5 on each side of midvein, base cuneate, margin minutely crenulate, apex acuminate. Inflorescences terminal or from apical axils, spikes, 0–4 cm, 8–12-flowered but sometimes reduced to a single flower in leaf axils; bracts oblanceolate-spatulate, 10–13 × 1.5–3 mm, sparsely pilose, apex entire to weakly 3-lobed; bracteoles oblong, ca. 6 × 1 mm, pilose with a comose apex, apex obtuse. Calyx ca. 1 cm, 5-lobed almost to base; lobes linear, ca. 9 × 1.5 mm, comose. Corolla blue, funnel-shaped, ca. 5 cm, strongly bent, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then gradually widened to ca. 9 mm at mouth; lobes ovate, ca. 4 × 3 mm, apex obtuse. Stamens 4, included; filaments pilose, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2.5 × 1.2 mm; pollen type 15. Ovary glabrous but pubescent at tip; style sparsely white pilose; stigma linear. Capsule oblong-fusiform, ca. 8 × 2 mm, glabrous apart from a few apical trichomes, 4-seeded. Fl. Aug–Oct, fr. Nov–Dec.

- Thickets; 700–1500 m. Yunnan.

**29. *Strobilanthes henryi*** Hemsley, J. Linn. Soc., Bot. 26: 240. 1890.

南一笼鸡 nan yi long ji

*Gutzlaffia anisandra* (Benoist) Handel-Mazzetti; *G. anisandra* var. *drosothyrsa* Handel-Mazzetti; *G. forrestii* S. Moore; *G. henryi* (Hemsley) C. B. Clarke ex S. Moore; *G. lyi* (H. Léveillé) E. Hossain; *G. multiramosa* Handel-Mazzetti; *Paragutzlaffia henryi* (Hemsley) H. P. Tsui; *P. lyi* (H. Léveillé) H. P. Tsui; *Ruellia lyi* H. Léveillé; *Strobilanthes anisandra* Benoist.

Subshrubs to 70 cm tall, variable from hirsute to subglabrous, weakly anisophyllous. Stems slender, erect or ascending, 4-angled, much branched, villous to subglabrous. Petiole 0.5–3 cm; leaf blade ovate, ovate-elliptic, or subrhomboidal, 2–9 × 1.5–4.5 cm, both surfaces thinly to densely pilose, abaxially paler, adaxially with linear cystoliths, secondary veins 5 or 6 on each side of midvein, base broadly cuneate, slightly oblique, and usually decurrent onto petiole, margin crenulate, apex acute. Inflorescences terminal, spikes, usually 3–8 cm; bracts at base of spike resembling sessile reduced leaves; floral bracts oblong to spatulate, 6–7 × 1–2 mm, persistent, abaxially gland-tipped pubescent to subglabrous; bracteoles linear, ca. 7 × 0.8 mm, abaxially gland-tipped pubescent to subglabrous. Flowers paired, varying considerably in density, basally distant on rachis but apically becoming imbricate. Calyx 8–11 mm, subequally 5-lobed almost to base; lobes linear, 6–7 mm, outside gland-tipped pubescent to subglabrous. Corolla light purple, blue, or white, funnel-shaped, 1.7–2.3 cm, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for 3.5–6 mm then bent and gradually widened to ca. 1 cm at mouth; lobes orbicular, ca. 2 mm in diam., spreading. Fertile stamens 2, staminodes 2; filaments ca. 3.5 mm, pubescent; anther thecae ovoid-oblong, exserted; pollen type 15. Ovary oblong, glabrous but with a few apical glands; style ca. 2 cm, glabrous. Capsule oblong, 7–10 mm, glabrous apart from a few apical glands, 4-seeded. Seeds suborbicular in outline, ca. 2 × 2 mm, densely villous; areola small. Fl. Jan, Apr, Jul–Oct.

• Mountain slopes; 1000–2800 m. Guizhou, Hubei, Hunan, Sichuan, SE Xizang, Yunnan.

**30. *Strobilanthes cyclus*** C. B. Clarke ex W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 192. 1918.

环毛马蓝 huan mao ma lan

Subshrubs 40–60 cm tall, isophyllous, whole plant with hispid trichomes. Stems erect or suberect, with whitish multicellular trichomes. Petiole 2–5 mm, densely pilose; leaf blade broadly ovate to suborbicular, 2.5–5.5 × 2–4.5 cm, abaxially pale green and hirsute along veins, adaxially dark green, densely hirsute, and with prominent linear cystoliths, secondary veins 4 or 5 on each side of midvein, base broadly cuneate to subrounded, margin crenate to sometimes subentire, apex rounded to acute. Inflorescences axillary or terminal, capitate spikes, 1–3 cm, shortly pedunculate; bracts narrowly oblong-elliptic, 10–12 × 5–6 mm, densely pilose; bracteoles oblong, ca. 7 × 2 mm, densely pilose on apical half, apex obtuse. Calyx ca. 7 mm, outside pilose, weakly 2-lipped; lobes linear-oblong;

lower 2 lobes distinct to base; upper 3 lobes fused in their basal half, with central lobe slightly longer. Corolla blue, 2–2.5 cm, substraight, outside glabrous except for pubescence on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.2 cm then gradually widened to ca. 1 cm at mouth; lobes suborbicular, ca. 5 mm in diam. Stamens 4; filaments glabrous, shorter pair ca. 3 mm and included, longer pair ca. 5 mm and exserted; anther thecae oblong, ca. 2.2 × 1.3 mm; pollen type 17. Ovary comose; style ca. 2 cm. Capsule ellipsoid, ca. 7 × 3.5 mm, pilose at tip, 2-seeded with basal retinacula sterile. Seeds ovate to suborbicular in outline, ca. 1 mm, flattened, pubescent; areola small but prominent. Fl. Aug.

• Forests; 1800–2300 m. Yunnan.

**31. *Strobilanthes serrata*** J. B. Imlay, Bull. Misc. Inform. Kew 1939: 117. 1939.

齿叶马蓝 chi ye ma lan

*Gutzlaffia glandulosa* Lace.

Subshrubs 50–100 m tall, perennial, erect, slightly anisophyllous. Stems sulcate, glabrous or with a few crisped trichomes. Petiole 0.5–7 cm, diminishing in length apically on stems, glabrous or sparsely pubescent; leaf blade ovate to oblong-ovate, 5–12 × 4–6 cm, abaxially uniformly violet to light green and glabrous except for pubescence along veins, adaxially green variegated with white patches and glabrous, secondary veins 7–9 on each side of midvein, base gradually narrowed and then ± decurrent to 2 cm onto petiole, margin coarsely serrate, apex acuminate. Inflorescences from apical leaf axils, simple or branched pedunculate spikes, commonly forming a terminal panicle of spikes; spikes 2–7 cm, densely gland-tipped pilose; peduncle of panicles 2–10 cm, subglabrous to thinly pubescent; rachis and branches densely gland-tipped pilose; bracts oblong-ovate to oblong-obovate, 3–4 × 1.5–2.5 mm, persistent, densely gland-tipped pilose, apex obtuse; bracteoles oblong to obovate, 3–4 × 1–1.5 mm, abaxially densely gland-tipped pilose, adaxially glabrous but densely covered with white cystoliths, apex obtuse. Flowers in opposite pairs, basally 1–2 cm apart on rachis, clearly separate all along spike except at very apex. Calyx 5–6 mm, subequally 5-lobed to base; lobes oblong, outside densely gland-tipped villous, inside glabrous and densely covered with white cystoliths. Corolla pale blue with a white tube, 2–2.6 cm, straight or slightly bent, outside sparsely to densely pilose with large-celled trichomes; tube basally cylindric and narrow for 6–8 mm then widened to ca. 1 cm at mouth; lobes ovate, ca. 3 × 3 mm, apex obtuse. Fertile stamens 2; filaments ca. 4 mm, glabrous; anther thecae ca. 1.5 mm, included; pollen type 18. Ovary villous; style ca. 2 cm, glabrous. Capsule oblong, 5–7 × ca. 2 mm, silky pubescent, 4-seeded. Seeds ca. 2 × 2 mm, pubescent. Fl. Sep–Jan.

Partly shaded moist places in evergreen broad-leaved forests; 700–1600 m. Yunnan [Myanmar, Thailand].

**32. *Strobilanthes tubiflos*** (C. B. Clarke) J. R. I. Wood, Edinburgh J. Bot. 51: 264. 1994.

管花马蓝 guan hua ma lan

*Strobilanthes petiolaris* Nees var. *tubiflos* C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 458. 1884.

Subshrubs of unknown habit. Stems 4-angled to subterete, sulcate, glabrous except for a few trichomes in grooves. Petiole 5–10 mm; leaf blade ovate-elliptic, 6.5–16 × 3.5–8 cm, abaxially paler, sometimes purplish, and glabrous except for appressed trichomes on midvein, adaxially glabrous and with prominent cystoliths, secondary veins 4–7 on each side of midvein, base cuneate and decurrent as a wing onto petiole, margin dentate, apex acuminate. Inflorescences terminal, branched spikes, 2–4 cm; rachis gland-tipped pilose; sterile bracts leaf-like, ovate, 9–10 × ca. 6 mm, with prominent cystoliths; floral bracts obovate, 5–6 × 2.5–3.5 mm, persistent, densely yellowish gland-tipped pubescent, cystoliths abaxially prominent, apex usually emarginate; bracteoles oblanceolate, ca. 5 × 1 mm, abaxially gland-tipped pubescent especially apically, apex obtuse. Calyx 7–8 mm, subequally 5-lobed almost to base; lobes oblong, ca. 1 mm wide, outside ciliate and apically gland-tipped pilose, inside glabrous. Corolla blue, 2–3 cm, curved, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1 mm wide for ca. 3 mm then gradually widened to ca. 1 cm at mouth; lobes broadly ovate, ca. 2 × 3 mm, apex rounded. Fertile stamens 2, included; filaments glabrous, ca. 4 mm; anther thecae oblong, erect, ca. 2 × 0.8 mm; pollen type 3. Ovary oblong-ovate, ca. 1 mm, apically pilose; style ca. 2 cm, glabrous. Capsule oblong, ca. 6 × 2 mm, pubescent, 4-seeded. Seeds suborbicular in outline, ca. 1 × 1 mm, pubescent; areole prominent. Fl. Aug.

● Valleys, streamsides; 200–300 m. Xizang (Mêdog).

**33. *Strobilanthes affinis*** (Griffith) Terao ex J. R. I. Wood & J. R. Bennett, Kew Bull. 58: 134. 2003.

肖笼鸡 xiao long ji

*Adenosma affinis* Griffith, Not. Pl. Asiat. 4: 133. 1854; *Strobilanthes acrocephala* T. Anderson; *S. darrisii* H. Léveillé; *S. thirionnii* H. Léveillé; *Tarphochlamys affinis* (Griffith) Bremekamp; *T. darrisii* (H. Léveillé) E. Hossain.

Herbs to 60 cm tall, isophyllous. Stems 4-angled, sulcate, white pubescent with large-celled trichomes. Petiole 0.5–1.5 cm, pubescent; leaf blade ovate to ovate-elliptic, 3–8 × 2–4.5 cm, both surfaces sparsely strigose, abaxially yellowish green, adaxially dark green and densely covered with subulate cystoliths, secondary veins 5–7 on each side of midvein, base subrounded to cuneate and decurrent onto petiole, margin crenulate, apex acute. Inflorescences axillary or terminal, dense spikes, 2–6 cm; peduncle 0.5–2 cm, densely gland-tipped pubescent; sterile bracts sometimes present, sessile, suborbicular to ovate, 5–10 × 5–10 mm, strigose; floral bracts imbricate, broadly obovate, rhomboidal, or elliptic, 6–7 × 3–4 mm, gland-tipped pilose with large-celled trichomes, 5-veined, margin ciliate, apex sometimes reflexed; bracteoles oblong-linear, ca. 5 × 1.2 mm, slightly shorter than calyx, gland-tipped pubescent, margin ciliate. Calyx 5–7 mm, 5-lobed almost to base; lobes linear, one slightly longer than others, gland-tipped pubescent, 1-veined, margin ciliate, apex obtuse. Corolla purplish blue to violet, ca. 1.5 cm, curved, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1

mm wide for ca. 7 mm then gradually widened to ca. 7 mm at mouth; limb somewhat 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes orbicular, ca. 3 × 3 mm, unequal. Stamens 4; shorter filament pair ca. 4 mm, glabrous; longer filament pair ca. 6 mm, hirsute; anther thecae oblong, ca. 2 × 1.2 mm, strongly exserted; pollen type 14. Ovary pilose; style pilose, ca. 1.2 cm. Capsule oblong, 7–9 mm, pubescent, 4-seeded. Seeds brown, ovate to suborbicular in outline, ca. 1.5 × 1.5 mm, pubescent, glabrescent; areola small, glabrous. Fl. Sep–Nov.

Mountain slopes, thickets; 600–1300 m. Guangxi, Guizhou, Hunan, Yunnan [India, Myanmar, Vietnam].

*Strobilanthes affinis* is a very distinct species. Not only is the pollen unique but also the species is distinctive for having 4 exserted stamens and trichomes caducous on the seeds.

**34. *Strobilanthes pinnatifida*** C. Z. Zheng, J. Hangzhou Univ. Nat. Sci. Ed. 8: 431. 1981.

羽裂马蓝 yu lie ma lan

*Pteracanthus pinnatifidus* (C. Z. Zheng) C. Y. Wu & C. C. Hu.

Herbs to 40 cm tall, unbranched, isophyllous. Stems erect, brown hirsute. Petiole 1.5–2 cm, hirsute; leaf blade elliptic to ovate-elliptic, 3–13 × 1–5 cm, whitish appressed hirsute, secondary veins 6 or 7 on each side of midvein, base cuneate to attenuate and often decurrent onto petiole, margin coarsely dentate to deeply pinnatifid or lobed, apex acuminate to caudate. Inflorescences terminal, spikes, 5–9 cm; bracts spatulate-obovate, to 1.2 cm, pubescent; bracteoles linear, 1–1.5 cm, pubescent. Flowers distant on rachis. Calyx 1–1.5 cm, pubescent with gland-tipped trichomes, 5-lobed almost to base; lobes linear, equal. Corolla purplish blue, ca. 3.5 cm, ventricose, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1.2 mm then gradually widened to ca. 1 cm at mouth; lobes oblong, ca. 4 × 3.5 mm, apex emarginate to obtuse. Stamens 4, included; filaments pilose, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2 mm. Ovary oblong, glabrous; style ca. 3 mm, sparsely hirsute. Capsule oblong, sparsely pubescent, 4-seeded. Seeds ovate in outline, ca. 2.5 × 2 mm, pubescent; areola small. Fl. Aug–Sep, fr. Nov.

● Forests in moist areas; 600–700 m. Zhejiang (Jingning, Qingyuan).

*Strobilanthes pinnatifida* is unique because of its pinnatifid or lobed leaves.

**35. *Strobilanthes auriculata*** Nees in Wallich, Pl. Asiat. Rar. 3: 86. 1832.

耳叶马蓝 er ye ma lan

*Perilepta auriculata* (Nees) Bremekamp; *P. edgeworthiana* (Nees) Bremekamp; *P. siamensis* (C. B. Clarke) Bremekamp; *Strobilanthes auriculata* var. *edgeworthiana* (Nees) C. B. Clarke; *S. auriculata* var. *siamensis* C. B. Clarke; *S. edgeworthiana* Nees; *S. siamensis* C. B. Clarke.

Subshrubs 0.5–2 m tall, much branched, weakly to strongly anisophyllous. Stems 4-angled, sometimes zigzag, gla-

brous or sparsely hirsute. Leaves sessile; leaf blade narrowly to broadly oblong-elliptic or oblong-oblancoate, rarely ovate for small leaves,  $2-20 \times 1.5-6$  cm, both surfaces sparsely pilose, abaxially pale green or reddish when young, adaxially green, secondary veins 12–15 on each side of midvein, base attenuate, cuneate, rounded, or auriculate, margin serrate to undulate, apex acuminate. Inflorescences axillary or terminal, spikes, 3–10 cm, sometimes branched; peduncle 2–4 cm, 4-angled, sulcate, bracteate; sterile bracts ovate,  $0.8-2 \times$  ca. 1.5 cm; floral bracts imbricate, broadly ovate to obovate-spatulate, 4–9 mm, often becoming recurved, persistent, densely villous and ciliate, apex usually apiculate but sometimes rounded or emarginate; bracteoles absent. Calyx 6–12 mm, gland-tipped pilose, 5-lobed almost to base; lobes linear, unequal with 2 slightly shorter than others, margin usually ciliate, apex subacute. Corolla pale purple to violet, funnel-shaped, 2.5–3 cm, curved, outside gland-tipped pilose on lobes, inside glabrous; tube basally cylindric and narrow for ca. 4 mm then weakly to strongly bent, abruptly inflated, and widened to ca. 2.5 cm at mouth; limb weakly 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes ca. 3 mm. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 4 mm; anther thecae oblong, ca.  $1.5 \times 1$  mm; pollen type 3. Ovary glabrous; style ca. 3.2 cm. Capsule narrowly oblong-obovoid,  $8-10 \times$  ca. 2 mm, glabrous, 4-seeded, apex apiculate. Seeds ovate-suborbicular in outline, ca.  $2 \times 1.8$  mm, pubescent; areola very small. Fl. Sep–Jan, fr. Jan–Feb.

Valleys; 300–1500 m. Guangxi, Yunnan [Bangladesh, India, Malaysia (Langkawi Island), Myanmar, Nepal, Pakistan, Thailand].

*Strobilanthes auriculata* var. *dyeriana* (Masters) J. R. I. Wood with leaf blade abaxially reddish rather than green is from Myanmar and Vietnam and is grown as a cultivated plant in Guangdong and Yunnan.

*Strobilanthes auriculata* is one of the few species of *Strobilanthes* that can be recognized in a sterile state with confidence on account of its sessile, sometimes auriculate, oblong to oblanceolate leaves. It is known to be pleisthesial in part of its range.

**36. *Strobilanthes mogokensis*** Lace, Bull. Misc. Inform. Kew 1915: 406. 1915.

卵叶马蓝 luan ye ma lan

Subshrubs to 60 cm tall. Stems 4-angled, sulcate, white gland-tipped pubescent, glabrescent. Petiole 0.6–1.5 cm, sulcate, pubescent; leaf blade variable in size and shape, basal ones broadly ovate and  $4-9 \times 2-5$  cm, apicalmost ones cordate and  $3-6 \times 2-4.5$  cm, both surfaces pubescent, secondary veins 4–6 on each side of midvein, base truncate to narrowly cuneate and slightly decurrent onto petiole, margin crenulate-serrate, apex acuminate to obtuse. Inflorescences terminal, spikes, 3–5 cm; rachis gland-tipped pubescent; bracts lanceolate-oblong,  $11-12 \times$  ca. 4 mm, abaxially yellowish gland-tipped pubescent, adaxially gland-tipped pubescent; bracteoles narrowly oblong-elliptic,  $7-8 \times$  ca. 1 mm, abaxially glabrous, adaxially gland-tipped pubescent. Calyx ca. 1 cm, outside pubescent, inside gland-tipped pubescent, 2-lipped, lower lip 2-lobed almost to base, upper lip 3-lobed to middle; lobes linear, ca. 1 mm wide. Corolla color not recorded, 2.5–3 cm, ventricose, curved, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then

gradually widened to ca. 1 cm at mouth; lobes ovate, ca.  $4 \times 4$  mm. Stamens 4, included; filaments glabrous, shorter pair ca. 3 mm, longer pair ca. 7 mm; anther thecae oblong, ca.  $2 \times 1.2$  mm, erect; pollen type 9. Ovary white pilose at tip; style ca. 2.5 cm, apically hirsute. Capsule ca. 1 cm, pilose at tip, 4-seeded. Seeds ovate in outline, ca.  $2.5 \times 2$  mm, compressed, densely pilose. Fl. Oct–Dec, fr. Jan–Feb.

Streamsides; 600–800 m. Yunnan (Ruili) [Myanmar].

**37. *Strobilanthes argentea*** J. B. Imlay, Bull. Misc. Inform. Kew 1939: 121. 1939.

银毛马蓝 yin mao ma lan

Subshrubs to 50 cm tall, anisophyllous. Stems somewhat sulcate, bifariously pilose with large-celled trichomes, eventually glabrescent, basally woody. Petiole 0.2–4.3 cm, pilose; leaf blade ovate,  $4-12 \times 2-6$  cm, smaller of pair ca. 1/2 size of larger one, both surfaces thinly or rather densely pilose with large white trichomes especially along veins, abaxially paler and with prominent cystoliths, base attenuate and  $\pm$  decurrent onto petiole, margin crenulate to dentate, apex acute to shortly acuminate and commonly falcate. Inflorescences terminal, spikes, simple or branched, 1–4 cm, 2–10-flowered; peduncle 1–2.5 cm, pilose; rachis pilose; bracts oblong-lanceolate but basal ones spatulate,  $7-10 \times 1.5-3.5$  mm, densely pilose with gland-tipped and non-glandular trichomes, apex acute; bracteoles oblong-lanceolate,  $6-7 \times 1.5-2$  mm, densely pilose with gland-tipped trichomes, apex acute. Flowers paired, basally distant on rachis but apically becoming confluent. Calyx subequally 5-lobed almost to base; lobes lanceolate, abaxially pilose with gland-tipped and non-glandular trichomes, apex acute; central upper lobe longer than laterals. Corolla blue, 2.3–3.5 cm, ventricose and strongly bent, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then gradually widened to 7–8 mm at mouth; lobes broadly ovate, ca.  $4 \times 4$  mm, apex rounded. Stamens 4, included; filaments glabrous, shorter pair 2–3 mm, longer pair 5–7 mm; anther thecae oblong, ca.  $2 \times 1$  mm. Ovary pilose at tip; style ca. 2.5 cm, pilose. Capsule not seen. Fl. Oct–Nov.

Partly shaded and moist places along streams; 1100–1700 m. Yunnan [Thailand].

**38. *Strobilanthes aprica*** (Hance) T. Anderson in Benth., Fl. Hongk. 262. 1861.

山一笼鸡 shan yi long ji

*Gutzlaffia aprica* Hance, Hooker's J. Bot. Kew Gard. Misc. 1: 143. 1849; *G. aprica* var. *glabra* (J. B. Imlay) H. S. Lo; *G. dielsiana* (W. W. Smith) S. Moore; *Phlebophyllum apricum* (Hance) Benth.; *Strobilanthes aprica* var. *glabra* J. B. Imlay; *S. cavaleriei* H. Léveillé var. *angustifolia* H. Léveillé; *S. dielsiana* W. W. Smith; *S. mairei* H. Léveillé.

Shrubs or perennial herbs, to 70 cm tall, isophyllous. Stems 4-angled, sulcate, retrorsely white hirsute. Petiole 5–10 mm, shortly white pubescent; leaf blade elliptic to oblong-elliptic,  $2-7 \times 1-3$  cm, leathery, indumentum very variable, both surfaces usually scabrous-hispid but abaxially sometimes whitish

silky tomentose and occasionally glabrous except for pubescent midvein, secondary veins 5–7 on each side of midvein, base broadly cuneate, margin entire and scabrid to thinly ciliate, apex acute. Inflorescences axillary or terminal, short dense subcapitate spikes, becoming clustered in apicalmost leaf axils; spikes usually sessile but occasionally basal ones with a 0.5–3(–7) cm peduncle; bracts ovate-lanceolate, 13–15 × 3–5 mm, subleathery, abaxially and on margin with white multicellular trichomes, adaxially glabrous, apex long acuminate; bracteoles linear, 10–11 × ca. 1 mm, both surfaces covered with white cystoliths, abaxially and on margin sparsely pilose with multicellular trichomes, adaxially glabrous. Calyx 1–1.3 cm, 5-lobed for ca. 1/2 its length; lobes linear, lower 2 becoming distinct, upper 3 remaining connate, outside pubescent to subglabrous, inside glabrous, margin pilose. Corolla lilac with a white tube, funnel-shaped, 2.5–3.5 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1 mm wide for 1.3–1.5 cm then abruptly inflated to ca. 1 cm in diam.; lobes suborbicular, ca. 5 × 5 mm, subequal, apex obtuse. Stamens 2, exserted; filaments ca. 1 cm, glabrous; anther thecae ellipsoid, ca. 2.5 mm; pollen type 11. Ovary white, narrowly oblong, pilose at tip; style ca. 3.5 cm, curved, pilose. Capsule oblong, 1–1.3 cm, glabrous except for a few trichomes at tip, 4-seeded. Seeds ovate in outline, ca. 2 mm, convex on both surfaces, pubescent; areola large, glabrous. Fl. Aug–Jan, fr. Sep–Feb.

Dry forests, montane thickets; below 2200 m. Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

**39. *Strobilanthes dalzielii*** (W. W. Smith) Benoist in Lecomte, Fl. Indo-Chine 4: 679. 1935.

曲枝马蓝 qu zhi ma lan

*Acanthopale dalzielii* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 193. 1919; *Championella dalzielii* (W. W. Smith) Bremekamp; *C. dalzielii* var. *glabra* Benoist; *Pteroptychia dalzielii* (W. W. Smith) H. S. Lo; *Strobilanthes dalzielii* var. *inaequalis* Benoist.

Subshrubs or perennial herbs, 40–100 cm tall, branched, strongly anisophyllous. Stems slender, erect, zigzag, slightly pubescent to subglabrous. Petiole 0–3 mm; leaf blade ovate to ovate-lanceolate, smaller of pair 2–5 × 1–2 cm and larger one 9–14 × 3–5 cm, abaxially glaucous and glabrous or sparsely pubescent along veins, adaxially green, glabrous, and with prominent cystoliths, secondary veins 3–5 on each side of midvein, base rounded but cordate for apical leaves, margin serrate, apex acuminate to acute and sometimes falcate. Inflorescences axillary or terminal, spikes, 2–5 cm, 2–5-flowered; rachis usually zigzag, sparsely white puberulent; bracts linear-lanceolate, ca. 3 × 1 mm, glabrous, 1-veined; bracteoles linear, ca. 5 × 1 mm, glabrous or puberulent with gland-tipped trichomes. Flowers distant on rachis, solitary, not paired. Calyx ca. 1 cm, densely white pilose at base and along midvein, 5-lobed almost to base; lobes linear, apex finely acuminate. Corolla purplish blue or white, 3.5–4.5 cm, curved, outside densely white pilose in bud, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then ventricose

and gradually widened to 1–1.5 cm at mouth; lobes suborbicular, ca. 8 mm in diam. Stamens 4, slightly exserted; filaments hirsute, shorter pair ca. 5 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 2 mm; pollen type 13. Ovary glabrous; style ca. 3.2 cm, pilose. Capsule linear-oblong, 1.8–2.2 cm, compressed, glabrous, 4-seeded, apex apiculate. Seeds ovate in outline, ca. 2 × 2 mm, densely appressed tomentose; areola very small. Fl. Oct–Jan.

By streams; 400–1200 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Taiwan, Yunnan [Laos, Thailand, Vietnam].

The strongly anisophyllous sessile leaves combined with the densely pubescent buds make *Strobilanthes dalzielii* very distinct.

Specimens misidentified as *Difflugossa divaricata* (Nees) Bremekamp (H. P. Tsui & C. C. Hu, FRPS 70: 172. 2002; C. C. Hu & X. P. Fu, Higher Pl. China 10: 377. 2004) belong here.

**40. *Strobilanthes bantonensis*** Lindau, Bull. Herb. Boissier 5: 650. 1897.

桂越马蓝 gui yue ma lan

Shrubs of unknown size, strongly anisophyllous. Stems zigzag, glabrous. Petiole 2–5 mm; leaf blade ovate-elliptic, smaller of each pair deciduous, larger one 7–15 × 4–7 cm, glabrous, secondary veins 4 or 5 on each side of midvein, base cuneate, margin sinuate-dentate, apex acute. Inflorescences axillary or terminal, spikes 3–13 cm, fertile apically only; bracts oblanceolate to obovate, ca. 2 × 1 mm, sparsely gland-tipped pilose, ± persistent, apex obtuse to rounded; bracteoles linear-oblanceolate, ca. 5 mm, sparsely gland-tipped pilose. Flowers 2 or 3 per spike, 1–1.4 cm apart, one fertile at each node alternately. Calyx 7–10 mm; lobes linear, 7–9 × ca. 1 mm, subequal, glabrous or becoming sparsely gland-tipped pilose, apex obtuse. Corolla purplish blue or white, ca. 3.2 cm, outside densely pubescent in bud, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then ventricose and gradually widened to ca. 1.3 cm at mouth; lobes oblong, ca. 4 × 6 mm. Stamens 4, included; filaments of shorter stamen pair ca. 2 mm and glabrous, longer pair ca. 5 mm and sparsely hirsute; anther thecae oblong ca. 2 mm; pollen type 1. Ovary glabrous; style ca. 3 cm, sparsely hirsute. Capsule fusiform, 1.2–1.3 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 mm, appressed pubescent. Fr. Dec.

Forests in limestone hills; 600–1500 m. Guangxi [Vietnam].

*Strobilanthes bantonensis* is a little-known species with very distinct pollen.

**41. *Strobilanthes pateriformis*** Lindau, Bull. Herb. Boissier 5: 653. 1897.

翅枝马蓝 chi zhi ma lan

*Pteracanthus alatiramosus* (H. S. Lo & D. Fang) C. Y. Wu & C. C. Hu; *Pteroptychia pateriformis* (Lindau) Bremekamp; *Strobilanthes alatiramosa* H. S. Lo & D. Fang.

Herbs to 50 cm tall, anisophyllous, drying blackish green. Stems somewhat zigzag, internodes winged, wing 1.5–4 mm wide. Petiole 1–3 cm, glabrous; leaf blade oblong-ovate to lanceolate, smaller of pair 2–8 × 1–3 cm and larger one 6–13(–17)

× 2.5–5.5 cm, glabrous, secondary veins 4–6 on each side of midvein, base cuneate and decurrent onto petiole, margin dentate to crenate, apex acute. Inflorescences axillary or terminal, spikes, 3–10 cm; bracts ovate to lanceolate, 2.5–5 mm, caducous, glabrous, apex acute to obtuse; bracteoles spatulate-linear to linear, 4–7 mm, caducous, glabrous. Flowers 5–10 mm apart on rachis, often one sterile per node. Calyx 6–12 mm, glabrous, subequally 5-lobed or with 2 lobes slightly longer; lobes lanceolate, ca. 10 × 1 mm but accrescent in fruit, apex acute. Corolla pale purple, 3–4 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 5 mm then gradually widened to ca. 1 cm at mouth; lobes ovate, 3–4 mm, subequal, apex emarginate. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 5 mm, hirsute; anther thecae oblong, ca. 2.5 × 1 mm; pollen type 12. Ovary apex minutely pubescent; style ca. 2.5 cm. Capsule fusiform, ca. 1.4 cm, glabrous except apically, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, densely appressed pubescent. Fl. Sep–Nov, fr. Dec–Feb.

Dense forests; 400–1700 m. Guangxi, Guizhou, Hainan, Sichuan, Yunnan [Indonesia, Laos, Thailand, Vietnam].

**42. *Strobilanthes truncata*** D. Fang & H. S. Lo, Guihaia 17: 31. 1997.

截头马蓝 jie tou ma lan

Herbs to 3 m tall, perennial, anisophyllous. Stems 4-angled, somewhat zigzag, sulcate, glabrous. Petiole 0.6–7 cm; leaf blade broadly ovate, ovate, ovate-elliptic, or rarely elliptic, smaller of pair 3.5–7 × 2–4 cm and larger one 10–19 × 4.5–11.5 cm, glabrous, densely covered with linear cystoliths especially along abaxial veins, secondary veins 4–7 on each side of midvein, reticulate veins conspicuous, base broadly cuneate and oblique, margin remotely dentate to rarely serrate, apex acute. Inflorescences axillary or terminal, spikes, 7–15(–26) cm, sometimes branched; peduncle 0.5–5.5 cm, glabrous; rachis 4-angled, strongly zigzag, sulcate, bifariously pubescent; bracts elliptic, 5–7 × ca. 4 mm, caducous, glabrous, margin ciliate, apex truncate to retuse; bracteoles yellowish but apically black, linear-lanceolate, ca. 8 × 1.5 mm, persistent, abaxially sparsely puberulent, margin ciliate, apex truncate to rounded. Flowers distant on rachis. Calyx yellowish with a black apex, 8–10 mm, sparsely pubescent, usually sparsely covered with cystoliths, 2-lipped, lower lip 2-lobed almost to base, upper lip 3-lobed; lobes lanceolate, 5–6 mm, margin apically ciliate. Corolla white, 3.5–4 cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 4 mm wide for 1–1.5 cm then ± ventricose and gradually widened to ca. 2 cm at mouth; lobes ovate, ca. 7 × 5 mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 7 mm, sparsely hirsute; anther thecae oblong, 3–4 × ca. 1.5 mm; pollen type 12. Ovary comose; style ca. 2.7 cm, sparsely hirsute. Capsule fusiform, ca. 1.7 cm, glabrous except at apex, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, densely appressed pubescent. Fl. Oct–Dec, Apr.

Forests on limestone hills; 900–1300 m. Guangxi (Napo) [Vietnam].

*Strobilanthes truncata* is doubtfully distinct from *S. pateriformis*, differing only in its truncate bracts and unwinged stem.

**43. *Strobilanthes rankanensis*** Hayata, Icon. Pl. Formosan. 9: 84. 1920.

兰嵌马蓝 lan qian ma lan

*Parachampionella rankanensis* (Hayata) Bremekamp.

Herbs 15–30 cm tall, rarely branched, isophyllous. Stems slender, 4-angled, procumbent, usually rooting at basal nodes, sulcate, bifariously pubescent. Petiole 0.5–1.5 cm, sulcate, bifariously pubescent or subglabrous; leaf blade ovate to elliptic, (0.5–)1–3.5 × 0.5–1.8 cm, glabrous or sparsely hirsute along veins, secondary veins 3 or 4 on each side of midvein, base cuneate to subrounded, margin serrate, apex acute. Flowers solitary in leaf axils. Bracts absent; bracteoles linear-spatulate, 6–9 × 0.7–0.9 mm, sparsely hirsute, apex obtuse. Calyx 6–9 mm, slightly hirsute, 2-lipped, lower lip 2-lobed almost to base, upper lip unequally 3-lobed; lobes linear, margin ciliate. Corolla purple with white stripes, funnel-shaped, ca. 2 cm, outside glabrous, inside glabrous except for a few trichomes at base of filaments and adaxially in throat; tube basally cylindric and ca. 1.5 mm wide for ca. 2.5 mm then gradually widened to ca. 2 cm at mouth; lobes oblong, ca. 3 × 4 mm, subequal, apex emarginate. Stamens 4, longer pair slightly exerted; filaments glabrous, shorter pair ca. 3 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2 mm, basally divergent; pollen type 11. Ovary ellipsoid, glabrous; style ca. 2 cm, basally sparsely gland-tipped pilose. Capsule fusiform, 1–1.2 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 2.5 × 1.5 mm, lenticular, densely covered with long appressed trichomes. Fl. May–Sep.

• Moist places in ravines; 600–1700 m. Taiwan.

*Strobilanthes rankanensis* is a distinctive, superficially isolated species because of the unique combination of trailing habit, 2-lipped calyx, and globose echinulate pollen.

**44. *Strobilanthes longispica*** (H. P. Tsui) J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 383. 2006.

长穗腺背蓝 chang sui xian bei lan

*Adenacanthus longispicus* H. P. Tsui, Fl. Reipubl. Popul. Sin. 70: 348. 2002; *Strobilanthes tripartita* J. R. I. Wood.

Herbs to 1.2 m tall, isophyllous, drying blackish green. Stems 4-angled, sulcate, bifariously pubescent. Petiole (0.2–)1–2.8 cm, hirsute; leaf blade elliptic to long ovate, 4.5–13 × 1.4–5 cm, both surfaces slightly strigose, adaxially densely covered with linear cystoliths, secondary veins 7 or 8 on each side of midvein, base attenuate, margin serrate, apex acuminate. Inflorescences axillary or terminal, spikes, 3–20 cm, with 2–7 flower pairs; peduncle ca. 1 cm, pubescent; rachis pubescent with gland-tipped trichomes; bracts linear-lanceolate, 6–8 × 1–2 mm, persistent, abaxially pubescent with gland-tipped trichomes, 1-veined, apex acute; bracteoles linear, 4–6 × ca. 1 mm, pubescent with gland-tipped trichomes, apex acute. Flowers 1.5–3.5 cm apart on rachis, usually only one sterile per node. Calyx 1.2–1.8 cm, outside pilose with gland-tipped trichomes, 2-lipped; lower lip 2-lobed almost to base, lobes lanceolate and 10–16 × 1.2–1.5 mm; upper lip 3-lobed, lobes triangular and 4–

6 × 1.2–1.5 mm. Corolla violet blue, ca. 3.5 cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 7 mm then gradually widened to ca. 1 cm at mouth; lobes oblong-ovate, ca. 7 × 6 mm, apex emarginate. Stamens 4, included; filaments hirsute, shorter pair ca. 2.2 mm, longer pair ca. 5 mm; anther thecae oblong, ca. 2 mm; pollen type 3. Ovary ellipsoid, ca. 3 mm, glabrous; style ca. 1.8 cm, sparsely gland-tipped pubescent. Capsule oblong, 1.5–1.8 cm, gland-tipped pubescent at tip, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, convex, densely pilose; areola small, glabrous. Fl. Oct–Jan.

Thickets on mountain slopes; 1300–1600 m. Yunnan (Gongshan) [Myanmar].

*Strobilanthes longispica* is very close to *S. dryadum*, differing only in its lanceolate rather than ovate-oblong bracts, unwinged inflorescence rachis, and less dense inflorescence indumentum.

**45. *Strobilanthes dryadum*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 94. 1922.

林马蓝 lin ma lan

*Pteracanthus dryadum* (Benoist) C. Y. Wu & C. C. Hu.

Herbs to 1 m tall, much branched, nearly isophyllous. Stems 4-angled, sulcate, bifariously pubescent. Petiole 1–3 cm, sulcate, bifariously pubescent; leaf blade ovate to lanceolate, to 25 × 8 cm, glabrous, abaxially pale, secondary veins 6 or 7 on each side of midvein, base attenuate and decurrent onto petiole forming wings, margin crenate-dentate, apex acuminate. Inflorescences terminal, spikes, 3–6 cm, with 2–6 flower pairs; rachis pubescent with gland-tipped trichomes, winged, wing ca. 1 mm; bracts ovate-oblong, 4–7 × 1–2 mm, persistent, gland-tipped pubescent, apex obtuse; bracteoles oblong, ca. 4 × 0.5 mm, gland-tipped pubescent. Flowers distant on rachis, usually one sterile per node. Calyx 1–1.5 cm, accrescent in fruit, outside gland-tipped pubescent, 2-lipped; lower lip 2-lobed almost to base; upper lip 3-lobed to below middle, lobes linear-oblong and 11–15 × 1–2 mm. Corolla blue, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then gradually widened to ca. 1 cm at mouth; lobes oblong, ca. 8 × 8 mm. Stamens 4, included; filaments hirsute, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2 mm; pollen type 4. Ovary puberulent at tip; style ca. 2.2 cm, sparsely pilose; stigma linear, compressed. Capsule narrowly oblong-obovoid, 1–1.2 cm, apically gland-tipped pubescent, 4-seeded. Seeds pilose; areola small. Fl. May, Sep–Nov, fr. Jan–Mar.

• Moist places in forests; 1300–2500 m. Guangxi, Yunnan.

**46. *Strobilanthes adpressa*** J. R. I. Wood, Kew Bull. 58: 110. 2003.

紧贴马蓝 jin tie ma lan

Subshrubs to 2 m tall, anisophyllous. Stems somewhat sulcate, bifariously pilose with large-celled trichomes, eventually glabrescent, basally woody; nodes pustulose, pubescent. Leaves basally petiolate, apically sessile; petiole (0–)1–2.5 cm, sulcate, sparsely pilose; leaf blade ovate-elliptic, (4–)6–16 × (1–)3.5–8.5 cm, smaller of pair ca. 2/3 size of larger one, thinly

leathery, both surfaces villous with large-celled trichomes especially on veins, secondary veins 9–13 on each side of midvein, curved, and netted near margin, base decurrent onto petiole or those apically on stem amplexicaul, margin shallowly serrate, apex acuminate. Inflorescences terminal, spikes, 5–7 cm; rachis 4-angled, gland-tipped pilose; bracts somewhat imbricate, oblong, 1.1–1.7 × 0.5–0.7 cm, gland-tipped pilose, tardily deciduous as flowers open; bracteoles linear-oblong, 9–15 × 1.2–2 mm, persistent, abaxially gland-tipped pilose, apex acute. Flowers arranged in pairs, erect, ± appressed to rachis. Calyx 1.2–1.6 cm, 2-lipped; lower lip 2-lobed almost to base; upper lip 3-lobed, lobes 12–14 × ca. 1.5 mm. Corolla yellow or blue, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric, ca. 2.5 mm wide for ca. 1.5 cm then gradually ventricose and widened to ca. 1.5 cm at mouth, strongly bent ca. 2.5 cm above base; lobes ovate, ca. 6 × 5 mm, apex obtuse. Stamens 4, included; filaments sparsely pilose, shorter pair ca. 4 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 4 × 1.5 mm. Ovary comose with shortly stipitate glands; style ca. 2.5 cm, pilose. Capsule not seen. Fl. Oct–Dec.

Streamsides in forests; 1500–1800 m. Yunnan (Maguan) [Vietnam].

**47. *Strobilanthes atroviridis*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 480. 2010.

景东马蓝 jing dong ma lan

Subshrubs to 3 m tall, isophyllous or slightly anisophyllous, blackish green when dry. Stems branched, 4-angled, sulcate, glabrous, densely covered with white prominent cystoliths; nodes pustulose, pubescent. Petiole 2–5 cm, bifariously pubescent; leaf blade ovate-elliptic, 9–22 × 5.5–14 cm, abaxially paler green and glabrous, adaxially green, subglabrous with sparse large-celled trichomes, and sparsely covered with prominent cystoliths especially along veins, secondary veins 6–10 on each side of midvein, prominent on both surfaces, curved, and netted near margin, tertiary veins conspicuous, base decurrent onto petiole, margin crenulate, apex acute to long acuminate. Inflorescences axillary, shortly pedunculate spikes, 1–3(–6) cm, 2(–8)-flowered but commonly reduced to a subcapitate flower pair; rachis gland-tipped pubescent; bracts linear-lanceolate, 9–14 × 2–3 mm, abaxially gland-tipped pubescent, adaxially glabrous; bracteoles linear-lanceolate, 9–13 × ca. 2.5 mm, abaxially gland-tipped pubescent, adaxially glabrous. Flowers paired. Calyx 1–1.5 cm, outside gland-tipped pubescent, inside glabrous, 2-lipped; lower lip 2-lobed almost to base, lobes linear-lanceolate, 9–14 × 2–3 mm, and apex acute; upper lip with 3 lanceolate 5–7 mm teeth connate for 4–7 mm. Corolla purplish blue, 3–4 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube ca. 2 mm wide at base then gradually widened to ca. 2 cm at mouth; lobes ovate, ca. 1 × 1 cm, apex emarginate. Stamens 4, included; filaments basally pubescent, shorter pair ca. 6 mm, longer pair ca. 8 mm; anther thecae oblong; pollen type 3. Ovary not examined; style ca. 2 cm, glabrous. Capsule not seen. Fl. Apr, Jun, Nov.

• Moist places in forests; 2100–2400 m. Yunnan (Jingdong).

**48. *Strobilanthes pteroclada*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 187. 1922.

延苞马蓝 *yan bao ma lan*

*Hymenochlaena pteroclada* (Benoist) C. Y. Wu & C. C. Hu.

Subshrubs or perennial herbs, to 1 m tall, slightly anisophyllous, becoming black when dry. Stems 4-angled, sulcate, glabrous or subglabrous. Petiole (0–)0.5–1.5(–4) cm; leaf blade lanceolate, 7–20 × 3–8 cm, glabrous, abaxially densely covered with white cystoliths along veins, adaxially cystoliths prominent, secondary veins 5–9 on each side of midvein, base cuneate and decurrent onto petiole, margin serrulate to crenate, apex acuminate. Inflorescences axillary or terminal, spikes, 5–12 cm; peduncle 2–4.5 cm, apically widened to ca. 1.6 cm to form base of bract; bracts lanceolate to narrowly ovate, 1.5–2 × 0.8–1.6 cm, glabrous or gland-tipped pubescent, pinnately veined, base gradually narrowed and decurrent onto peduncle, margin entire or slightly dentate, apex acute to acuminate; bracteoles narrowly lanceolate, 5–7 × ca. 0.8 mm, glabrous, apex acuminate. Flowers ca. 3 cm apart on rachis. Calyx 7–9 mm, glabrous, weakly 2-lipped; lower lip 2-lobed, lobes 6–8 mm; upper lip 3-lobed, lobes lanceolate, ca. 6 mm, and apex acuminate. Corolla purplish blue, 3–4 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2.5 mm wide for ca. 1.4 cm and then gradually widened to ca. 1.8 cm at mouth; lobes ovate, ca. 6 × 5 mm, subequal, apex obtuse. Stamens 4, included; filaments pilose at base, shorter pair ca. 4 mm, longer pair ca. 7 mm; anther thecae oblong, ca. 2.5 × 1.5 mm; pollen type 3. Ovary glabrous; style ca. 2.4 cm, sparsely pubescent. Capsule fusiform, ca. 1.3 cm, glabrous, 4-seeded. Seeds white, ovate in outline, ca. 2 × 2 mm, densely appressed tomentose. Fl. Apr–May, fr. Jun–Jul.

Thickets or forests by streams; 300–900 m. Guangxi, Guizhou [Vietnam].

**49. *Strobilanthes ovata*** Y. F. Deng & J. R. I. Wood, Novon 20: 143. 2010.

滇西马蓝 *dian xi ma lan*

Herbs 30–40 cm tall, perennial. Stems with a narrow wing to 0.8 mm wide on each side, densely covered with cystoliths, glabrous. Leaves basally petiolate and apically becoming sessile; petiole of basal leaves 3–5 mm, glabrous; leaf blade ovate-elliptic, 2–5 × 1–2.3 cm, both surfaces glabrous and with prominent cystoliths, abaxially paler and with prominent veins covered by cystoliths, secondary veins 2–4 on each side of midvein, base decurrent onto petiole, margin crenate to crenate-serrate, apex acuminate. Inflorescences terminal on main stem or on branches arising from apicalmost leaf axils, spikes, 1–7 cm; rachis narrowly winged, pilose with multicellular trichomes and some gland-tipped trichomes; bracts ovate, oblong-ovate, or rounded, 3–7 × 1–5 mm, pubescent; bracteoles oblanceolate, ca. 5 × 1 mm, subglabrous to pilose with multicellular trichomes and some gland-tipped trichomes, apex rounded. Calyx subglabrous or gland-tipped pilose on margin, slightly 2-lipped; upper lip 8–10 mm, 3-lobed to 3 mm from base, lobes triangular and 5–7 mm; lower lip 2-lobed almost to base, lobes linear-oblan-

ceolate to subspatulate, 9–10 mm, and apex obtuse. Corolla light blue, 3–3.5 cm, gently curved, subventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm and then gradually widened to ca. 1.3 cm at mouth; lobes ovate, ca. 4 × 4 mm, subequal. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 5 mm, basally pilose; anther thecae oblong, ca. 2 × 1 mm; pollen type 3. Ovary oblong, ca. 2 mm, comose at tip; style ca. 2.2 cm, sparsely pilose. Capsule narrowly oblong-ellipsoid, ca. 12 × 2 mm, glabrous except for gland-tipped pubescent tip, 4-seeded. Seeds ovate to suborbicular in outline, ca. 3 × 2 mm, pilose. Fl. Oct–Feb, fr. Dec–Mar.

• Moist forests; 1600–2200 m. Yunnan.

**50. *Strobilanthes tamburensis*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 454. 1884.

毛冠马蓝 *mao guan ma lan*

Herbs to 50 cm tall, perennial, slightly anisophyllous. Stems decumbent and basally rooting then ascending, 4-angled, sulcate, bifariously pilose. Leaves usually sessile or with a petiole to 3 mm; leaf blade ovate to suborbicular, 8–45 × 8–45 cm, both surfaces glabrous or pilose, abaxially whitish, adaxially green, secondary veins 5–7 on each side of midvein, base rounded to subcordate, margin entire or obscurely crenulate-serrate, apex acute to obtuse. Inflorescences terminal, spikes, 3–6 cm; bracts orbicular to obovate, 5–8 × 5–8 mm, persistent until flowers fall, pilose; bracteoles obovate, ca. 3 × 3 mm, pilose. Flowers ca. 2.5 cm apart basally on rachis but imbricate apically. Calyx 6–10 mm, 5-lobed almost to base; lobes linear-spatulate, margin ciliate. Corolla blue, 2.5–3 cm, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1 cm then bent to ca. 90° and abruptly widened to 8–10 mm at mouth; lobes broadly ovate, ca. 5 × 6–7 mm. Stamens 4, included; filaments subglabrous, shorter pair ca. 4 mm, longer pair ca. 7 mm; anther thecae oblong, ca. 2 × 1 mm; pollen type 16. Ovary gland-tipped; style ca. 2.5 cm, sparsely pilose, apically glabrous. Capsule ca. 1.2 cm, gland-tipped pilose, 4-seeded. Seeds orbicular in outline, ca. 3 × 3 mm, densely pilose; areola absent. Fl. Aug–Nov.

Wet places in forests; 1200–2100 m. Xizang (Cona) [Bhutan, India, Nepal].

**51. *Strobilanthes taoana*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 479. 2010.

陶氏马蓝 *tao shi ma lan*

Subshrubs, weakly anisophyllous, becoming black when dry. Stems somewhat sulcate, pilose with large-celled trichomes, eventually glabrescent, basally woody. Petiole 0–2 mm, pilose; leaf blade ovate, 4–10 × 2–5 cm, smaller of pair ca. 2/3 size of larger one, abaxially paler, glabrous except for a few trichomes on veins, and densely covered with prominent cystoliths, adaxially green with inconspicuous cystoliths and subglabrous except for a few scattered hispid trichomes and a strigose or scurfy midvein, base slightly asymmetric, rounded to subcordate, and briefly decurrent onto petiole, margin serrate, apex

acute to shortly acuminate and commonly falcate. Inflorescences axillary or terminal, spikes, 2–5 cm; rachis straight, pilose; sterile bracts leaflike, apically diminishing in size, subsessile, ovate, 1–4 × 0.7–2.2 cm, apex acuminate; floral bracts oblong-elliptic, 3–6 × 2–4 mm, glabrous, apex acuminate; bracteoles obovate to oblong-lanceolate, 3–5 × 1–2 mm, glabrous. Flowers in opposite pairs but often solitary. Calyx 9–16 × 1–2 mm, subequally 5-lobed to ca. 1 mm from base; lobes almost colorless, linear, glabrous, covered with cystoliths, apex obtuse. Corolla white, 2–2.5 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally ca. 2 mm wide then gradually widened to ca. 1.2 cm at mouth; lobes ovate, 4–6 mm, apex rounded. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 6 mm; anther thecae spherical, ca. 1 mm in diam., glabrous. Ovary glabrous; style ca. 2 cm, glabrous. Capsule not seen. Fl. Jan.

● Limestone hills; ca. 2200 m. Yunnan (Jinghong).

**52. *Strobilanthes rubescens*** T. Anderson, J. Linn. Soc., Bot. 9: 479. 1867.

红色马蓝 hong se ma lan

*Pteracanthus rubescens* (T. Anderson) Bremekamp.

Subshrubs 0.5–2 m tall, isophyllous. Stems somewhat sulcate, pilose with large-celled trichomes, eventually glabrescent, basally woody. Petiole to 2 mm but apically leaves becoming sessile, pilose; leaf blade ovate to suborbicular, 4–10 × 2–5 cm, smaller of pair ca. 2/3 size of larger one, abaxially paler and glabrous except for a few trichomes on veins and densely covered with prominent cystoliths, adaxially green with inconspicuous cystoliths and subglabrous except for a few scattered hispid trichomes and a strigose or scurfy midvein, base rounded, cordate, or cuneate and decurrent onto petiole, margin crenulate-dentate, apex acute to shortly acuminate and commonly falcate. Inflorescences axillary, spikes, 2–5 cm, secund, sometimes reduced to solitary flowers in leaf axils; rachis straight or obscurely zigzag, pilose; sterile bracts leaflike, sessile, ovate, 1–4 × 0.7–2.2 cm, variable in development, glabrous, densely covered with cystoliths, apex acuminate; floral bracts ovate, 2–3 × 1–1.5 mm, persistent, glabrous, apex acuminate; bracteoles oblong-lanceolate, 1.5–3 × 0.5–1 mm, caducous, glabrous. Flowers to 2 cm apart basally on rachis but internodes shorter apically. Calyx 0.9–1.6 cm, subequally 5-lobed to ca. 1 mm from base; lobes almost colorless, linear, 1–2 mm wide, glabrous, covered with cystoliths, apex acute. Corolla white, 2–2.5 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 5 mm then gradually widened to ca. 1.2 cm at mouth; lobes ovate, 4–6 mm, apex rounded. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 6 mm; anther thecae spherical, ca. 1 mm in diam., glabrous; pollen type 3, requires confirmation. Ovary glabrous; style ca. 2 cm, glabrous. Capsule 1–1.2 cm, glabrous except hairy at tip, 4-seeded. Fl. Oct–May.

Limestone hills; ca. 1900 m. Yunnan [Bhutan, India].

**53. *Strobilanthes pinetorum*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 197. 1918.

松林马蓝 song lin ma lan

*Diffugossa pinetorum* (W. W. Smith) C. Y. Wu & C. C. Hu.

Subshrubs to 1 m tall, much branched, anisophyllous. Stems erect, glabrous or subglabrous. Petiole (0–)1–2 cm, subglabrous, winged; leaf blade broadly ovate to suborbicular, smaller of pair 2–3 × 1–1.5 cm and larger one 6–10 × 3.5–5 cm, both surfaces with prominent cystoliths, abaxially olive-green and glabrous, adaxially dark green and sparsely pilose but soon glabrescent, secondary veins 5 or 6 on each side of midvein, base subrounded to broadly cuneate and abruptly decurrent onto petiole or cordate for apical leaves, margin serrate, apex long acuminate. Inflorescences axillary or terminal, simple or branched spikes, to 10 cm; sterile bracts leaflike, sessile, ovate, 1–5 × 0.7–3.5 cm, base cordate, apex shortly acuminate; floral bracts ovate-oblong, 7–11 × 2–3 mm; bracteoles linear-lanceolate, ca. 6 × 1 mm, glabrous, apex obtuse. Calyx ca. 7 mm, glabrous, 5-lobed almost to base; lobes linear-oblong, ca. 6 × 1 mm, apex obtuse. Corolla whitish purple, ca. 4 cm, curved, ventricose, outside glabrous; tube basally cylindric and ca. 2 mm wide for ca. 1.3 cm then curved and gradually widened to ca. 1.2 cm at mouth; lobes orbicular, ca. 4 × 4 mm. Stamens 4, included; filaments subglabrous, shorter pair ca. 4 mm, longer pair ca. 7 mm; anther thecae oblong, ca. 2 × 1.5 mm; pollen type 5. Ovary pilose at tip; style ca. 3.2 cm, apically sparsely hirsute. Capsule not seen. Fl. Jun.

● Forests; ca. 2000 m. Yunnan (Tengchong).

*Strobilanthes pinetorum* is only known from the type, which is distinctive but very immature.

**54. *Strobilanthes helicta*** T. Anderson, J. Linn. Soc., Bot. 9: 479. 1867.

曲序马蓝 qu xu ma lan

*Asystasia calycina* Nees (1832), not *Strobilanthes calycina* Nees (1836); *Echinacanthus calycinus* (Nees) Nees; *Pteracanthus calycinus* (Nees) Bremekamp.

Subshrubs 50–100 cm tall, pliestesial, nearly isophyllous. Stems 4-angled, erect, sulcate, usually glabrous but sometimes apically brown pubescent. Petiole 0.2–5 cm, bifariously pubescent; leaf blade ovate-lanceolate to elliptic, 5–12 × 1–6 cm, both surfaces glabrous except for pubescence on margin near base, abaxially paler, adaxially dark green, secondary veins 6 or 7 on each side of midvein and abaxially prominent, base attenuate and decurrent onto petiole, margin serrate to rarely subentire, apex acuminate. Inflorescences axillary, spikes, 2–12 cm, secund, sometimes few flowered and frequently with bract pairs fertile only apically; rachis usually strongly zigzag; bracts linear, 5–13 mm, persistent, one of pair per node shorter than other, glabrous or gland-tipped pilose; bracteoles linear, 2–3 mm, glabrous or gland-tipped pilose. Flowers 6–10 mm apart on rachis, only one sterile per node. Calyx 1.3–2.5 cm, glabrous or gland-tipped pubescent, 5-lobed almost to base; lobes linear with one shorter than others, often keeled, outside with white cystoliths, apex acuminate. Corolla white or flushed pale purple, 3.5–4 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally narrow and cylindric for ca. 5 mm then

abruptly widened to ca. 1.8 cm and finally narrowed slightly and bent to ca. 90° near mouth; lobes oblong, ca. 5 × 4 mm, unequal, apex emarginate. Stamens 4, included; filaments glabrous, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 3 × 1 mm; pollen type 4. Ovary glabrous; style 2.8–3.2 cm, apically hirsute. Capsule oblong, 1.8–2 cm, glabrous, 4-seeded, apex apiculate. Seeds ovate to obovate in outline, ca. 4 × 2.5 mm, appressed pubescent. Fl. Sep–Nov, fr. Nov–Jan.

Evergreen broad-leaved forests; 1700–2200 m. SE Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

**55. *Strobilanthes rostrata*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 476. 2010.

西畴马蓝 xi chou ma lan

Herbs to 1 m tall, perennial, slightly anisophyllous. Stems 4-angled, sulcate, glabrous. Petiole (1.5–)4–8 cm, glabrous; leaf blade elliptic, (4.5–)11–17 × (2.5–)7–10 cm, both surfaces glabrous, abaxially paler, adaxially green and with numerous cystoliths, secondary veins (6–)9–12 on each side of midvein, base subrounded and decurrent onto petiole, margin dentate, apex acute. Inflorescences axillary, branched spikes, bearing a pair of reduced leaves at branching point and forming a lax terminal panicle of spikes, ultimate branches slightly zigzag; bracts spatulate-linear, 2–3 mm, persistent, glabrous, both surfaces with abundant white cystoliths; bracteoles linear, ca. 3 mm. Flowers only one fertile per pair. Calyx ca. 1 cm, glabrous, outside densely covered with white cystoliths, inside with cystoliths in 2 lines along lobe margin, 5-lobed to ca. 2 mm from base; lobes linear, equal. Corolla blue, ca. 3.8 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.2 cm, bent to ca. 45° at middle, and gradually widened to ca. 1 cm at mouth. Stamens 4; filaments included, shorter pair ca. 6 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 2 mm. Ovary glabrous; style ca. 2.7 cm, pilose. Capsule ca. 1.6 cm, glabrous, 4-seeded, apex with a ca. 4 mm beak. Seeds ovate in outline, ca. 2 × 2 mm, appressed pilose; areola small. Fl. Aug–Sep, fr. Nov.

• Forests by streams in limestone areas; 1400–1600 m. Yunnan (Xichou).

**56. *Strobilanthes chrysodelta*** J. R. I. Wood, Kew Bull. 64: 41. 2009.

金三角马蓝 jin san jiao ma lan

Herbs 30–60 cm tall, perennial, anisophyllous. Stems slightly 4-angled, sulcate, glabrous. Petiole 0.5–2.5 cm, glabrous; leaf blade elliptic, 3–9 × 1.7–4 cm, smaller of pair ca. 2/3 size of larger one but similar in shape, both surfaces glabrous, abaxially with prominent cystoliths, adaxially much paler, secondary veins 4 on each side of midvein, base attenuate and slightly decurrent onto petiole, margin slightly serrate, apex acute. Inflorescences terminal, spikes, 2–10 cm, 2–10-flowered; rachis gland-tipped pilose; basal sterile bracts leaflike but sessile or almost so, ovate, base rounded; apical floral bracts ovate-elliptic, 5–6.5 × ca. 2 mm, persistent, gland-tipped pilose, apex obtuse; bracteoles oblong-oblancheolate, ca. 8 × 1 mm, persistent until after anthesis, gland-tipped pilose, apex obtuse. Flowers

opposite pairs, 1–2 cm apart on rachis. Calyx 1–1.1 cm, accrescent to ca. 1.5 cm in fruits; lobes linear, gland-tipped pilose, apex obtuse; lower 2 lobes distinct to base; upper 3 lobes connate for ca. 3 mm from base but becoming distinct in fruit, central lobe slightly longer than others and becoming subspatulate. Corolla pale violet with a white tube, 3.7–4 cm, straight, outside glabrous; tube basally cylindric and ca. 2.5 mm wide for ca. 1.1 cm then gradually widened to ca. 1.2 cm at mouth; lobes ovate, 9–10 × ca. 7 mm, apex rounded. Stamens 4, all fertile, included; filaments erect, very sparsely pilose, shorter pair ca. 2 mm, longer pair ca. 4 mm; anther thecae oblong, ca. 2 × 0.5 mm, erect, mucous. Ovary comose; style pilose. Capsule ca. 1.5 cm, glabrous except for a few gland-tipped trichomes at apex, 4-seeded. Seeds ca. 3 × 2.5 mm, lenticular, pilose; areola almost lacking. Fl. and fr. Apr.

Moist places; 2100–2400 m. Yunnan [Myanmar].

**57. *Strobilanthes tonkinensis*** Lindau, Bull. Herb. Boissier 5: 651. 1897.

糯米香 nuo mi xiang

Herbs 50–100 cm tall, weakly anisophyllous. Stems 4-angled, pubescent, glabrescent, fragrant when dry. Petiole to 2 cm, pubescent; leaf blade broadly oblong-elliptic, to 18.5 × 6 cm, both surfaces sparsely pubescent especially on veins, adaxially with prominent cystoliths, secondary veins 4–7 on each side of midvein, base cuneate and decurrent onto petiole, margin crenate, apex acute. Inflorescences terminal, simple spikes, 3–11 cm, sometimes with branches arising in apical leaf axils; rachis pubescent with gland-tipped trichomes; bracts linear-spatulate, 10–12 × 2–2.5 mm, sparsely pubescent and gland-tipped pubescent, densely covered with white cystoliths, 1-veined; bracteoles linear, ca. 5 × 1 mm, pubescent, abaxially densely covered with cystoliths. Calyx 5-lobed to base; lobes linear, 8–9 × ca. 1 mm, subequal, pubescent, outside covered with prominent cystoliths. Corolla pink to pure white, ca. 3.2 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then gradually widened to ca. 1 cm at mouth; lobes orbicular, ca. 5 mm in diam. Stamens 4, included; shorter filament pair ca. 4 mm, glabrous; longer filament pair ca. 7 mm, puberulent; anther thecae oblong, ca. 3 mm; pollen type 4. Ovary obovoid, ca. 3 mm, gland-tipped pilose at tip; style ca. 1.5 cm, glabrous. Capsule narrowly oblong-obovoid, 8–10 × ca. 2.5 mm, gland-tipped pilose, 4-seeded, apex apiculate. Seeds ovate in outline, ca. 2 × 2 mm, pubescent; areola small, glabrous. Fl. Apr–Jun, Dec, fr. Jun–Jul.

Moist forests; 200–1500 m. Guangxi, Yunnan [Thailand, Vietnam].

*Strobilanthes tonkinensis* is a medicinal and aromatic plant.

The name "*Semnostachya menglaensis*" (H. P. Tsui, FRPS 70: 349. 2002) belongs here but was not validly published because the herbarium where the type specimen is conserved was not specified (Vienna Code, Art. 37.7).

**58. *Strobilanthes stolonifera*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 98. 1922.

匍枝马蓝 pu zhi ma lan

Subshrubs to 20 cm tall, isophyllous. Stems ascending, usually rooting at nodes, glabrous but with cystoliths. Petiole 3–15(–20) mm, glabrous; leaf blade elliptic, (3–)5–10 × (1–)2–2.5 cm, both surfaces with prominent cystoliths, abaxially pale green to whitish and sparsely pubescent, adaxially pubescent but soon glabrescent, secondary veins 5–7 on each side of midvein, base decurrent onto petiole, margin crenate to crenate-serrate, apex acuminate. Inflorescences terminal, spikes, 1–2 cm; rachis pilose; sterile bracts at base of inflorescence leaflike; floral bracts oblong to elliptic, 9–13 × 2–3 mm, pubescent; bracteoles oblong, ca. 8 × 1.5 mm, pilose with large-celled trichomes. Calyx lobes linear, 11–14 × ca. 1 mm, pubescent with some trichomes gland-tipped. Corolla violet, 3–3.5 cm, subventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then slightly curved and gradually widened to ca. 1 cm at mouth; lobes ovate, ca. 4 × 4 mm. Stamens 4, included; filaments pilose, shorter pair ca. 3 mm, longer pair ca. 6 mm; anther thecae oblong, 2.5–3 × ca. 0.8 mm; pollen type 4, requires confirmation. Ovary oblong, 3–4 mm, puberulent at tip with some gland-tipped trichomes; style ca. 3 cm, villous. Capsule narrowly oblong, ca. 13 × 3 mm, pilose, 4-seeded. Seeds orbicular in outline, ca. 3 × 3 mm, villous. Fl. Jun.

- Dry places; 1800–2400 m. Yunnan.

**59. *Strobilanthes vallicola*** Y. F. Deng & J. R. I. Wood, Bot. J. Linn. Soc. 150: 380. 2006.

河口马蓝 he kou ma lan

Herbs 0.8–1.5 m tall, perennial, isophyllous. Stems black, 4-angled, apically sulcate, glabrous. Petiole 1.3–2.5 cm, glabrous; leaf blade oblong-elliptic, 15–25 × 6.5–11 cm, both surfaces glabrous and with prominent cystoliths, abaxially paler and with prominent veins covered with cystoliths, secondary veins 6–9 on each side of midvein, base cuneate, margin serrate, apex acuminate. Inflorescences terminal, spikes, 15–25 cm, branched or rarely unbranched; rachis densely pilose with large-celled trichomes; bracts ovate-oblong, 8–12 × ca. 4 mm, persistent, pilose with large-celled trichomes and some gland-tipped trichomes; bracteoles lanceolate, 9–13 × 1.1–1.3 mm, persistent, pilose with large-celled trichomes and some gland-tipped trichomes. Flowers opposite pairs, sessile, 0.8–2 cm apart on rachis. Calyx 14–18 × 1–1.5 mm, persistent, pilose with large-celled trichomes, some trichomes gland-tipped. Corolla white, 3–3.5 cm, outside glabrous except for lobe margin, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for 1–1.5 cm then gradually ventricose and strongly bent 1.5–2.5 cm from base; lobes ovate, ca. 4 × 5 mm, apex obtuse. Stamens 4, included; filaments glabrous, shorter pairs 2–3 mm, longer pairs 3–5 mm; anther thecae oblong, 3–4 × ca. 1 mm, glabrous; pollen type 9. Ovary ca. 3 × 1 mm, glabrous; style ca. 2.5 cm. Capsule oblong, 1.5–2 × 0.2–0.3 cm, narrowed at both ends, comose, 4-seeded. Seeds ovate to suborbicular in outline, ca. 3 × 3 mm, pilose. Fl. Apr–Jun.

- Moist places, stream and riversides in moist forests; below 200 m. Yunnan (Hekou).

**60. *Strobilanthes cognata*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 189. 1922.

奇瓣马蓝 qi ban ma lan

*Pteracanthus cognatus* (Benoist) C. Y. Wu & C. C. Hu.

Herbs to 50 cm tall, isophyllous, drying blackish. Stems stout, 4-angled, lenticellate, glabrous. Petiole ca. 1 cm, glabrous; leaf blade oblong to lanceolate, 6–12 × 3–4.5 cm, both surfaces densely covered with small cystoliths, very sparsely pilose with scattered large-celled trichomes, secondary veins 8–10 on each side of midvein, base cuneate, margin crenate, apex acuminate. Inflorescences terminal, spikes, 3–5 cm; bracts lanceolate, 7–20 × ca. 6 mm, sparsely pilose with large-celled white trichomes, margin ciliate, apex acuminate; bracteoles oblong, ca. 11 × 2 mm, gland-tipped pilose, apex acute. Flowers imbricate on rachis. Calyx 1–1.2 cm, outside gland-tipped pilose, 5-lobed almost to base; lobes linear, ca. 1 mm wide, apex acute. Corolla violet, 4–5 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 2.5 cm then gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 6 × 5 mm, apex obtuse. Stamens 4, included; filaments erect, shorter pair ca. 6 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 3 × 1 mm; pollen type 4. Ovary glabrous except pilose at tip; style 3.5–4.2 cm. Capsule ca. 1.8 cm, pilose at tip, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, densely appressed pubescent. Fl. Aug–Oct, fr. Nov–Dec.

- Moist places by streams; 1200–1400 m. Guizhou, Hubei, Hunan.

**61. *Strobilanthes cusia*** (Nees) Kuntze, Revis. Gen. Pl. 2: 499. 1891.

板蓝 ban lan

*Goldfussia cusia* Nees in Wallich, Pl. Asiat. Rar. 3: 88. 1832; *Baphicacanthus cusia* (Nees) Bremekamp; *Dipteracanthus calycinus* Champion; *Ruellia indigofera* Griffith; *R. indigotica* Fortune; *Strobilanthes balansae* Lindau; *S. championii* T. Anderson; *S. flaccidifolia* Nees.

Herbs 0.5–1.5 m tall, erect, branched, drying blackish, isophyllous to weakly anisophyllous. Stems glabrous or minutely brown puberulent. Petiole 0.5–7 cm; leaf blade elliptic to ovate, 4–20 × 2–9 cm, both surfaces glabrous or abaxially minutely puberulent along veins, abaxially paler green, adaxially dark green, secondary veins 7–9 on each side of midvein, base attenuate, margin serrate, apex acute. Inflorescences terminal or axillary, bracteate spikes, 1–6 cm, often aggregated to form a leafy branched panicle; peduncle 1–12 cm; bracts leaflike, petiolate, oblanceolate, obovate, or spatulate, 1.2–2.5 cm, basally usually sterile; bracteoles linear-oblanceolate, 2–3 mm, deciduous before bracts. Calyx 0.8–1.5 mm in flower, accrescent to ca. 2.5 cm in fruit, minutely puberulent, 5-lobed almost to base; 4 lobes linear-lanceolate, apex acute to obtuse; 1 lobe oblanceolate and much longer. Corolla blue, 3.5–5 cm, straight to slightly bent, outside glabrous; tube basally cylindric and ca. 3 mm wide for 1–1.5 cm then slightly curved and gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 9 × 9 mm, subequal. Stamens 4, included; filaments glabrous, shorter pair ca. 3 mm, longer pair ca. 7 mm; anther thecae oblong, ca. 3 mm; pollen type 4. Ovary oblong, apex puberulent with few gland-tipped

trichomes; style ca. 3.2 cm, glabrous. Capsule 1.5–2.2 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3.5 mm, covered with appressed trichomes; areola small. Fl. Jul–Feb, fr. Dec–Feb.  $2n = 16, 32$ .

Usually in moist wooded places, sometimes cultivated; 100–2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Laos, Myanmar, Thailand, Vietnam].

*Strobilanthes cusia* is reported to flower irregularly. The species is perhaps pliestesial.

In at least part of its stated range *Strobilanthes cusia* may be cultivated rather than native.

This is a medicinal and dye plant and is the source of "Assam indigo."

**62. *Strobilanthes flexicaulis*** Hayata, Icon. Pl. Formosan. 5: 135. 1915.

曲茎兰 嵌马蓝 qu jing lan qian ma lan

*Parachampionella flexicaulis* (Hayata) C. F. Hsieh & T. C. Huang; *Strobilanthes fauriei* Benoist; *S. glandulifera* Hayata; *S. prionophylla* Hayata; *Trianaecanthus flexicaulis* (Hayata) C. F. Hsieh & T. C. Huang.

Subshrubs to 1 m tall, much branched, anisophyllous. Stems 4-angled, winged, glabrous. Petiole 0.2–2.5 cm, glabrous or sparsely pubescent; leaf blade ovate, ovate-lanceolate, or ovate-elliptic, 3.5–18 × 1.8–5 cm, abaxially glaucous, adaxially sparsely pilose to subglabrous, secondary veins 4–6 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin serrate to crenate, apex acuminate. Inflorescences axillary or terminal, spikes, ca. 3 cm, few flowered; rachis often zigzag, glabrous to gland-tipped pilose; bracts persistent, basally merging into leaves, ovate to suborbicular, and shortly petiolate, apically becoming ovate to oblanceolate and sessile, 4–15 × 2–10 mm, apically diminishing in size, glabrous, apex obtuse; bracteoles linear, ca. 4 × 0.5 mm at anthesis but accrescent to ca. 14 × 1 mm, glabrous or sparsely gland-tipped pilose. Pedicel to 1 mm or flowers sessile. Calyx 0.9–1.1 cm at anthesis, strongly accrescent to ca. 3.2 cm in fruit, 2-lipped; lower lip 2-lobed almost to base, lobes linear; upper lip 3-lobed to middle, lobes linear, ca. 6 × 1 mm at anthesis, margin ciliate with gland-tipped trichomes but soon glabrescent, and apex obtuse. Corolla blue to purple, campanulate, ca. 4 cm, outside glabrous or glabrescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 4 mm wide for ca. 1.5 cm then gradually widened to ca. 1.5 cm at mouth; limb slightly 2-lipped; lower lip ca. 1 cm, 3-lobed, center lobe orbicular, ca. 6 × 7 mm, base contracted, and apex emarginate, lateral lobes orbicular, somewhat oblique, and apex emarginate; upper lip 2-lobed, lobes semiorbicular and ca. 5 × 8 mm. Stamens 4; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 7 mm, hirsute; anther thecae oblong-linear, ca. 3.5 × 1 mm; pollen type 3. Ovary obovoid, glabrous; style filiform, ca. 3 cm, pubescent with gland-tipped trichomes; stigma subulate. Capsule linear-oblong, 1.6–2 cm, glabrous, 4-seeded. Seeds oblong-ovate in outline, ca. 3.5 × 2 mm, densely covered with appressed trichomes. Fl. Sep–Nov, fr. Feb.  $2n = 30$ .

Streamsides in forests; 200–2300 m. Taiwan [Japan (Ryukyu Islands)].

*Strobilanthes tashiroi* Hayata (*S. flexicaulis* var. *tashiroi* (Hayata) Yamazaki) is endemic to the Ryukyu Islands (K. Iwatsuki et al., eds., Fl. Japan 3a: 391. 1993).

**63. *Strobilanthes lanyuensis*** Seok, C. F. Hsieh & J. Murata, J. Jap. Bot. 79: 151. 2004.

兰屿马蓝 lan yu ma lan

Subshrubs to 1.5 m tall, anisophyllous. Stems 4-angled, retrorsely pubescent. Petiole 0.5–5 cm, appressed pubescent; leaf blade variable in shape and size, oblong-lanceolate, oblong-ovate, or ovate, 3–20 × 2–8 cm, abaxially glabrous or sometimes pubescent along veins, adaxially glabrous and with numerous cystoliths, secondary veins 3–5 on each side of midvein and abaxially prominent, base cuneate to narrowly cuneate and decurrent onto petiole, margin mucronate-serrate, apex acute to acuminate. Inflorescences terminal or from apical leaf axils, spikes, 5–10 cm; rachis 4-angled, glabrous or gland-tipped pubescent; bracts obovate, narrowly oblong, or linear-oblanceolate, 1–2.5 × 0.3–2 cm, abaxially glabrous or sparsely pubescent and with numerous cystoliths, apex obtuse; bracteoles linear, 10–20 × 3–4 mm, abaxially glabrous or sparsely pubescent. Calyx 1.3–2.4 cm, accrescent to ca. 4 cm in fruit, 2-lipped, lower lip 2-lobed almost to base, upper lip 3-lobed to 2/3 of length; lobes linear, glabrous, pubescent, or rarely gland-tipped pilose on margin, cystoliths numerous, apex acute. Corolla white, funnel-shaped, ca. 4 cm, bent near mouth, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 8 mm then gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 5 × 4 mm. Stamens 4, included; filaments densely pilose, shorter pairs ca. 2 mm, longer pair ca. 2.5 mm; anther thecae oblong, ca. 2 mm; pollen type 3. Ovary glabrous; style ca. 2.5 cm; stigma very unequally 2-lobed. Capsule cylindric-fusiform, ca. 1.7 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 × 3 mm, densely appressed pubescent. Fl. Sep–Nov, fr. Jan.

● Moist places in forests; 200–1000 m. Taiwan (Lan Yu).

*Strobilanthes lanyuensis* is close to *S. flexicaulis*, itself a variable species, differing only in the white, resupinate corolla and a few other minor characters. Further studies are needed to confirm its status.

**64. *Strobilanthes atropurpurea*** Nees in Wallich, Pl. Asiat. Rar. 3: 86. 1832.

翅柄马蓝 chi bing ma lan

Herbs 30–50(–100) cm tall, perennial, much branched, isophyllous or slightly anisophyllous. Stems slender, 4-angled, rooting at nodes, glabrous or pubescent. Leaves basally petiolate, apically sessile; petiole 0–2 cm, winged, glabrous or pubescent; leaf blade ovate, elliptic, or narrowly lanceolate, 1–6(–16) × 0.5–3.5(–6.5) cm, puberulent or glabrous, adaxially with linear cystoliths, secondary veins 5 or 6 on each side of midvein, base rounded to attenuate and shortly decurrent onto petiole, margin serrate to coarsely crenate, apex acute to acuminate. Inflorescences axillary, spikes, 2–7 cm, zigzag, secund, few flowered, often much reduced to flowers solitary or paired in leaf axil on main stem; bracts leaflike, ovate to subcordate, 8–

10 × ca. 3 mm, apically smaller, persistent, glabrous, 3-veined or pinnately veined; bracteoles linear-oblong, ca. 5 × 2 mm. Calyx 1–1.5 cm, accrescent to 2–2.5 cm in fruit, 5-lobed almost to base; lobes linear, 11–20 × 1–1.5 mm, unequal with one slightly larger than others, glabrous or pilose, rarely gland-tipped pubescent, abaxially with linear cystoliths. Corolla pale purple, bluish purple, or rarely white, 2.5–3.5 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then inflated, widened to 1.5–1.8 cm, and bent at mouth; lobes oblong, ca. 3 × 4 mm, apex obtuse. Stamens 4, included; filaments glabrous, shorter pair ca. 4 mm, longer pair ca. 7 mm; anther thecae oblong, ca. 2 mm; pollen type 3. Ovary glabrous; style ca. 2 cm, glabrous; stigma acute. Capsule fusiform, 1.2–1.8 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 × 3 mm, pubescent with appressed trichomes; areola 0.2–0.3 mm. Fl. Jun–Oct.

Moist places on mountain slopes, forests, by rivers; 700–2900 m. Chongqing, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Myanmar, Nepal, Pakistan, Vietnam].

There are no reports of *Strobilanthes atropurpurea* being pleistocene flowering from China or the E Himalaya, although this is a well-known phenomenon in this species in the W Himalaya.

- 1a. Leaf blade ovate to ovate-elliptic,  
1.5–6(–16) × 1–3.5(–6.5) cm,  
glabrous or pubescent ..... 64a. var. *atropurpurea*  
1b. Leaf blade lanceolate,  
1–3 × 0.5–1.2 cm, glabrous ..... 64b. var. *stenophylla*

**64a. *Strobilanthes atropurpurea* var. *atropurpurea***

翅柄马蓝(原变种) *chi bing ma lan* (yuan bian zhong)

*Hemigraphis cuneata* S. Y. Hu; *Pteracanthus alatus* (Wallich ex Nees) Bremekamp; *Ruellia alata* Wallich ex Nees; *Strobilanthes densa* Benoist; *S. wallichii* Nees; *S. wallichii* var. *microphylla* Nees.

Leaf blade ovate to ovate-elliptic, 1.5–6(–16) × 1–3.5(–6.5) cm, glabrous or pubescent. Fl. Jun–Sep.  $2n = 32, 40$ .

Moist places on mountain slopes, forests; 700–2900 m. Chongqing, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang (Cona, Nyalam), Yunnan, Zhejiang [Bhutan, India, Myanmar, Nepal, Pakistan, Vietnam].

The name "*Strobilanthes triflora*" (Y. C. Tang, Iconogr. Cormophyt. Sin. 4: 163. 1975) belongs to this variety but was not validly published because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

**64b. *Strobilanthes atropurpurea* var. *stenophylla* (C. B. Clarke) Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 482. 2010.**

镇宁马蓝 *zhen ning ma lan*

*Strobilanthes stenophylla* C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 472. 1884 [*"stenophyllus"*]; *S. martini* H. Léveillé.

Leaf blade lanceolate, 1–3 × 0.5–1.2 cm, glabrous. Fl. Oct.

By rivers. Guizhou (Zhenning) [India].

**65. *Strobilanthes latisejala* Hemsley, J. Linn. Soc., Bot. 26: 241. 1890.**

薄萼马蓝 *bao e ma lan*

Herbs to 50 cm tall, perennial, isophyllous. Stems 4-angled, sulcate, glabrous. Petiole 1–2.5 cm, glabrous; leaf blade lanceolate to ovate-lanceolate, 2–6 × 1–2.5 cm, abaxially glabrous and paler, adaxially with a few scattered trichomes and abundant cystoliths, secondary veins 4–6 on each side of midvein, base cuneate and decurrent onto petiole, margin crenulate, apex acuminate. Inflorescences axillary, subcapitate, 1–2 cm, 2–4-flowered; peduncle 0–2 cm; bracts leaflike, ovate, 6–9 × 3–5 mm, persistent, glabrous, margin subentire, apex acute; bracteoles linear, 5–6 × ca. 2 mm, glabrous. Calyx 8–10 mm, 5-lobed almost to base; lobes ovate-elliptic, 6–10 × 3–5 mm, unequal with one larger than others, outside sparsely pilose, apex obtuse. Corolla pale blue, ca. 3.2 cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then gradually widened to ca. 1 cm at mouth; lobes ovate, ca. 4 × 3 mm. Stamens 4; filaments glabrous, shorter pair ca. 4 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 2 × 1.2 mm, erect; pollen type 3. Ovary glabrous; style ca. 2.7 cm, glabrous. Capsule not seen.

- Forests. Hubei (Xingshan).

*Strobilanthes latisejala* is only known from the type and is possibly conspecific with the very variable *S. atropurpurea*, from which it can be distinguished by its distinctive broad sepals.

**66. *Strobilanthes tibetica* J. R. I. Wood, Edinburgh J. Bot. 51: 262. 1994.**

西藏马蓝 *xi zang ma lan*

*Pteracanthus tibeticus* (J. R. I. Wood) C. Y. Wu & C. C. Hu.

Subshrubs to 1.5 m tall, gregarious, probably pleistocene, nearly isophyllous. Stems slightly 4-angled, glabrous or obscurely bifariously pubescent. Petiole 1–3 cm, sparsely pilose; leaf blade ovate to elliptic, 7–14 × 3–9 cm, abaxially paler and subglabrous except for a few trichomes near base of midvein, adaxially green, subglabrous except for a few scattered short hispid trichomes, strigose or scurfy along midvein, and with conspicuous cystoliths, secondary veins 5 or 6 on each side of midvein, base narrowly cuneate and decurrent nearly to petiole base, margin strongly serrate, apex shortly acuminate and slightly falcate. Inflorescences axillary, spikes, 4–12 cm, secund, sometimes reduced to single axillary flowers; rachis finely puberulent to gland-tipped pilose, straight or obscurely zigzag, winged, wings 0.2–1 mm wide; bracts glabrous; basal bracts leaflike, with a petiole to 4 mm, ovate, 1.5–2.5 cm, apex acuminate; apical bracts sessile, narrowly oblong-elliptic, 1–1.2 cm, apex acuminate; bracteoles oblong, 2.5–4 mm, apex obtuse. Flowers to 1.5 cm apart on rachis. Calyx 0.9–2 cm, apparently not accrescent, subequally 5-lobed to ca. 1 mm above base; lobes almost colorless, linear, glabrous or sparsely gland-tipped pilose, apex obtuse. Corolla violet, 3.2–4 cm, outside pubescent but silky gray in bud, inside glabrous; tube strongly inflated from near base then widened to ca. 1.5 cm at middle and finally bent to ca. 90° but not narrowed at mouth; lobes ovate, ca. 5 × 7 mm, apex rounded to slightly emarginate. Stamens 4, included; filaments ca. 2.5 mm, all equal in length, glabrous; anther

thecae oblong, ca. 1.5 mm. Ovary glabrous; style ca. 2 cm, glabrous or with a few trichomes. Capsule oblong, 1.1–1.2 cm, glabrous, 4-seeded, apex apiculate. Seeds oblong in outline, ca. 3 × 2 mm, covered with stiff white trichomes. Fl. Aug–Sep, fr. Oct–Nov.

*Tsuga* forests; 2300–2700 m. Xizang (Zayü) [India].

**67. *Strobilanthes pterygorrhachis*** C. B. Clarke, J. Linn. Soc., Bot. 25: 54. 1889.

翅轴马蓝 *chi zhou ma lan*

Subshrubs to 3.8 m tall, vigorous, subglabrous. Stems and branches weakly 4-angled. Petiole 2–9 cm, glabrous; leaf blade ovate, ca. 15 × 7.5 cm, glabrous, adaxially darker and with abundant cystoliths, base cuneate and shortly decurrent onto petiole, margin serrate, apex acute to shortly acuminate. Inflorescences terminal or axillary, spikes, secund; rachis 3–25 cm, slightly zigzag, strongly winged, glabrous; bracts at base of spike leaflike, petiolate, lanceolate, to 2 × 0.7 cm but diminishing in size apically to 6 × 3 mm; bracteoles linear-oblan-ceolate, 5–10 mm. Flowers mostly paired, to 4 cm apart basally on rachis but somewhat confluent apically. Calyx 2.5–3.6 cm, subequally 5-lobed to near base; lobes narrowly lanceolate, 2.2–3.2 × ca. 0.3 cm, margin minutely ciliolate, apex narrowed into a finely acuminate or aristate point. Corolla yellow, ca. 3.5 cm, outside pubescent, inside glabrous except for trichomes retaining style; tube short, basally cylindric then abruptly widened and bent just below mouth. Filaments glabrous, shorter pair 3–4 mm, longer pair 5–6 mm; anther thecae oblong, 3–3.5 × ca. 1 mm. Ovary comose; style ca. 3 cm, glabrous. Capsule comose. Fl. Aug.

Moist places in forests; ca. 1800 m. Xizang (Mêdog) [India].

**68. *Strobilanthes urophylla*** Nees in A. Candolle, Prodr. 11: 192. 1847.

尾叶马蓝 *wei ye ma lan*

*Pteracanthus urophyllus* (Nees) Bremekamp; *Strobilanthes urophylla* var. *sikkimensis* C. B. Clarke.

Subshrubs, much branched, glabrous, anisophyllous. Stems 4-angled, glabrous. Petiole 0.8–1.6 cm; leaf blade narrowly ovate-elliptic, 5–14 × 1.5–5.5 cm, abaxially pale green, pubescent along veins, and with inconspicuous cystoliths, adaxially yellowish green, secondary veins 6–9 on each side of midvein, base cuneate to broadly cuneate and decurrent onto petiole, margin remotely serrate, apex shortly acuminate to caudate. Inflorescences axillary, short spikes; bracts leaflike, petiolate, ovate-elliptic, 0.8–4.5 cm, very persistent, abaxially with conspicuous cystoliths, pinnately veined, margin subentire, apex obtuse; bracteoles petiolate, obovate-spatulate, ca. 4 mm, persistent, subglabrous, 3-veined. Flowers in opposite pairs, 1–1.5 cm apart on rachis, in axils of leaflike bracts. Calyx 7–8 mm, pubescent, 5-lobed almost to base; lobes lanceolate with one longer than others, accrescent in fruit, apex acuminate. Corolla pale purple, 2–2.5 cm, ventricose, outside pubescent, inside subglabrous except for trichomes retaining style; tube basally cylindric and ca. 6 mm wide for ca. 5 mm then slightly bent and regularly widened to ca. 1.2 cm at mouth; lobes oblong, ca. 5 ×

4 mm, apex obtuse. Stamens 4, included; filaments hirsute, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2.5 × 1.2 mm; pollen type 3. Ovary comose; style ca. 1.7 cm, hirsute. Capsule ca. 1.4 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 2.5 × 2 mm, pubescent; areola small. Fl. May–Jun, fr. Jul–Aug.

Evergreen broad-leaved forests; 1200–2000 m. Xizang (Mêdog) [India].

**69. *Strobilanthes inflata*** T. Anderson, J. Linn. Soc., Bot. 9: 476. 1867.

锡金马蓝 *xi jin ma lan*

Herbs 50–100 cm tall, branched, isophyllous. Stems straight or somewhat zigzag, glabrous, slightly 4-angled, sulcate, pubescent or with dense brown large-celled trichomes. Petiole 3–3.5(–7.5) cm, subglabrous, pubescent, or densely yellowish brown hirsute; leaf blade oblong-ovate, elliptic, or ovate, 5–20 × 1–10 cm, abaxially hirsute, pubescent, or subglabrous and with conspicuous cystoliths, adaxially pubescent or glabrous except brownish and whitish tomentose along veins, sparsely setose, densely yellowish brown hirsute on midvein, and with numerous cystoliths, secondary veins 6–8 on each side of midvein, base oblique and broadly rounded to cuneate and decurrent onto petiole, margin serrate to crenate, apex acuminate to caudate. Inflorescences spikes, 2.5–12(–21) cm, secund, sometimes reduced to 1 or 2 flower pairs; peduncle 1.5–3 cm; rachis usually geniculate at first node then straight or somewhat zigzag; bracts variable in size and shape with basalmost ones leaflike, with a 3–4 mm petiole, ovate to narrowly ovate, 2–3 × 0.8–1.3 cm, and margin serrate; apical bracts petiolate, obovate, elliptic, or ovate-spatulate, 0.6–3 × 0.3–1.2 cm, persistent, pubescent, margin usually with 1 or 2 teeth; bracteoles oblong to linear, 2–3.5 mm, apex rounded. Flowers 1–2 cm apart on rachis. Calyx 1.1–1.4 cm, white pilose with large-celled gland-tipped trichomes, 5-lobed to base; lobes linear, unequal, reflexed, glabrous in anthesis, sometimes gland-tipped pubescent in fruit, densely covered with white linear cystoliths, margin paler, apex acute. Corolla pinkish blue to blue, 3.5–4 cm, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 5 mm then abruptly widened to ca. 1.3 cm at mouth, just basal to mouth slightly narrowed and bent to ca. 90°; lobes oblong, ca. 5 × 6 mm. Stamens 4, included; filaments glabrous, shorter pair 3–4 mm and incurved, longer pair 5–6 mm; anther thecae oblong, ca. 2 × 1 mm; pollen type 3. Ovary comose; style ca. 1.8 cm, sparsely gland-tipped pubescent at base. Capsule brownish yellow, narrowly ellipsoid, 1.6–2 cm, glabrous, 4-seeded. Seeds orbicular in outline, ca. 3 mm in diam., villous; areola inconspicuous. Fl. Jun–Nov.

Evergreen broad-leaved forests, streamsides in shady places, forests, forest margins; 1700–3200 m. Xizang, Yunnan [Bhutan, India, Indonesia, Myanmar, Nepal].

- 1a. Stems, petioles, and inflorescences densely covered with long yellowish brown trichomes; leaf blade broadly ovate, 12–20 × 6–10 cm ..... 69c. var. *aenobarba*

- 1b. Stems, petioles, and inflorescences  
subglabrous or white pubescent; leaf  
blade ovate-elliptic, less than  $8 \times 6$  cm.

2a. Leaf blade white pubescent ..... 69a. var. *inflata*

2b. Leaf blade subglabrous ..... 69b. var. *gongshanensis*

**69a. *Strobilanthes inflata* var. *inflata***

锡金马蓝(原变种) xī jīn mǎ lán (yuán biàn zhōng)

*Pteracanthus inflatus* (T. Anderson) Bremekamp; *Strobilanthes wardii* W. W. Smith.

Stems, petioles, and inflorescences white pubescent. Leaf blade elliptic to ovate, ca.  $5.5 \times 3$  cm. Fl. Jun–Nov.

Forests; ca. 1700 m. Xizang (Médog, Zayü), Yunnan [Bhutan, India, Myanmar, Nepal].

**69b. *Strobilanthes inflata* var. *gongshanensis*** (H. P. Tsui) J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 387. 2006.

贡山马蓝 gòng shān mǎ lán

*Pteracanthus gongshanensis* H. P. Tsui, Acta Bot. Yunnan. 12: 277. 1990; *Strobilanthes unilateralis* J. R. I. Wood.

Stems, petioles, and inflorescences subglabrous. Leaf blade ovate-elliptic,  $5\text{--}12 \times 1\text{--}4.5$  cm. Fl. Aug–Oct, fr. Dec.

Evergreen broad-leaved forests; 1900–2200 m. Yunnan (Gongshan) [Indonesia, Myanmar].

**69c. *Strobilanthes inflata* var. *aenobarba*** (W. W. Smith) J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 386. 2006.

铜毛马蓝 tóng máo mǎ lán

*Strobilanthes aenobarba* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 185. 1921; *Pteracanthus aenobarbus* (W. W. Smith) C. Y. Wu & C. C. Hu.

Stems, petioles, and inflorescences densely covered with long yellowish brown trichomes. Leaf blade broadly ovate,  $12\text{--}20 \times 6\text{--}10$  cm. Fl. Aug–Oct.

Streamsides in shady places, forest margins; 2300–3200 m. Xizang (Zayü), Yunnan [Indonesia, Myanmar].

**70. *Strobilanthes congesta*** Terao, Notes Roy. Bot. Gard. Edinburgh 40: 153. 1982.

密序马蓝 mǐ xù mǎ lán

*Pteracanthus congestus* (Terao) C. Y. Wu & C. C. Hu.

Subshrubs 0.6–1.8 m tall, anisophyllous. Stems subterete, whitish to brownish yellow pubescent with large-celled trichomes. Petiole 1–7 mm, densely hirsute; leaf blade ovate-lanceolate,  $2\text{--}9 \times 0.8\text{--}3.5$  cm, smaller of pair ca.  $2/3$  size of larger one, both surfaces brownish to yellow hirsute, secondary veins 4–7 on each side of midvein and inconspicuous, base attenuate, oblique, and shortly decurrent onto petiole, margin crenate and ciliate, apex acuminate and often falcate. Inflorescences axillary or terminal, spicate with 1–4 small capitula borne singly along rachis; capitula 2–8-flowered, to 4 cm apart; rachis 3–7 cm, often basally with a pair of sterile leaflike bracts so leaves sometimes appearing verticillate, densely white or yellow pi-

lose; bracts linear-ob lanceolate,  $3\text{--}8 \times 0.8\text{--}1.5$  mm, persistent, pilose, apex obtuse; bracteoles ca.  $6 \times 1$  mm, linear, white pilose. Calyx 5-lobed almost to base; lobes ovate to lanceolate, pilose on both surfaces except basally inside, abruptly narrowed at middle with an obtuse often apically recurved cauda  $11\text{--}14 \times 1.5\text{--}5$  mm; one lobe ca. 2 mm longer than others. Corolla pale whitish purple, ca. 2.5 cm, curved, outside pubescent; tube basally narrow and cylindric for ca. 6 mm then abruptly inflated and widened to ca. 1 cm at mouth; lobes oblong, ca.  $4 \times 3.5$  mm. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair 5–6 mm, base pilose; anther thecae oblong, ca.  $2 \times 0.5$  mm; pollen type 3. Ovary glabrous; style ca. 1.8 cm, pilose and gland-tipped pubescent. Capsule oblong, ca.  $10 \times 3$  mm, glabrous, 4-seeded; seeds ovate in outline, ca.  $3 \times 2.5$  mm, pubescent. Fl. Jul–Aug, fr. Dec.

Thickets, tropical forests; 1600–1800 m. Yunnan [Myanmar, ?Nepal].

*Strobilanthes congesta* is a very distinct species because of the form of its inflorescence and unique calyx.

**71. *Strobilanthes larium*** Handel-Mazzetti, Symb. Sin. 7: 893. 1936.

闭花马蓝 bì huā mǎ lán

Herbs to 1.5 m tall, isophyllous. Branches 4-angled, sulcate, silky gland-tipped pubescent. Petiole 2–5 cm, sulcate, subglabrous; leaf blade ovate-elliptic,  $(5\text{--})7\text{--}12 \times (2\text{--})3\text{--}7$  cm, abaxially glabrous except pilose along midvein, glaucous, and with numerous cystoliths, adaxially green and subglabrous except for few large-celled multicellular trichomes along veins, secondary veins 6–8 on each side of midvein, base cuneate and decurrent onto petiole, margin dentate and ciliate, apex acuminate and falcate. Inflorescences axillary, spikes,  $(1\text{--})3\text{--}10$  cm; bracts oblong,  $1.5\text{--}4 \times 0.2\text{--}0.5$  cm, variable in size and apically diminishing in size, abaxially densely covered with white large-celled multicellular trichomes especially toward base, margin subentire; bracteoles linear, ca.  $4 \times 1$  mm, puberulent. Calyx 1–1.2 cm, 5-lobed almost to base; lobes unequal with one larger than others, outside puberulent, margin large-celled multicellular pubescent with gland-tipped trichomes. Corolla purplish, curved, 3.5–4 cm, outside densely whitish pubescent when young but glabrescent, inside densely pubescent when young but glabrescent except for trichomes below lobe bases; tube basally cylindric and ca. 3 mm wide for ca. 5 mm then ventricose, bent to ca.  $90^\circ$ , and finally abruptly widened to ca. 1.3 cm at mouth; lobes oblong, ca.  $5 \times 4$  mm, apex emarginate. Stamens 4, included; filaments glabrous, shorter pair 3–4 mm, longer pair 6–7 mm; anther thecae oblong, ca.  $3 \times 1$  mm. Ovary glabrous; style 2.8–3 cm, apical part pilose. Capsule clavate, ca. 1.5 cm, glabrous except for pilose apex, 4-seeded. Seeds ca.  $2 \times 1.5$  mm, lenticular, densely covered with scalelike trichomes; areola ca. 0.3 mm. Fl. May–Sep.

• By streams; 600–2700 m. Chongqing, Hubei, Hunan, Sichuan.

**72. *Strobilanthes oresbia*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 196. 1918.

山马蓝 shān mǎ lán

*Goldfussia grandissima* H. P. Tsui; *Pteracanthus grandissimus* (H. P. Tsui) C. Y. Wu & C. C. Hu; *P. oresbius* (W. W. Smith) C. Y. Wu & C. C. Hu; *Strobilanthes grandissima* (H. P. Tsui) J. R. I. Wood.

Herbs to 2 m tall, erect, nearly isophyllous. Stems 4-angled, densely white pubescent with gland-tipped trichomes, glabrescent. Petiole 2–13 cm, gland-tipped pubescent, glabrescent, apically winged; leaf blade ovate to orbicular, 7–22 × 4–18 cm, pubescent especially along veins, cystoliths abundant on both surfaces, secondary veins 9–11 on each side of midvein, base cuneate, rounded, or sometimes subcordate and decurrent onto petiole, margin deeply dentate or serrate, apex acute to acuminate. Inflorescences axillary, spikes, to 15 cm, secund, sometimes reduced to single flowers; peduncle 0.5–7 cm, densely gland-tipped pubescent; rachis somewhat zigzag; bracts at base of spike leaflike, petiolate, ovate, to 4 × 2 cm, gland-tipped pubescent, base cuneate, margin serrate, apex obtuse; bracts toward spike apex lanceolate, diminishing apically to ca. 10 × 1 mm, margin entire, apex obtuse; bracteoles linear-oblancheolate, ca. 7 × 1 mm, gland-tipped pubescent, apex obtuse. Flowers usually 1 per node, 0.8–2.5 cm apart on rachis. Calyx 1.2–2.1 cm, densely gland-tipped pubescent, 5-lobed almost to base; lobes linear-oblancheolate, apex obtuse; one lobe to 2 mm longer than others. Corolla purplish blue, 4–5 cm, ventricose, outside sparsely white pubescent, inside pubescent; tube basally cylindric and narrow for ca. 5 mm then bent to ca. 90°, strongly ventricose, and widened to ca. 1.5 cm at mouth; lobes oblong, ca. 6 × 5 mm, apex obtuse. Stamens 4; filaments glabrous, shorter pair ca. 2.5 mm, longer pair ca. 4 mm; anther thecae oblong, ca. 2.5 × 1 mm; pollen type 4. Ovary glabrous; style ca. 2.2 cm, shortly pilose. Capsule oblong, ca. 15 × 2–3 mm, glabrous except for very few stalked glands near apex, 4-seeded. Seeds blackish brown, elliptic in outline, 3–3.5 × ca. 2.5 mm, densely pilose; areola very small. Fl. Jul–Sep, fr. Oct–Dec.

Moist alpine meadows and forests; 1600–3300 m. Chongqing, Sichuan, Xizang (Zayü), Yunnan [India, Myanmar].

**73. *Strobilanthes flexa*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 186. 1922.

城口马蓝 cheng kou ma lan

*Pteracanthus flexus* (Benoist) C. Y. Wu & C. C. Hu.

Herbs to 60 cm tall, isophyllous. Stems 4-angled, glabrescent. Petiole 1–5 cm, thinly pubescent; leaf blade ovate to elliptic, 3.5–15 × 3–7 cm, both surfaces glabrous except basally on abaxial midvein, cystoliths apparently absent, secondary veins 6–8 on each side of midvein, base cuneate and decurrent onto petiole, margin coarsely dentate or serrate, apex acute. Inflorescences axillary or terminal, spikes, 3–6 cm, lax, sometimes reduced to a single flower in axil of apical leaves; rachis gland-tipped pilose; bracts leaflike, oblong-oblancheolate, 1.5–2 × 0.2–0.4 cm, apically diminishing in size, gland-tipped pubescent, apex acute to acuminate; bracteoles oblong, 7–8 × ca. 1 mm, gland-tipped pubescent, apex obtuse. Flowers basally to 1 cm apart on rachis but apically becoming congested. Calyx 0.8–1.2 cm, accrescent in fruit, gland-tipped pubescent, 5-lobed almost to base; lobes linear-oblong, 7–10 × ca. 1 mm, subequal, apex obtuse. Corolla purplish blue, 3.5–4 cm, outside pilose,

inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then abruptly inflated, bent to ca. 90° above middle, and finally widened to ca. 1.4 cm at mouth; lobes ovate, ca. 5 × 5 mm, apex rounded. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 4 mm; anther thecae oblong, ca. 2 × 1 mm, erect; pollen type 4. Ovary comose; style ca. 3.2 cm, sparsely pilose. Capsule oblong, 1.5–1.8 cm, apically gland-tipped pubescent, 4-seeded. Fl. Aug–Sep, fr. Oct–Dec.

• Forests; 1400–3600 m. Chongqing, Guizhou, Hubei, Sichuan, Yunnan.

*Strobilanthes flexa* appears to intergrade with *S. versicolor* and may just be a more robust form.

**74. *Strobilanthes versicolor*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 163. 1912.

变色马蓝 bian se ma lan

*Pteracanthus versicolor* (Diels) H. W. Li.

Herbs to 50(–100) cm tall, with several annual stems arising from a perennial base, isophyllous. Stems sparsely to densely pubescent, glabrescent. Petiole (0–)1–3 cm, pubescent; leaf blade obovate to suborbicular, 2.5–6 × 1–3.5 cm, both surfaces thinly pilose especially on veins, densely covered with cystoliths, secondary veins 4–6 on each side of midvein, base broadly cuneate and decurrent onto petiole, margin coarsely serrate, apex acute. Inflorescences terminal or axillary, spikes, 4–15 cm, simple or sparingly branched; bracts leaflike, 1.2–3.5 × 0.3–1 cm, persistent, apically diminishing in size, thinly pilose; basal bracts petiolate, suborbicular to oblong-elliptic, margin dentate; apical bracts sessile, narrowly oblong-elliptic, margin entire; bracteoles linear-oblancheolate, 4–8 × 1–2 mm, pilose. Flower pairs 1–1.5 cm apart on rachis even apically. Calyx ca. 1.5 cm, 5-lobed almost to base; lobes linear, 10–11 × ca. 1 mm, subequal, pilose with large-celled trichomes, apex obtuse. Corolla white or blue, 3.5–4 cm, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2.5 mm wide for 1–1.5 cm then abruptly bent to ca. 90° above middle and finally widened to ca. 1.5 cm at mouth; lobes ovate, ca. 6 × 5 mm, apex rounded. Stamens 4, included; filaments pilose, shorter pair ca. 5 mm, longer pair ca. 7 mm; anther thecae oblong, 2–2.5 × ca. 0.8 mm; pollen type 6. Ovary comose; style ca. 2.8 cm, pilose. Capsule ca. 1.4 cm, gland-tipped pubescent, 4-seeded. Seeds ovate in outline, ca. 3 × 3 mm, appressed pubescent. Fl. May–Aug.

• Grasslands at forest margins; 2800–3300 m. Sichuan, S Xizang, Yunnan.

**75. *Strobilanthes forrestii*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 162. 1912.

腺毛马蓝 xian mao ma lan

*Pteracanthus forrestii* (Diels) H. P. Tsui; *P. rotundifolius* (Benoist) Bremekamp; *Strobilanthes panpienkaiensis* H. Léveillé; *S. rotundifolia* Benoist.

Herbs to 30–75 cm tall, isophyllous. Stems 4-angled, thinly pilose with gland-tipped trichomes, glabrescent, basally

woody. Leaves subsessile; leaf blade ovate to rarely ovate-oblong, 2–5 × 1.2–3 cm, both surfaces thinly pilose, adaxially with cystoliths, secondary veins ca. 4 on each side of midvein, base rounded, cordate, or rarely cuneate, margin crenate to subentire, apex acute to obtuse. Inflorescences terminal or very rarely also from apical leaf axils, spikes, 5–15 cm; rachis pilose with gland-tipped trichomes; bracts leaflike, pilose with gland-tipped trichomes; basal bracts ovate-elliptic, 1–3 × 1–2 cm, margin obscurely crenate; apical bracts lanceolate, 7–10 × ca. 3 mm, margin entire; bracteoles linear to narrowly oblong, 6–11 × ca. 1 mm, pilose with gland-tipped trichomes. Flowers 1–2.5 cm apart on rachis. Calyx 0.8–1.2 cm, 5-lobed almost to base; lobes linear with one ca. 2 mm longer than others, pilose with gland-tipped trichomes. Corolla blue to purple, 3.2–4 cm, curved, outside with a few trichomes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 5 mm then bent to ca. 90° and widened to ca. 1.5 cm at mouth; lobes ovate, ca. 6 × 7 mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 2 mm; longer filament pair ca. 8 mm, shortly pubescent; anther thecae oblong, ca. 2 × 0.8 mm; pollen type 3. Ovary gland-tipped puberulent at tip; style ca. 2.8 cm. Capsule oblong, ca. 1.2 cm, apically gland-tipped pilose, 4-seeded. Seeds dark brown, ovate in outline, ca. 3 mm, pubescent; areola white, small. Fl. Jul–Aug.

- Forests, grass slopes; ca. 3000 m. Yunnan.

*Strobilanthes forrestii* was misidentified as *S. extensa* (*Pteracanthus extensus*) by Handel-Mazzetti (Symb. Sin. 7: 895. 1936), C. Y. Wu (Index Fl. Yunnan. 2: 1682. 1984), and H. P. Tsui and C. C. Hu (FRPS 70: 136. 2002; Fl. Yunnan. 16: 696. 2006).

**76. *Strobilanthes lachenensis*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 465. 1884.

白毛马蓝 bai mao ma lan

*Championella xanthantha* (Diels) Bremekamp; *Pteracanthus lachenensis* (C. B. Clarke) Bremekamp; *P. leucotrichus* (Benoist) C. Y. Wu & C. C. Hu; *Strobilanthes leucotricha* Benoist; *S. xanthantha* Diels.

Herbs 30–100 cm tall, isophyllous. Stems erect, basally glabrescent, apically pubescent. Petiole 0.5–3.5 cm, thinly pubescent to glabrescent; leaf blade ovate, obovate, or broadly elliptic, 3–11 × 2–6.5 cm, both surfaces thinly white pubescent especially along veins, secondary veins 5–9 on each side of midvein, base cuneate and often decurrent onto petiole, margin serrate to crenate, apex acute to shortly acuminate. Inflorescences axillary or terminal, spikes, 3–10 cm, often forming a diffuse panicle of spikes; rachis gland-tipped pilose; bracts variable in size and shape; basal bracts leaflike, sessile, ovate, 2–5 × 0.5–2 cm, persistent, margin often toothed; apical bracts oblong to sometimes elliptic, 5–12 × 1–2 mm, persistent until flowers fall; bracteoles linear, 4–5 × ca. 1 mm, white gland-tipped pilose. Flowers basally to 2.5 cm apart on rachis but apically congested. Calyx 0.8–1.6 cm, accrescent in fruit, gland-tipped pilose, 5-lobed almost to base; lobes linear, 7–12 × ca. 1 mm, one longer and becoming spatulate. Corolla blue, 3–3.6 cm, curved, outside pubescent on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm, slightly bent at mouth, and gradually

widened to ca. 1.2 cm at mouth; lobes ovate, ca. 4 × 4 mm. Stamens 4, included; shorter filament pair 2–3 mm, glabrous; longer filament pair 7–8 mm, sparsely pilose; anther thecae oblong, ca. 2 × 1.3 mm, erect; pollen type 3. Ovary comose; style 2.7–3.2 cm, sparsely gland-tipped pilose. Capsule 1.1–1.4 cm, gland-tipped pilose at tip, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, densely appressed pubescent. Fl. Jun–Oct.

Forests; 1800–3400 m. Sichuan, Xizang (Dinggyê), Yunnan [Bhutan, India, Nepal].

*Strobilanthes lachenensis* was incorrectly reported as *Pteracanthus urticifolius* (Kuntze) Bremekamp by H. W. Li (Fl. Xizang. 4: 179. 1985).

**77. *Strobilanthes nemorosa*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 97. 1922.

琴叶马蓝 qin ye ma lan

*Difflugossa muliensis* H. P. Tsui; *Pteracanthus nemorosus* (Benoist) C. Y. Wu & C. C. Hu; *P. panduratus* (Handel-Mazzetti) C. Y. Wu & C. C. Hu; *Strobilanthes pandurata* Handel-Mazzetti.

Herbs to 60 cm tall, much branched, isophyllous. Stems 4-angled, sulcate, pubescent, basally woody. Leaves sessile or with petiole to 1.5 cm; leaf blade lanceolate to oblong-elliptic, occasionally basally pandurate, 5–15(–20) × 1.5–6 cm, both surfaces sparsely pilose but glabrescent, adaxially dark green and densely covered with cystoliths, secondary veins 6–12 on each side of midvein, base rounded to attenuate, margin remotely serrate, apex acuminate. Inflorescences terminal or axillary, spikes, usually several spikes forming a panicle; rachis densely pilose, with gland-tipped trichomes; basal bracts leaflike, ovate-lanceolate, to 6 × 2 cm; apical bracts linear to narrowly oblong-elliptic, 7–12 × 1–3 mm, persistent, pilose with gland-tipped trichomes; bracteoles linear, ca. 5 × 1 mm, pilose with gland-tipped trichomes. Calyx 1–1.5 cm, pilose with gland-tipped trichomes, 5-lobed almost to base; lobes linear with one longer than others, apex obtuse. Corolla blue, 3–3.7 cm, ventricose, outside sparsely pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 5 mm then gradually widened to ca. 1 cm at mouth; lobes oblong, ca. 5 × 4 mm, apex rounded. Stamens 4, included; shorter filament pair ca. 4 mm; longer filament pair ca. 6 mm, base pilose; anther thecae oblong, ca. 2.5 mm; pollen type 3. Ovary comose; style 2.8–3.2 cm, glabrous. Capsule clavate, ca. 1.6 cm, apically gland-tipped pilose, 4-seeded. Seeds ovate in outline, ca. 2.5 × 2 mm, densely appressed pubescent. Fl. Aug.

- *Pinus-Quercus* forests, thickets; 1900–3400 m. Sichuan, Yunnan.

*Strobilanthes nemorosa* is similar to *S. lachenensis*, differing in little more than leaf shape. It may not be a distinct species.

**78. *Strobilanthes extensa*** (Nees) Nees in A. Candolle, Prodr. 11: 191. 1847.

棒果马蓝 bang guo ma lan

*Goldfussia extensa* Nees in Wallich, Pl. Asiat. Rar. 3: 88. 1832; *Pteracanthus claviculatus* (C. B. Clarke ex W. W. Smith) C. Y. Wu ex C. C. Hu; *P. duclouxii* (C. B. Clarke ex Benoist) C.

Y. Wu & C. C. Hu; *P. extensus* (Nees) Bremekamp; *Strobilanthes claviculata* C. B. Clarke ex W. W. Smith; *S. duclouxii* C. B. Clarke ex Benoist.

Subshrubs 0.5–2 m tall, much branched, anisophyllous. Stems erect, glabrous or pilose. Petiole (0–)5–10 mm, narrowly winged, sparsely pubescent; leaf blade ovate, lanceolate, or oblong-lanceolate, 4–15 × 1–5 cm, both surfaces with prominent cystoliths, abaxially subglabrous to pilose, adaxially glabrous or sparsely pilose, secondary veins ca. 5 on each side of midvein, base cuneate, margin remotely serrate, apex acuminate and falcate. Inflorescences axillary or terminal, spikes, to 5 cm, very lax, 2–6-flowered; peduncle and rachis densely hirsute; sterile bracts intergrading with leaves but sessile, ovate to lanceolate, to 6 × 2.5 cm, glabrous or pubescent, base cuneate to cordate; floral bracts ovate to linear, 3–6 × 1.5–4 mm, persistent, gland-tipped pilose; bracteoles oblong to elliptic, ca. 4 × 1–3 mm, gland-tipped pilose. Flowers usually paired, basally to 4 cm apart on rachis but apically closer. Calyx 1–2 cm, strongly accrescent in fruit, gland-tipped pilose, 5-lobed almost to base; lobes oblong-ob lanceolate, one lobe 2–3 mm longer than others, apex spatulate and darker green. Corolla pale whitish purple to violet, 3.2–4 cm, ventricose, outside pubescent only on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.2 mm then gradually widened to ca. 1.5 cm and bent at mouth; lobes orbicular, ca. 5 mm in diam. Stamens 4, included; filaments glabrous, shorter pair 3–4 mm, longer pair 7–8 mm; anther thecae oblong, ca. 2.5 × 1 mm, erect; pollen type 3. Ovary glabrous, apex with numerous sessile glands; style ca. 3.2 cm, sparsely pilose. Capsule clavate, 10–16 × ca. 2 mm, apically thinly gland-tipped pilose, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, pubescent; areola small. Fl. Aug–Oct, fr. Oct–Dec.

Mixed forests; 1900–2200 m. Sichuan, Yunnan [Bhutan, India, ?Nepal].

*Strobilanthes extensa* is very variable in leaf blade, bract, and bracteole shape and in the density of the indumentum.

**79. *Strobilanthes spiciformis*** Y. F. Deng & J. R. I. Wood, J. Trop. Subtrop. Bot. 18: 473. 2010.

黄连山马蓝 huang lian shan ma lan

Subshrubs to 50 cm tall, anisophyllous. Stems to 5 mm in diam., young part sulcate and angled, subglabrous apart from pubescent at nodes, basally woody. Leaves petiolate or apically subsessile; petiole (0.5–)1.3–2.3(–2.5) cm, glabrous; leaf blade ovate, smaller of pair 4–7 × 2–3.5 cm and larger one 9–15 × 3–6 cm, both surfaces glabrous, adaxially with prominent cystoliths, secondary veins 5 or 6 on each side of midvein, base cuneate and decurrent onto petiole, margin serrate, apex acuminate. Inflorescences terminal, spikes, 4–9 cm; rachis 4-angled, gland-tipped pilose; bracts ovate, ca. 8 × 5 mm, deciduous as flowers open, abaxially sparsely gland-tipped pilose, adaxially glabrous, apex rounded; bracteoles absent. Calyx 1–1.6 cm; lobes linear-oblong, 8–16 × 1–2 mm, unequal with one distinctly longer than others, gland-tipped pilose, margin entire and ciliate, apex acute. Corolla color not noted, probably bluish, ca. 2.5 cm, straight, outside pubescent in bud but soon glabrescent, inside glabrous; tube basally cylindric and ca. 2 mm

wide for ca. 1 cm then gradually widened to ca. 8 mm at mouth; lobes orbicular, ca. 3 × 3 mm, apex obtuse. Stamens 4, included; filaments pilose, shorter pair ca. 5 mm, longer pair ca. 2 cm; anther thecae oblong, ca. 2 × 1 mm; pollen type 3. Ovary ca. 2.5 × 0.8 mm, glabrous except for a few gland-tipped pilose trichomes at tip; style ca. 2 cm, glabrous. Capsule oblong, 1.5–2 × 0.3–0.4 cm, glabrous except for a few gland-tipped pilose trichomes at tip and along ribs toward tip, 4-seeded. Seeds ovate to suborbicular in outline, ca. 3 × 3 mm, pilose. Fl. Aug–Oct.

• Moist places in forests; 1200–2400 m. Yunnan.

**80. *Strobilanthes pseudocollina*** K. J. He & D. H. Qin, Acta Phytotax. Sin. 45: 701. 2007.

阳朔马蓝 yang shuo ma lan

Herbs to 50 cm tall, ascending, weakly anisophyllous. Stems terete, lenticellate, glabrous. Petiole 0.5–2.5 cm, sulcate; leaf blade ovate to lanceolate-ovate, 2.5–13 × 1.5–6 cm, smaller of pair 1/2–2/3 size of larger one, glabrous, cystoliths prominent, secondary veins 4–8 on each side of midvein, base obtuse to cuneate, margin subentire to sparsely crenulate, apex acuminate. Inflorescences from terminal leaf axils, spikes, (1–)3–11 cm, 4–16-flowered; bracts subspatulate, 6–10 × 1.5–3 mm, leathery, glabrous, margin ciliate, apex acute; bracteoles lanceolate, ca. 4 × 0.6 mm, margin ciliate. Flower pairs 0.5–1.5 cm apart on rachis. Calyx 0.9–1.1 cm, 5-lobed almost to base; lobes linear, ca. 1 mm wide, unequal, margin ciliate. Corolla purple, ca. 4.5 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1.5 mm wide for ca. 1 cm then gradually widened to ca. 1.5 cm at mouth; lobes suborbicular, 7–8 × 8–9 mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 6 mm, sparsely hirsute; anther thecae oblong, ca. 2.5 × 1 mm, apiculate; connective shortly extended; pollen type 3. Ovary glabrous; style ca. 3 cm, glabrous. Capsule 1–1.5 cm, glabrous. Seeds ovate in outline, ca. 4 × 2 mm, densely pubescent. Fl. Sep–Oct, fr. Oct–Nov.

• Forests on limestone hills; 100–300 m. Guangxi (Yangshuo).

**81. *Strobilanthes longzhouensis*** H. S. Lo & D. Fang, Guihaia 17: 34. 1997.

龙州马蓝 long zhou ma lan

*Perilepta longzhouensis* (H. S. Lo & D. Fang) C. Y. Wu & C. C. Hu.

Shrubs to 2.5 m tall, slightly anisophyllous. Stems basally gray, apically purplish black, glabrous. Petiole 0.5–1.5 cm, glabrous; leaf blade lanceolate-ovate to oblong-elliptic, 3–15.5 × 2.5–6 cm, leathery, glabrous, cystoliths numerous, secondary veins 5–7(–9) on each side of midvein and prominent on both surfaces, base cuneate, margin serrulate to undulate, apex acuminate to acute. Inflorescences axillary, branched spikes, 1.5–5 cm, to 4 per leaf axil, sometimes becoming compound and paniculate; bracts ovate, 3–4 × ca. 2 mm, persistent, abaxially glabrous with numerous cystoliths, margin ciliate, apex acute; bracteoles ca. 6 × 1.2 mm. Flowers 1 sterile per node. Calyx 8–10 mm, with prominent cystoliths, 2-lipped; lower lip 2-lobed, upper lip 3-lobed; lobes lanceolate-triangular, ca. 6 mm, mar-

gins white ciliolate. Corolla pale purple, 3–3.5 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then gradually widened to ca. 1.5 cm at mouth; lobes broadly obovate, ca. 5 mm, apex emarginate. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 7 mm, villous; anther thecae oblong, ca. 2 mm; pollen type 3. Ovary glabrous; style ca. 2 cm, basally villous. Capsule oblong, 1.2–1.4 cm, glabrous, 4-seeded. Seeds ovate in outline, ca.  $2.5 \times 2.5$  mm, densely covered with appressed trichomes. Fl. Sep–Dec, fr. Dec–Feb.

Hilly limestone areas; 200–500 m. Guangxi, Hainan [Vietnam].

**82. *Strobilanthes cystolithigera*** Lindau, Bull. Herb. Boissier 5: 651. 1897.

串花马蓝 chuan hua ma lan

*Pteracanthus botryanthus* (D. Fang & H. S. Lo) C. Y. Wu & C. C. Hu; *Strobilanthes botryantha* D. Fang & H. S. Lo; *S. myriostachya* D. Fang & H. S. Lo.

Subshrubs 1.5–3.5 m tall, isophyllous, drying green. Stems 4-angled, sulcate, glabrous. Petiole 0.5–2 cm, sulcate; leaf blade narrowly elliptic, narrowly ovate, or rarely ovate-elliptic, (2–)4–17  $\times$  1.5–4.5 cm, glabrous, densely covered with linear cystoliths, secondary veins 4–6 on each side of midvein, base cuneate and decurrent onto petiole, margin subentire to irregularly crenate, apex acuminate. Inflorescences axillary, spikes, 2–6(–12) cm, sometimes branched, (2–)8–14-flowered; peduncle 0.5–1.5 cm; bracts elliptic, 4–6  $\times$  3–4 mm, persistent, abaxially with prominent cystoliths and frequently a single black squamate gland, margin ciliolate, apex obtuse to acute; bracteoles ovate-lanceolate, ca. 5  $\times$  1 mm, glabrous except for ciliolate margin, densely covered with cystoliths, apex acute. Flowers in opposite pairs, ca. 0.5 mm apart on rachis. Calyx 8–10 mm, subequally 5-lobed to base; lobes linear-lanceolate, 5–6  $\times$  ca. 1 mm, basally overlapping, glabrous, apex obtuse. Corolla purple, 3–4.5 cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 1 cm then gradually widened to ca. 1.8 cm at mouth; lobes broadly ovate, ca. 6  $\times$  7 mm, apex rounded. Stamens 4, included; filaments pilose, shorter pair ca. 2 mm, longer pair ca. 5 mm; anther thecae oblong, ca. 2  $\times$  1 mm; pollen type 3. Ovary glabrous; style ca. 2.8 cm, hirsute; stigma glabrous. Capsule oblong, ca. 1.7 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 1 cm, pilose; areola small, glabrous. Fl. Sep–Nov, fr. Dec.

Ravines or streamsides on limestone hills; 800–1200 m. Guangxi, Hainan, Yunnan [Vietnam].

**83. *Strobilanthes abbreviata*** Y. F. Deng & J. R. I. Wood, Bot. J. Linn. Soc. 150: 377. 2006.

短尖马蓝 duan jian ma lan

Shrubs to 3 m tall, isophyllous, drying green. Stems terete, ca. 9 mm in diam., sulcate, striate, glabrous; bark dull brown, smooth. Petiole 1–2.5 cm, glabrous; leaf blade oblong-elliptic, 6–25  $\times$  2.5–9 cm, both surfaces glabrous and with numerous small cystoliths, abaxially olive-green, adaxially dark green,

base long attenuate and decurrent onto petiole, margin serrate, apex tapered, long acuminate, and sometimes falcate. Inflorescences axillary, spikes, 2–14 cm, basally rarely with a reduced second spike, usually some forming a 30–50 cm leafless panicle of spikes; peduncle 1–3 mm; rachis glabrous; bracts broadly oblong-obovate, 5–7  $\times$  3–4 mm, concave, rigid, persistent into fruit, abaxially densely covered with cystoliths and dotted with small sessile brownish glands and often with larger sticky gland-tipped patches along midvein, apex abruptly truncate and with a short deciduous mucro; bracteoles lanceolate to oblong-lanceolate, 10–13  $\times$  1–2 mm, slightly shorter than calyx, concave, rather rigid, glabrous or (rarely) scurfy along margin, abaxially densely covered with cystoliths and with scattered sessile glands sometimes becoming stipitate in fruit, apex obtuse. Flowers arranged in opposite pairs, both usually fertile, basally to 1 cm apart on rachis, apically confluent. Calyx 1.2–1.5 cm, slightly accrescent in fruit, subequally 5-lobed to just above base; lobes narrowly lanceolate, 10–14  $\times$  1–2 mm, glabrous except for apical glands that sometimes become stipitate, outside non-glandular except for a few sessile glands near apex, densely covered with cystoliths, apex acute to acuminate. Corolla bluish purple, 4–4.5 cm, sometimes apically bent, outside glabrous; tube basally cylindric and ca. 1.5 mm wide for 7–8 mm then ventricose and widened to ca. 1.5 cm at mouth; lobes ovate, ca. 5  $\times$  5 mm. Stamens 4, included; filaments setose, shorter pair ca. 2 mm, longer pair ca. 4 mm; anther thecae narrowly oblong, ca. 3  $\times$  0.5 mm; pollen type 3. Ovary comose; style ca. 2.5 cm, densely villous. Capsule oblong, 17–18  $\times$  ca. 3 mm, comose with a few trichomes, 4-seeded. Seeds ovate in outline, flattened, densely pilose; areola small, glabrous. Fl. Jun–Oct, fr. Dec–Mar.

Forests by streams; 200–1500 m. Yunnan [Cambodia, India, Myanmar, Thailand, Vietnam].

**84. *Strobilanthes biocullata*** Y. F. Deng & J. R. I. Wood, Novon 20: 406. 2010.

湖南马蓝 hu nan ma lan

Subshrubs 0.8–2 m tall, gregarious, anisophyllous. Stems subterete, bisulcate, glabrous. Petiole 1–5 cm, sulcate, glabrous; leaf blade oblong-elliptic to elliptic, smaller of pair 6–12  $\times$  2–4 cm and larger ones 13–26  $\times$  4–8 cm, both surfaces glabrous and densely covered with cystoliths, secondary veins 5–10 on each side of midvein and prominent on both surfaces, tertiary veins prominent, base narrowly cuneate, margin serrate, apex acuminate. Inflorescences axillary, simple spikes, (3–)7–10 cm, solitary, leafless; rachis glabrous; bracts ovate, 3.5–5  $\times$  2.5–3 mm, glabrous, abaxially with 2 swollen bulges resembling eyes, apex long acuminate to mucronate; bracteoles ovate-oblong, ca. 4  $\times$  2 mm, somewhat fragile and caducous, glabrous, apex acuminate to mucronate. Flowers in opposite pairs, 1–2 cm apart on rachis. Calyx 1–1.2 cm, sparsely pubescent when young, glabrescent, subequally 5-lobed almost to base; lobes yellowish brown, lanceolate, 1-veined, apex long acuminate. Corolla purplish blue, 3.5–4 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for 6–11 mm then bent to ca. 90° and gradually widened to ca. 2 cm at mouth; lobes ovate, ca. 4  $\times$  7 mm, apex emarginate. Stamens 4, included; filaments pilose, shorter pair ca. 3 mm, longer pair ca. 1 cm; anther thecae oblong, ca. 3  $\times$  1.2 mm;

pollen type 3. Ovary ca. 3 mm, glabrous; style ca. 2.8 cm. Capsule clavate, 1.5–2 cm, glabrous, 4-seeded. Seeds ca. 3 × 3 mm, lenticular, densely appressed pubescent; areola small. Fl. Jul–Oct, fr. Nov.

• On rocks by streams; 200–800 m. Guangdong, Guangxi, Hunan.

**85. *Strobilanthes longespicata*** Hayata, Icon. Pl. Formosan. 9: 83. 1920.

长穗马蓝 cháng suǐ mǎ lán

*Semnostachya longespicata* (Hayata) C. F. Hsieh & T. C. Huang.

Shrubs 1.2–2 m tall, much branched, drying green. Branches ± 4-angled, sulcate, glabrous. Petiole 1–3 cm, sulcate, glabrous; leaf blade lanceolate to oblong-oblancoate, 7–20 × 2–6 cm, glabrous, both surfaces with abundant cystoliths, secondary veins 6–10 on each side of midvein, base attenuate, margin remotely serrate, apex acute to shortly acuminate. Inflorescences axillary, spikes, (5–)10–15 cm, simple or less commonly branched; peduncle and rachis pubescent; bracts narrowly ovate to lanceolate, (5–)10–13 × (3–)6–7 mm, glabrous, cystoliths prominent, base truncate, apex acuminate; bracteoles linear-lanceolate, 9–11 × ca. 2 mm, scurfy-pubescent, apex acuminate. Flowers in opposite pairs, basally ca. 1 cm apart on rachis but apically imbricate. Calyx 5-lobed almost to base, accrescent in fruit; lobes linear-lanceolate, 9–15 × 2–3 mm, scurfy-pubescent, prominently 1-veined, margin ciliate, apex acuminate. Corolla pale purple, 4.5–5 cm, straight or slightly bent, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1 cm then gradually widened to 1.5–2 cm at mouth; lobes oblong, ca. 8 × 7 mm, subequal, apex emarginate. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 8 mm; anther thecae oblong, 2–2.5 × ca. 1 mm; pollen type 3. Ovary cylindric-oblong, apically slightly hispid; style filiform, 3–3.2 mm, hispid. Capsule linear, ca. 1.7 cm, glabrous, 4-seeded. Seeds suborbicular in outline, ca. 3 mm in diam., flattened. Fl. Sep–Dec, fr. Feb–May.

• Forests; 200–1000 m. Taiwan.

**86. *Strobilanthes myura*** Benoist, Bull. Mus. Natl. Hist. Nat. 28: 95. 1922.

鼠尾马蓝 shǔ wěi mǎ lán

Shrubs, drying green. Stems subterete, glabrous. Petiole 1–2.5 cm, glabrous; leaf blade ovate to elliptic, to 7–16 × 3–6 cm, glabrous, adaxially with cystoliths, secondary veins 8–11 on each side of midvein, base cuneate, margin crenate-dentate, apex acuminate. Inflorescences axillary, spikes, 5–8 cm; bracts ovate-triangular, 6–9 × ca. 2 mm, glabrous, midvein abaxially lined by cystoliths, margin sparsely ciliate, apex acuminate; bracteoles narrowly ovate, ca. 3.5 × 1 mm, margin sparsely ciliate, apex acuminate. Flowers basally ca. 1.5 cm apart on rachis but apically somewhat confluent. Calyx 5-lobed to base; lobes lanceolate, ca. 7 × 1 mm, equal, margin minutely ciliate, apex acuminate and shortly apiculate. Corolla purple, 2.5–3.4 cm, outside glabrous, inside glabrous except for trichomes retaining

style; tube basally cylindric and narrow for ca. 5 mm then bent and abruptly widened to 1–1.2 cm at mouth; lobes oblong-ovate, ca. 5 × 4 mm. Stamens 4, included; filaments pilose, shorter pair ca. 4 mm, longer pair ca. 6 mm; anther thecae oblong, ca. 2 × 1 mm; pollen type 3. Ovary sparsely pilose; style ca. 2.8 cm, sparsely pilose. Capsule unknown. Fl. Jul.

• Thickets; 600–800 m. Guizhou (Dushan).

**87. *Strobilanthes guangxiensis*** S. Z. Huang, Guihaia 6: 179. 1986.

广西马蓝 guāng xī mǎ lán

*Pteracanthus guangxiensis* (S. Z. Huang) C. Y. Wu & C. Hu.

Herbs to 1 m tall, perennial, anisophyllous. Stems erect or ascending, densely pubescent, soon glabrescent. Petiole 0.3–3.5 cm, densely pubescent; leaf blade elliptic, smaller of pair 4–9 × 2.3–4.5 cm and larger one 9–14(–18) × 3.3–6(–8) cm, abaxially pale green and slightly pubescent, adaxially green, glabrous, and densely covered with prominent ca. 0.5 mm cystoliths, secondary veins 4–8 on each side of midvein, base cuneate, margin entire or slightly undulate, apex acuminate. Inflorescences axillary or terminal, spikes, 4–8 cm; peduncle ca. 4 cm, densely pubescent; rachis densely pubescent, usually with 2–6 nodes; bracts oblong to lanceolate, 10–13 × 2–3 mm, persistent, abaxially pubescent, adaxially glabrous, margin ciliate, apex acuminate to caudate; bracteoles oblong to lanceolate, 11–16 × 2–3 mm, abaxially pubescent, adaxially glabrous, margin ciliate, apex acuminate to caudate. Flowers 0.8–1.2 cm apart on rachis. Calyx ca. 1 cm, 5-lobed almost to base; lobes linear, ca. 9 × 1 mm, equal, outside pubescent, inside glabrous, margin ciliate from middle apically, apex acute. Corolla purple, 3.5–4 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1.2 cm then gradually widened to ca. 1.4 cm at mouth; lobes oblong, ca. 5 × 5 mm, unequal, apex emarginate. Stamens 4, included; filaments glabrous, shorter pair ca. 3 mm, longer pair ca. 6 mm; anther thecae oblong, 2.5–3.5 × ca. 2 mm. Ovary oblong, ca. 3 mm, pilose at tip; style 2.5–3 cm, villous; stigma linear, glabrous. Capsule not seen. Fl. Oct–Dec.

• Shaded valleys; 200–400 m. Guangxi (Liujiang).

This species is used medicinally.

**88. *Strobilanthes compacta*** D. Fang & H. S. Lo, Guihaia 17: 31. 1997.

密苞马蓝 mǐ bāo mǎ lán

Subshrubs to 2 m tall, slightly anisophyllous. Stems 4-angled, glabrous. Petiole 1–3 cm, sulcate, glabrous; leaf blade elliptic to ovate-elliptic, 8.5–15 × 3.5–7 cm, both surfaces glabrous and densely covered with cystoliths, adaxially blackish when dry, secondary veins 8 or 9 on each side of midvein and prominent, base cuneate to attenuate, margin serrate, apex acuminate. Inflorescences axillary, simple spikes, 1.5–8(–10) × ca. 1.2 cm, very dense; basal sterile bracts ovate-oblong, 3–4 × ca. 1 cm, leathery, abruptly narrowed at middle with a long caudate apex; floral bracts ovate, 2–3 × 0.4–0.6 cm, leathery, persistent, abaxially glabrous, margin minutely ciliate or glabrous, apex

long acuminate; bracteoles ovate, ca.  $1 \times 0.5$  cm, glabrous, densely covered with cystoliths, margin minutely ciliolate, apex acuminate. Flowers imbricate on rachis. Calyx 5-lobed almost to base; lobes broadly lanceolate,  $12\text{--}15 \times 3\text{--}4$  mm, subequal, basally overlapping, margin minutely ciliolate but otherwise glabrous, apex acuminate. Corolla purple,  $3.5\text{--}4.8$  cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then slightly ventricose and gradually widened to ca. 1.5 cm at mouth; lobes ovate, ca. 5 mm, apex rounded. Stamens 4, included; filaments pubescent, shorter pair ca. 2.5 mm, longer pair ca. 6 mm; anther thecae oblong, ca.  $3 \times 1$  mm, glabrous. Ovary sparsely hirsute at tip; style ca. 2.5 cm, slightly hirsute at base and glabrous apically. Capsule fusiform, ca. 1.5 cm, somewhat hirsute on apical part, 4-seeded. Seeds ovate in outline, ca.  $3 \times 2$  mm, densely appressed hairy. Fl. Aug–Sep.

• Forests on limestone hills; 200–300 m. Guangdong, Guangxi.

**89. *Strobilanthes heteroclita*** D. Fang & H. S. Lo, Guihaia 17: 32. 1997.

异序马蓝 yi xu ma lan

Herbs or subshrubs, to 1.5 m tall, gregarious, isophyllous. Stems  $\pm$  4-angled, sulcate, glabrous. Petiole to 5 cm; leaf blade broadly ovate, elliptic, broadly elliptic, or suborbicular,  $5.5\text{--}19 \times 2.5\text{--}10$  cm, glabrous, both surfaces densely covered with linear cystoliths, secondary veins 7–10 on each side of midvein and prominent, base rounded to broadly cuneate, margin serrate, apex shortly caudate. Inflorescences axillary from apical axils, spikes, 1.5–5 cm, compact, 1–3 per axil; peduncle 0–1.3 cm; bracts broadly lanceolate,  $11\text{--}12 \times 3\text{--}4$  mm, leathery, persistent, rust-colored scurfy pubescent, abaxially with black sessile glands, glabrescent, apex acuminate; bracteoles lanceolate, 8–9 mm, leathery, rust-colored tomentose, apex acuminate. Calyx 1.2–1.4 cm, 5-lobed almost to base; lobes narrowly lanceolate, with 2 lobes slightly longer than others, apex acuminate. Corolla purple to light blue,  $3.5\text{--}4$  cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1 cm then ventricose and gradually widened to ca. 1.2 cm at mouth; lobes ovate,  $5\text{--}6 \times 5\text{--}6$  mm, apex obtuse. Stamens 4, included; filaments pilose, shorter pair ca. 2 mm, longer pair ca. 7 mm; anther thecae oblong, 2–2.5 mm. Ovary sparsely hirsute at tip; style ca. 1.7 cm; stigma hirsute. Capsule fusiform, 1.5–2 cm, pilose at tip, 4-seeded. Seeds ovate in outline, ca.  $3 \times 3$  mm, appressed pubescent. Fl. Jul–Sep, fr. Nov.

• Forests on limestone hills; 100–500 m. Guangxi (Long'an).

**90. *Strobilanthes mucronatoproducta*** Lindau, Bull. Herb. Boissier 5: 650. 1897.

尾苞马蓝 wei bao ma lan

Shrubs to 1.5 m tall, weakly anisophyllous, drying blackish. Stems  $\pm$  4-angled, glabrescent. Petiole 0.5–3 cm, scurfy pubescent; leaf blade ovate, elliptic, or oblong-elliptic,  $8.5\text{--}15 \times 3.5\text{--}7$  cm, abaxially puberulent along veins, adaxially glabrous, both surfaces densely covered with cystoliths, secondary veins 8 or 9 on each side of midvein, base cuneate to attenuate, margin dentate, serrulate, or subentire, apex acuminate. In-

florescences terminal and from apical leaf axils, simple spikes, 4–9 cm, solitary; peduncle 0.3–1 cm, rust-colored pubescent; bracts lanceolate, ca.  $2.4 \times 0.6$  cm, persistent, rust-colored pilose, apex acuminate; bracteoles lanceolate, ca.  $5 \times 4$  mm, rust-colored pilose, apex long acuminate and aristate. Flowers imbricate on rachis. Calyx 1.7–1.8 cm, 5-lobed almost to base; lobes lanceolate,  $16\text{--}17 \times$  ca. 2 mm, subequal, rust-colored pilose, apex acuminate. Corolla purple,  $3.5\text{--}4$  cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1 mm then gradually widened to ca. 1.3 cm at mouth; lobes ovate, ca.  $7 \times 7$  mm, apex obtuse. Stamens 4, included; filaments sparsely pubescent, shorter pair ca. 2 mm, longer pair ca. 4 mm; anther thecae oblong, ca.  $2 \times 1.3$  mm; pollen type 3. Ovary pilose; style ca. 2.7 cm; stigma ca. 3 mm, pubescent. Capsule fusiform, 2–2.2 cm, pilose, 4-seeded. Seeds ovate in outline, ca.  $4 \times 3.5$  mm, appressed pubescent. Fl. Sep–Oct, fr. Dec.

Forests on mountain slopes; 400–700 m. Guangxi, Yunnan [Vietnam].

**91. *Strobilanthes fimbriata*** Nees in Wallich, Pl. Asiat. Rar. 3: 85. 1832.

流苏马蓝 liu su ma lan

*Endopogon macrostegius* Nees; *Strobilanthes fimbriata* var. *majuscula* W. W. Smith; *S. macrostegia* (Nees) C. B. Clarke; *S. neesii* Kurz.

Shrubs 0.6–1.5 m tall, drying blackish green. Branches terete, apically thinly brown pubescent, glabrescent. Petiole 0.5–2.5 cm; leaf blade oblong-elliptic to elliptic, to  $18 \times 7$  cm, both surfaces with cystoliths, abaxially glabrous except for brown scurfy pubescence along veins, adaxially glabrous, secondary veins 8–12 on each side of midvein, base cuneate, margin subentire, apex acuminate. Inflorescences axillary, spikes, 3–6 cm, with 6–8 flower pairs; peduncle 0–0.3 cm, glabrous; bracts obovate, ca.  $13 \times 5$  mm, both surfaces densely covered with cystoliths, apical margin ciliate with rigid brown trichomes, apex abruptly narrowed to a mucro; bracteoles oblanceolate, ca.  $1 \times 3$  mm, abaxially apically fulvous pubescent, margin with a distinct shoulder, apex cuspidate. Flowers imbricate on rachis. Calyx 1–1.3 cm at anthesis, accrescent to ca. 2 cm; lobes linear-lanceolate; to  $18 \times 1$  mm, apex long acuminate. Corolla violet, ca. 4.5 cm, outside and inside glabrous except for trichomes retaining style; tube basally cylindric for ca. 8 mm then abruptly widened to 1.5–1.8 cm at mouth; lobes broadly ovate, ca.  $6 \times 7$  mm, apex rounded. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 7 mm, pilose; anther thecae oblong, ca.  $3 \times 1.5$  mm, erect; pollen type 3. Ovary glabrous except for densely comose tip; style ca. 4 cm, pilose. Capsule oblong, 1–2 cm, comose, 4-seeded. Seeds ovate in outline, ca.  $4 \times 3$  mm, densely appressed pilose. Fl. May.

Moist places in forests; ca. 1000 m. Xizang (Médog) [Bangladesh, India, Myanmar].

**92. *Strobilanthes brunnescens*** Benoist, Bull. Mus. Natl. Hist. Nat. 27: 544. 1921.

折苞马蓝 zhe bao ma lan

*Perilepta refracta* (D. Fang, Y. G. Wei & J. Murata) C. Y. Wu & C. C. Hu; *Strobilanthes refracta* D. Fang, Y. G. Wei & J. Murata.

Subshrubs 1–2 m tall, anisophyllous, drying blackish. Stems 4-angled, sulcate, brownish puberulent. Petiole 0.2–2.5 cm, brownish puberulent; leaf blade ovate to rarely obovate-elliptic, (2–)4.5–21 × (1–)2.5–9.5 cm, both surfaces densely covered with cystoliths, abaxially puberulent along veins, adaxially glabrous, secondary veins 4–12 on each side of midvein, base cuneate, margin subentire to crenulate, apex shortly acuminate. Inflorescences axillary, spikes, 1.5–3 cm; bracts oblong-obovate with a broad base, ca. 11 × 4–5 mm, concave, rigid, abaxially pubescent and with marginal cilia of rigid brown trichomes, apex acute and becoming reflexed; bracteoles linear, 10–12 × ca. 1 mm, apically brownish pubescent, apex often reflexed. Flowers imbricate on rachis. Calyx 1.2–1.5 cm, subequally 5-lobed; lobes lanceolate, ca. 10 × 1 mm, pubescent with rigid trichomes, apex acuminate. Corolla purple, ca. 4 cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 1 cm then gradually widened to ca. 2 cm at mouth; lobes ovate, ca. 5 mm, apex emarginate. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 7 mm, pilose; anther thecae oblong, 3–3.5 mm. Ovary hirsute at tip; style ca. 2.7 cm, pilose; stigma obconical. Capsule not seen. Fl. Dec.

Forests in valleys; 300–500 m. Guangxi, Yunnan [Vietnam].

**93. *Strobilanthes nobilis*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 471. 1884.

沙坝马蓝 sha ba ma lan

*Strobilanthes petelotii* Benoist.

Herbs 50–100 cm tall, perennial, isophyllous, drying blackish. Stems ± 4-angled, sulcate, reddish brown pubescent, apically with distinctive scattered wartlike excrescences. Petiole 1–1.5 cm or leaves sessile; leaf blade ovate-lanceolate to oblong-elliptic, sometimes pandurate, 7–17(–25) × 3.5–8 cm, glabrous or thinly pilose especially on abaxial veins, margin, and adaxial surface, abaxially paler, adaxially with cystoliths, secondary veins 6 or 7 on each side of midvein and somewhat parallel, base cuneate to rounded and auriculate, margin crenate, apex shortly acuminate. Inflorescences axillary or terminal, simple or basally branched spikes, 5–20 cm, often forming a panicle when mature; rachis reddish brown puberulent, apically becoming very slender; bracts lanceolate, 1.5–2 × 0.2–0.4 cm, persistent, glabrous except for ciliolate margin, occasionally developing stipitate glands when mature, 1-veined, apex long acuminate; bracteoles similar to bracts but narrowly linear-lanceolate, ca. 18 × 1 mm. Flowers 1–1.5 cm apart on rachis and apically not very confluent. Calyx 1–2.2 cm, accrescent in fruit, 5-lobed almost to base; lobes linear, 14–20 × ca. 1 mm, equal, occasionally developing stipitate glands when mature, margin ciliolate, apex finely acuminate. Corolla blue, ca. 3 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2.5 mm wide for ca. 7 mm then strongly bent and abruptly widened to 1–1.4 cm at mouth; lobes ovate, ca. 4 × 4 mm, apex emarginate. Stamens 4, included; shorter filament pair 2–3 mm, glabrous; longer filament pair ca.

7 mm, basally pilose; anther thecae oblong, ca. 3 × 1.2 mm; pollen type 3. Ovary glabrous, with 2 ovules per locule; style ca. 2.5 cm, pilose. Capsule 1.2–2.2 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, densely appressed pubescent; areola small. Fl. Sep–Nov, fr. Mar.

Streamsides, forests; 1100–1800 m. Yunnan [India, Myanmar, Vietnam].

**94. *Strobilanthes polyneuros*** C. B. Clarke ex W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 198. 1918.

多脉马蓝 duo mai ma lan

Shrubs to 2 m tall, isophyllous. Stems 4-angled, sulcate, glabrous. Petiole 1–5 cm, sulcate, subglabrous; leaf blade elliptic to broadly lanceolate, 13–30 × 5–11 cm, glabrous, abaxially paler, adaxially with numerous cystoliths, secondary veins 12–20 on each side of midvein and parallel, base cuneate, margin serrate, apex acuminate. Inflorescences axillary, spikes, 2–8 cm, composed of 1–5 simple dense spikes arising at apex of peduncle forming a dense cluster of spikes; peduncle ca. 1 cm, puberulent and sometimes with warty excrescences; sterile bracts ovate at base of spike, ca. 1 × 0.5 cm; floral bracts lanceolate, 1.5–3 × 0.3–0.4 cm, abaxially minutely puberulent, apex finely acuminate and slightly incurved; bracteoles linear-lanceolate, ca. 2 cm, minutely puberulent, apex acuminate. Flowers imbricate on rachis. Calyx 1.7–2.3 cm, somewhat accrescent and sometimes becoming gland-tipped pilose at maturity, 5-lobed almost to base; lobes linear-lanceolate, thinly puberulent, apex finely acuminate. Corolla purple, 3.5–4 cm, straight, outside sparsely pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1.4 cm then gradually widened to ca. 1.4 cm at mouth; lobes orbicular, ca. 6 mm in diam. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 5 mm; anther thecae oblong, ca. 3.5 × 1 mm; pollen type 3. Ovary sparsely gland-tipped pilose at tip; style ca. 3.5 cm, pilose. Capsule ca. 20 × 3 mm, glabrous or with a very few apical trichomes, 4-seeded. Seeds ovate in outline, 3–5 × 2–4 mm, densely appressed pubescent. Fl. Oct–Jan, fr. Mar.

Forests; 200–1600 m. Yunnan [Myanmar, Thailand, Vietnam].

**95. *Strobilanthes bipartita*** Terao ex J. R. I. Wood, Kew Bull. 58: 122. 2003.

双萼马蓝 shuang e ma lan

Subshrubs 50–100 cm tall, isophyllous. Stems terete, glabrous. Petiole 0.7–1.5 cm, sparsely brown pilose; leaf blade elliptic, 6–22 × 3.5–10 cm, hirsute especially along veins, abaxially cystoliths prominent, secondary veins 12–16 on each side of midvein, base cuneate, margin remotely serrate, apex acute. Inflorescences axillary or terminal, abbreviated to headlike spikes, ca. 2 cm; peduncle 2–4 mm, brown pubescent; bracts ovate, 3–3.5 × 1.2–1.7 cm, glabrous except for ciliate margin, margin entire or apically serrate, apex acute; bracteoles oblong-lanceolate, ca. 15 × 3 mm, glabrous. Calyx with appressed silky trichomes on both surfaces, 2-lipped; lower lip ca. 1.2 cm, 2-lobed, lobes triangular and ca. 1.5 × 1.5 mm; upper lip ca. 1.3 cm, 3-dentate to ca. 1 mm. Corolla purplish blue, ca. 4 cm, ventricose, outside glabrous, inside glabrous except for trichomes

retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.2 cm then gradually widened to ca. 1.4 cm at mouth; lobes ovate, ca.  $5 \times 7$  mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 2 mm, glabrous; longer filament pair ca. 4.5 mm, sparsely pilose; anther thecae oblong, ca.  $3 \times 1$  mm. Ovary glabrous; style ca. 3.2 cm, pilose. Capsule not seen. Fl. Dec.

Thickets on limestone hills; 300–900 m. Yunnan (Jinghong) [Laos].

**96. *Strobilanthes retusa*** D. Fang, Acta Phytotax. Sin. 38: 187. 2000.

凹苞马蓝 ao bao ma lan

*Perilepta retusa* (D. Fang) C. Y. Wu & C. C. Hu.

Herbs to 80 cm tall, branched, anisophyllous. Stems black when dry, 4-angled, glabrous, winged between nodes, wing 0.5–2 mm wide. Leaves sessile; leaf blade elliptic, rhombic-elliptic, obovate, or ovate, 6.5–20.5  $\times$  4–8.5 cm, abaxially glabrous except sparsely pilose along veins, adaxially pubescent and densely covered with cystoliths, secondary veins 5–9 on each side of midvein and prominent on both surfaces, basally attenuate to rarely broadly cuneate, base auriculate, amplexicaul, and decurrent onto petiole, margin crenate, apex acute to acuminate. Inflorescences axillary or terminal, subcapitate, 2.5–3.5  $\times$  2–2.5 cm, elongating after flowering; peduncle 1–4 cm; bracts ovate, ca. 2.2  $\times$  1.5 cm, abaxially puberulent, base cordate, margin deeply crenate, apex acute; bracteoles elliptic, 1.4–1.6  $\times$  ca. 0.7 cm, margin undulate, apex obtuse to emarginate. Calyx ca. 1.2 cm, accrescent to ca. 1.8 cm in fruit, subequally 5-lobed; lobes oblanceolate, puberulent, lower 2 ca. 9.5 mm and connate at base, upper 3 ca. 1.2 cm and extremely shortly connate. Corolla white with purplish stripes on upper lobes, ca. 4 cm, slightly curved, outside glabrous; tube basally cylindric and narrow for ca. 1 cm then gradually widened to ca. 2 cm at mouth; lobes oblong, ca.  $5 \times 5$  mm, apex subrounded. Stamens 4, included; filaments pilose, shorter pair ca. 2.5 mm and basally sparsely pilose, longer pair ca. 5 mm; anther thecae oblong, 3–4 mm. Ovary glabrous; style ca. 2.5 cm, pubescent; stigma unequally 2-lobed. Capsule ellipsoid, ca. 1.8 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 2.5  $\times$  2.5 mm, densely appressed pilose. Fl. Jul.

• Moist places by streams; 500–600 m. Guangxi (Huanjiang).

**97. *Strobilanthes cruciata*** (Bremekamp) Terao, Acta Phytotax. Geobot. 31: 59. 1980.

四苞马蓝 si bao ma lan

*Tetragoga cruciata* Bremekamp, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Sect. 2, 41(1): 300. 1944; *T. nagensis* Bremekamp.

Subshrubs 1–2 m tall, anisophyllous. Stems 4-angled, sulcate, rust-colored hirsute or glabrous. Petiole 1–1.5 cm, pubescent; leaf blade ovate to ovate-lanceolate, 4–13  $\times$  1.5–5.5 cm, smaller of pair ca. 1/3 size of larger one, abaxially pale white tomentose especially along midvein, adaxially sparsely tomentose and brownish green when dry, secondary veins 7–9 on each side of midvein, base cuneate, margin serrate and ciliate,

apex acuminate. Inflorescences axillary or terminal, subcapitate; peduncle 0–2.5 cm, gland-tipped pilose; outer bracts leaf-like, petiolar base forming a rigid involucre around capitulum, 1–2  $\times$  0.5–1 cm, outside densely brownish gland-tipped pilose to subglabrous, inside glabrous, apical laminar portion ovate, 2–4  $\times$  2–3 cm, and erect; inner bracts linear-pandurate, 12–16  $\times$  3–5 mm, abaxially pilose and apically gland-tipped pubescent, adaxially glabrous, margin entire, apex acute; bracteoles narrowly linear, ca. 13  $\times$  1 mm. Calyx ca. 1.1 cm, outside pilose except glabrous toward base, inside apically silky villous, margin apically ciliate. Corolla white, ca. 2.5 cm, curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 1 mm then ventricose and gradually widened to ca. 1.2 cm at mouth; lobes ovate, ca. 4  $\times$  4 mm, apex obtuse. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 6 mm, hirsute; anther thecae oblong, ca.  $3 \times 1$  mm, erect, apiculate; connective shortly excurrent; pollen type 1. Ovary oblong, glabrous; style ca. 2.2 cm, gland-tipped pilose. Capsule fusiform, ca. 1.5 cm, glabrous, 4-seeded. Seeds brown, ovate in outline, ca. 4  $\times$  3 mm, densely appressed pubescent; areola small. Fl. Dec–Jul.

Dense moist mixed forests; 800–1500 m. Hainan, Xizang (Mêdog), Yunnan [India, Indonesia, Myanmar, Thailand].

*Strobilanthes cruciata* is a very distinct species with unique inflorescence structure and unusual pollen combined with the calyx sericeous inside.

**98. *Strobilanthes simonsii*** T. Anderson, J. Linn. Soc., Bot. 9: 474. 1867.

西蒙马蓝 xi meng ma lan

Subshrubs to 1 m tall, anisophyllous. Stems and branches 4-angled, sulcate, tomentose. Petiole 2–10 mm, sulcate, tomentose; leaf blade ovate-elliptic, smaller one 1.2–4  $\times$  0.6–1.4 cm and larger one 3.5–18  $\times$  1.6–6.5 cm, both surfaces tomentose, secondary veins 5–7 on each side of midvein, base cuneate and oblique, margin crenulate-serrate, apex acuminate and falcate. Inflorescences axillary, capitate, few flowered; peduncle 0.2–1 cm, pubescent; bracts variable in size and shape; outermost bracts leaflike, pandurate with a constricted middle and broad petiolar base, 3–4  $\times$  ca. 0.5 cm; inner bracts lanceolate, 13–20  $\times$  ca. 3 mm, abaxially tomentose, apex acute; bracteoles linear, ca. 2  $\times$  0.3 cm, abaxially apically pubescent. Calyx ca. 1.4 cm, subequally 5-lobed almost to base; lobes linear, outside apically pilose, apex acute. Corolla white, ca. 4 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2.5 mm wide for ca. 8 mm then gradually widened to ca. 1.8 cm at mouth; lobes oblong, ca. 6  $\times$  5 mm, apex rounded. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 1 cm, hirsute; anther thecae oblong, ca. 2  $\times$  1 mm, base divaricate, apex apiculate; connective shortly excurrent. Ovary glabrous; style ca. 3.2 cm, hirsute. Capsule clavate, 1.8–2 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3  $\times$  2 mm, densely pubescent. Fl. Mar–Aug.

Forests; 1300–1700 m. Xizang (Mêdog) [Bhutan, India].

**99. *Strobilanthes echinata*** Nees in Wallich, Pl. Asiat. Rar. 3: 85. 1832.

长苞马蓝 chang bao ma lan

*Goldfussia echinata* (Nees) N. P. Balakrishnan; *Strobilanthes jugorum* Benoist; *Tetraglochidium jugorum* (Benoist) Bremekamp.

Herbs to 2 m tall, anisophyllous. Stems subterete to 4-angled, sulcate, pubescent with brownish trichomes or glabrescent. Leaves petiolate but apicalmost ones subsessile; petiole 0.5–4 cm, flat, slightly winged, pubescent or glabrous; leaf blade ovate, elliptic, or ovate-lanceolate, 4–20 × 1.5–7.5 cm, smaller of pair ca. 1/2 size of larger one, both surfaces pilose to subglabrous and with cystoliths, abaxially pale green, adaxially green; secondary veins 7–11 on each side of midvein, base cuneate and decurrent onto petiole, margin crenate-serrate, apex acuminate. Inflorescences capitate, 4–8-flowered, enveloped by bracts; peduncle short, usually simple; outer sterile bracts sessile, ovate, ovate-oblong, or oblong-ovate, 3–5 × 2–2.5 cm, equal or unequal, persistent, margin dentate, apex obtuse, rounded, or fimbriate; inner bracts fertile, obovate to spatulate, 2–3 × 0.7–0.8 cm, margin ciliate; bracteoles linear to oblanceolate, 13–23 × 1.5–3 mm, pubescent or glabrous, margin entire or sometimes dentate or fimbriate toward apex, apex acuminate. Calyx 1.5–2 cm, pubescent, 5-lobed almost to base; lobes linear, 12–19 × 1–2 mm, subequal, outside apically pubescent. Corolla violet, 4.5–5.5 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.5 mm then ventricose and widened to ca. 1.5 cm at mouth; lobes ovate, 8–9 × 8–10 mm, apex rounded. Fertile stamens 4, included; shorter filament pair 3–5 mm, glabrous; longer filament pair 5–7 mm, pilose; anther thecae oblong, 2–3 × ca. 2 mm, apex apiculate; connective excurrent; staminode occasionally present, small or inconspicuous; pollen type 3. Ovary glabrous; style ca. 2.5 cm, hirsute. Capsule fusiform, 1.2–1.8 cm, glabrous, 4-seeded. Seeds brown, ovate in outline, 3–5 × 2.5–4 mm, pilose; areola small. Fl. May–Sep.

Moist forests; 100–2200 m. Guangdong, Guangxi, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

*Strobilanthes echinata* has been misidentified in the recent literature as *Tetraglochidium gigantodes* (Lindau) C. Y. Wu & C. C. Hu (*Strobilanthes gigantodes* Lindau) by D. Fang et al. (Guihaia 17: 38, 1997), C. C. Hu (FRPS 70: 157, 2002), and C. C. Hu and X. P. Fu (Higher Pl. China 10: 373, 2004).

**100. *Strobilanthes cuneata*** (Shakya) J. R. I. Wood, Edinburgh J. Bot. 51: 218. 1994.

楔叶马蓝 xie ye ma lan

*Dossifluga cuneata* Shakya, J. Jap. Bot. 50: 99. 1975.

Herbs to 30 cm tall, isophyllous. Stems 4-angled, glabrous. Petiole ca. 5 mm; leaf blade obovate to broadly elliptic, 4.5–7 × 2–3.5 cm, abaxially sparsely pilose along veins, adaxially glabrous and densely covered with cystoliths, secondary veins 6 or 7 on each side of midvein, base narrowly cuneate, margin serrate and ciliate, apex acuminate. Inflorescences axillary, subsessile clusters; bracts leaflike, obovate, 6–12 × 6–8 mm, cystoliths

prominent, margin dentate; bracteoles linear-oblanceolate, 2–4 mm. Calyx 1.2–1.5 cm, 5-lobed almost to base; lobes linear-lanceolate, 1–1.5 mm wide, subequal, margin ciliate. Corolla blue, campanulate, 3–4 cm, outside glabrous except for cilia along veins, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.2 cm then gradually widened to ca. 1.4 cm at mouth; lobes orbicular, ca. 8 mm in diam. Stamens 4, included; filaments glabrous; shorter filament pair ca. 3 mm, equal, incurved; longer filament pair ca. 8 mm, unequal, incurved; anther thecae spherical, ca. 1.2 mm in diam., nodding; pollen type 3. Ovary glabrous; style 2.8–3.2 cm. Capsule obovoid, ca. 10 × 3 mm, glabrous, 4-seeded. Seeds suborbicular in outline, ca. 1.5 mm, long pilose; areole large. Fl. Aug.

Forests; ca. 2500 m. Xizang (Nyalam) [Nepal].

**101. *Strobilanthes glomerata*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 475. 1867.

球序马蓝 qiu xu ma lan

*Goldfussia glomerata* Nees in Wallich, Pl. Asiat. Rar. 3: 88. 1832.

Subshrubs to 1 m tall, strongly anisophyllous. Stems and branches 4-angled to subterete, setose. Petiole 0.6–3 cm, densely pubescent; leaf blade elliptic, broadly elliptic, or narrowly ovate, 5.5–19 × 2.7–10 cm, smaller of pair ca. 1/5 size of larger one, both surfaces densely pubescent with purplish trichomes, secondary veins 5–7 on each side of midvein, base oblique, rounded, and decurrent onto petiole, margin serrate with shallow widely spaced teeth and ciliate with red multicellular trichomes, apex acuminate. Inflorescences capitate; bracts variable in size and shape; outer bracts sterile, lanceolate, ca. 3 × 0.6 cm, densely pubescent with purplish trichomes, margin serrate; inner bracts lanceolate, ca. 1.6 × 0.4 cm, margin entire and ciliate, apex acuminate; bracteoles lanceolate, 8–12 × ca. 2 mm, pubescent. Calyx ca. 1.5 cm, 5-lobed almost to base; lobes 10–13 × ca. 1.5 mm, slightly unequal, outside pubescent with purplish trichomes especially apically, inside glabrous. Corolla purple, 4–6 cm, subventricose, outside pubescent with gland-tipped trichomes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for 0.6–1.6 cm then bent to ca. 90° and gradually widened to ca. 1.7 cm at mouth; lobes ovate, ca. 4 × 7 mm, apex retuse. Stamens 4, included; filaments glabrous, shorter pair ca. 1.5 mm, longer pair 7–9 mm and unequal; anther thecae obliquely ellipsoid, ca. 1.5 mm; pollen type 3. Ovary glabrous; style ca. 3 cm, glabrous. Capsule fusiform, ca. 12 × 3 mm, glabrous, 4-seeded. Seeds ovate in outline, ca. 2 × 2 mm, densely pubescent; areola small. Fl. Aug–Oct.

Forests; 1000–1500 m. Xizang (Cona) [India].

*Strobilanthes glomerata* is introduced in Indonesia.

**102. *Strobilanthes capitata*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 475. 1867.

头花马蓝 tou hua ma lan

*Goldfussia capitata* Nees in Wallich, Pl. Asiat. Rar. 3: 88. 1832.

Subshrubs or perennial herbs, to 1 m tall, much branched, anisophyllous. Stems decumbent to ascending, pilose, glabrescent. Petiole 1–3 cm; leaf blade lanceolate, elliptic-ovate, or elliptic, 4–14 × 1.5–9 cm, abaxially pubescent along veins but often glabrescent, adaxially sparsely pilose and with numerous cystoliths, secondary veins 6 or 7 on each side of midvein, base attenuate and oblique, margin serrate, apex acuminate. Inflorescences axillary, pedunculate heads, ovoid to ellipsoid, 1.5–2 × 1–3 cm, 1–3 per axil, sometimes forming a panicle of heads with reduced leaves; peduncle 1–6 cm, glabrous or pubescent, simple or branched, sometimes with a sterile bract at branching point; outer floral bracts sterile, ovate, 1.5–2.3 cm, not overtopping capitula, concave, deciduous as flowers open, pubescent or glabrous, margin crenate, apex obtuse, acute, or acuminate; inner bracts oblong-elliptic, 1.3–1.6 cm, margin entire or with 1 or 2 teeth; bracteoles oblong-elliptic, 7–11 mm, caducous, pilose. Calyx pale green, ca. 1.2 cm, accrescent to ca. 2 cm in fruit, 5-lobed almost to base; lobes linear-oblongate, equal, outside pubescent, margin ciliate. Corolla blue, 4.3–5.5 cm, straight, outside thinly pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 1.5 cm then gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 5 × 4 mm. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm and nodding, longer pair 7–8 mm and unequal; anther thecae spherical, ca. 1.2 mm in diam., incurved; pollen type 3. Ovary gland-tipped pilose; style ca. 3.5 cm, thinly pilose. Capsule oblong, 1.4–2 cm, apical half gland-tipped pilose, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, pubescent; areola small. Fl. Sep–Feb.

Forests; 900–1700 m. Xizang (Mainling, Nyalam) [Bhutan, India, Myanmar, Nepal].

**103. *Strobilanthes speciosa* Blume, Bijdr. 799. 1826.**

美丽马蓝 mei li ma lan

*Baphicacanthus multibractealatus* Hung T. Chang & H. Zhu; *Goldfussia speciosa* (Blume) Bremekamp.

Subshrubs or herbs, to 1.2 m tall, perennial, anisophyllous. Stems ascending, apically pubescent. Petiole 0.5–2 cm, hirsute; leaf blade of smaller pair ovate to suborbicular and ca. 3 × 1.6 cm and of larger pair ovate and 12.5–16.5 × 6–8 cm, both surfaces hirsute, adaxially with numerous prominent linear cystoliths, secondary veins 7–9 on each side of midvein, base oblique and decurrent onto petiole, margin irregularly crenate-dentate, apex acute to caudate. Inflorescences axillary, heads, narrowly ovoid, 1–2.5 × 1–1.5 cm, borne on simple or 3-furcate branches; peduncle 1–3 cm, simple or branched and sometimes with a sterile bract at branching point, hirsute; sterile bracts resembling small leaves; floral bracts lanceolate, 1.2–2.3 × 0.7–1 cm, overtopping capitula, abaxially brownish pubescent with gland-tipped trichomes, margin entire and ciliate, apex acuminate and falcate; bracteoles oblanceolate, 7–13 × ca. 2 mm, abaxially pilose, margin ciliate. Calyx outside hirsute, 5-lobed almost to base; lobes oblanceolate, 7–15 × ca. 0.2 mm, subequal, margin ciliate, apex acute. Corolla purplish blue, 3.5–5 cm, ventricose, outside gland-tipped pilose, inside glabrous; tube basally cylindric and ca. 2.5 mm wide for ca. 1 cm then gradually widened to ca. 1.5 cm at mouth; lobes ca. 5 × 4 mm,

apex rounded. Stamens 4, included; filaments glabrous, shorter pair 1–2 mm and nodding, longer pair 4–6 mm; anther thecae spherical, ca. 1.2 mm in diam., incurved; pollen type 3. Ovary comose; style ca. 3.7 cm; stigma unequally 2-lobed. Capsule fusiform, 1.5–1.8 × ca. 0.4 cm, apically with a few gland-tipped trichomes, 4-seeded. Seeds brown, ovate in outline, ca. 3 × 2.5 mm, appressed pilose. Fl. Sep–Dec, fr. Jan.

Forests; 500–1800 m. Yunnan [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam].

This species intergrades with *Strobilanthes capitata*, from which it differs in little more than the narrower heads overtopped by the floral bracts and may not be distinct.

*Strobilanthes speciosa* has been misidentified as *Goldfussia glomerata* Nees by C. C. Hu (FRPS 70: 164. 2002).

**104. *Strobilanthes kingdonii* J. R. I. Wood, Edinburgh J. Bot. 51: 244. 1994.**

合页草 he ye cao

Subshrubs 0.5–3 m tall, branched, slightly anisophyllous. Stems 4-angled, bifariously pilose, apically glabrescent. Petiole 0.5–2 cm, pubescent; leaf blade ovate, 5–12 × 1.5–5 cm, both surfaces pubescent, abaxially slightly paler, secondary veins 5–8 on each side of midvein, base long attenuate, margin crenate to serrate, apex acute to acuminate and slightly falcate. Inflorescences axillary, dense headlike spikes, borne on a short usually simple or (2 or) 3-furcate peduncle; peduncle 1–3 cm, pilose; rachis sparsely pilose; outer sterile bracts leaflike, lanceolate to narrowly oblong-elliptic, 1.3–2.7 × 0.3–0.8 cm, pubescent, margin dentate; floral bracts ovate, ovate-elliptic, or subrhomboidal, 7–10 × 2–4 mm, persistent, abaxially ciliate with long non-glandular white trichomes and scattered shorter white trichomes, apex obtuse; bracteoles linear-oblongate, 4–8 × 1.5–2 mm, persistent, margin ciliate with long white trichomes and sometimes stalked glands at apex, apex obtuse to acute. Calyx outside densely pilose with scattered long white trichomes mixed with numerous gland-tipped trichomes, inside glabrous, subequally 5-lobed to base, not accrescent; lobes narrowly oblong to lanceolate, 7–9 × ca. 1.5 mm, apex acute. Corolla purple, blue, or rose, 3.5–4.2 cm, straight, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and 1.5–2 mm wide for ca. 8 mm then ventricose and widened to ca. 1.2 cm at mouth; lobes broadly ovate, ca. 7 × 6 mm, apex rounded. Stamens 4, included; shorter filament pair 1.5–3.5 mm, glabrous; longer filament pair 6–8 mm, pilose; anther thecae shortly ellipsoid, ca. 1.2 mm, incurved; pollen type 3. Ovary apically gland-tipped pilose; style 1.7–1.9 mm, sparsely pilose. Capsule oblong, ca. 1 cm, gland-tipped pilose, 4-seeded. Seeds ca. 3 × 1.8 mm, pubescent. Fl. Mar, Jul, Nov.

● Evergreen broad-leaved forests by streams; 1500–2800 m. Xizang (Médog, Zayü), Yunnan (Fugong).

*Strobilanthes kingdonii* was mistakenly treated as *Sympagis monadelpha* (Nees) Bremekamp by C. C. Hu (FRPS 70: 176. 2002) and C. C. Hu and X. P. Fu (Higher Pl. China 10: 378. 2004) and also as *Sympagis petiolaris* (Nees) Bremekamp by C. C. Hu (FRPS 70: 178. 2002).

**105. *Strobilanthes lamiifolia*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 476. 1867.

蒙自马蓝 meng zi ma lan

*Goldfussia lamiifolia* Nees in Wallich, Pl. Asiat. Rar. 3: 88. 1832; *G. austinii* (C. B. Clarke ex W. W. Smith) Bremekamp; *G. feddei* (H. Léveillé) E. Hossain; *G. hancockii* (C. B. Clarke ex W. W. Smith) Bremekamp; *G. mahongensis* (H. Léveillé) E. Hossain; *G. rotundifolia* (D. Don) Bremekamp; *Ruellia rotundifolia* D. Don; *Strobilanthes austinii* C. B. Clarke ex W. W. Smith; *S. feddei* H. Léveillé; *S. hancockii* C. B. Clarke ex W. W. Smith; *S. mahongensis* H. Léveillé.

Herbs 30–60 cm tall, erect, much branched, isophyllous. Stems slender, decumbent and often rooting at nodes, bifariously pilose or glabrescent. Petiole 0–3 cm but apically leaves sessile, densely yellowish brown pilose; leaf blade elliptic, ovate, obovate, or ovate-lanceolate, 1–7(–11) × 1–4(–6) cm, abaxially glabrous or pilose, adaxially dark green and glabrous or sparsely pilose, secondary veins 4–7 on each side of midvein, base cuneate and often decurrent onto petiole, margin serrulate to crenulate, apex acute. Inflorescences terminal or axillary from apical leaf axils, spikes, 2–5 cm; peduncle 0–6 cm, pubescent; sterile bracts resembling reduced leaves; floral bracts imbricate, oblong to ovate-elliptic, 1.1–2.5 cm, concave, caducous or somewhat persistent after flowering, dull green, abaxially pubescent and covered with cystoliths, margin usually crenulate; bracteoles narrowly oblong-elliptic, 6–7 × 1–2 mm, scarious and caducous, abaxially puberulent. Calyx 0.8–1.4 cm, outside gland-tipped ciliate, 5-lobed almost to base; lobes linear-oblong with one distinctly longer than others, apex acute. Corolla purplish red to blue, 3.5–5 cm, ventricose, outside pubescent; tube basally cylindric and ca. 2 mm wide for ca. 1.2 cm then slightly curved and gradually widened to ca. 1.2 cm at mouth; lobes orbicular, 5–6 mm in diam. Stamens 4, included; filaments subglabrous, shorter pair ca. 2 mm and strongly reflexed, longer pair ca. 7 mm; anther thecae subspherical, ca. 1.2 mm; pollen type 3. Ovary comose; style 3.2–3.5 cm. Capsule fusiform, ca. 1.2 cm, glabrous except for few trichomes at tip, 4-seeded. Seeds light brown, ovate in outline, ca. 2.5 × 2 mm, densely pubescent; areola small, glabrous. Fl. Aug–Nov.

Dry grasslands and open *Pinus* forests; 1000–2600 m. Guizhou, Sichuan, SE Xizang, Yunnan [Bhutan, India, Nepal].

*Strobilanthes lamiifolia* was misidentified as *S. oligocephala* by Q. H. Chen (Fl. Guizhou. 10: 257. 2004).

**106. *Strobilanthes penstemonoides*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 477. 1867 [*“pentstemonoides”*].

圆苞马蓝 yuan bao ma lan

*Goldfussia penstemonoides* Nees in Wallich, Pl. Asiat. Rar. 3: 88. 1832 [*“pentstemonoides”*]; *G. flexuosa* Nees; *Ruellia capitata* Buchanan-Hamilton ex D. Don.

Herbs to 1 m tall, anisophyllous. Stems 4-angled, sulcate, subglabrous. Leaves subsessile; leaf blade elliptic to elliptic-lanceolate, 4–15 × 1–4 cm, abaxially glabrous but sometimes pubescent along veins, adaxially glabrous, secondary veins 5–7

on each side of midvein, base cuneate, margin serrulate, apex acute. Inflorescences terminal, abbreviated headlike spikes, simple or 3-furcately branched, sometimes with 1 or a few distant flowers; peduncle gland-tipped pilose; bracts orbicular, 6–9 mm in diam., unequal in size, soon scarious and caducous, glabrous; bracteoles absent. Calyx 0.5–1.2 cm, strongly accrescent in fruit, 5-lobed almost to base; lobes linear, unequal with one slightly longer than others, outside gland-tipped pilose. Corolla violet, ca. 3.5 cm, slightly curved, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then gradually widened to ca. 1.2 cm at mouth; lobes ovate, ca. 4 × 4 mm. Stamens 4, included; filaments subglabrous, shorter pair ca. 4 mm and curved, longer pair 7–8 mm; anther thecae spherical, ca. 1.3 mm in diam., incurved; pollen type 3. Ovary pilose at tip; style ca. 2.8 cm, sparsely hirsute. Capsule clavate, ca. 1.2 cm, gland-tipped pubescent, 4-seeded. Seeds suborbicular in outline, ca. 2.5 mm in diam., pubescent. Fl. Aug–Nov, fr. Sep–Dec.

Mountain slopes; 2100–2300 m. SE Xizang, Yunnan [Bhutan, India, Nepal].

**107. *Strobilanthes ningmingensis*** D. Fang & H. S. Lo, Guihaia 17: 39. 1997.

宁明马蓝 ning ming ma lan

*Goldfussia ningmingensis* (D. Fang & H. S. Lo) C. Y. Wu ex C. C. Hu.

Herbs or subshrubs, to 40 cm tall, branched, anisophyllous. Stems 4-angled, sulcate, glabrous except for pubescent nodes. Petiole 3–7 cm; leaf blade ovate-elliptic, smaller of pair 1–1.7 × 0.7–1.2 cm and larger one 3–5.5 × 2–3 cm, both surfaces glabrous, abaxially cystoliths prominent, whitish, and dense along veins, adaxially with prominent linear cystoliths, secondary veins 4–6 on each side of midvein, base subrounded, margin serrulate, apex acute to acuminate. Inflorescences axillary or terminal, headlike simple spikes, 3- or 4-flowered; peduncle ca. 3 cm, apically thickened; bracts elliptic, 6–12 mm, caducous, abaxially densely covered with cystoliths, margin ciliate, apex acute; bracteoles linear, ca. 5 × 1 mm, caducous, abaxially sparsely hirsute. Calyx 5-lobed almost to base; lobes oblong-elliptic, 6–7 × ca. 1.5 mm, slightly unequal with one longer than others, outside glabrous, margin ciliate. Corolla purple, ca. 4 cm, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2.5 mm wide for ca. 1.2 cm then gradually widened to ca. 1.3 cm at mouth; lobes orbicular, ca. 6 mm in diam., apex emarginate. Stamens 4, included; filaments glabrous; shorter filament pair ca. 3 mm, equal, incurved; longer filament pair 6–8 mm, unequal, erect; anther thecae subspherical, ca. 1.3 mm in diam., nodding. Ovary sparsely gland-tipped pilose at tip; style ca. 3 cm, sparsely gland-tipped pilose at base. Capsule not seen. Fl. Dec.

• Limestone hills; 200–300 m. Guangxi (Ningming).

Known only from the type, *Strobilanthes ningmingensis* is very close to, and may be conspecific with, the very variable *S. dimorphotricha*, differing only in the non-glandular calyx, which may be only a development stage.

**108. *Strobilanthes dimorphotricha*** Hance, J. Bot. 21: 355. 1883.

球花马蓝 qiu hua ma lan

Herbs 40–150 cm tall, perennial, much branched, isophyllous or anisophyllous. Stems apically somewhat zigzag, glabrous or yellowish pubescent. Petiole 0.5–1.5 cm, sparsely pubescent or glabrous; leaf blade elliptic, elliptic-lanceolate, ovate, oblong, or oblong-elliptic, 1.5–15 × 0.5–4.5 cm, smaller of pair 1/3–2/3 size of larger one, adaxially dark green, white appressed pubescent, and with slightly prominent cystoliths, abaxially glabrous or whitish pubescent along veins and with or without multicellular trichomes, secondary veins 5–7 on each side of midvein and sometimes forming a net near margin, base cuneate to attenuate, margin serrulate, apex acuminate, caudate, or acute. Inflorescences axillary or terminal, headlike spikes, subspherical, very compact, 2- or 3-flowered, usually 1–3 spikes forming a forked panicle; peduncle ca. 2.5 cm, glabrous or pubescent; bracts ovate-elliptic, 1–1.3 cm, caducous, glabrous, apex acute to acuminate; bracteoles lanceolate, ca. 5 mm, caducous. Calyx 7–9 mm, accrescent to 1.5–1.7 cm, 5-lobed almost to base; lobes lanceolate, gland-tipped pubescent, one lobe slightly longer than others. Corolla violet, 3–4 cm, slightly curved, outside subglabrous to sparsely pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 5 mm then ventricose and gradually widened to ca. 1.5 cm at mouth; lobes orbicular, 5–6 mm in diam., subequal, apex emarginate. Stamens 4, included; filaments glabrous; shorter filament pair ca. 2 mm, equal, incurved; longer filament pair 5–7 mm, unequal, erect; anther thecae spherical, ca. 1 mm in diam.; pollen type 3. Ovary pilose; style ca. 3.5 cm, pilose. Capsule oblong-clavate, 1.4–1.8 cm, gland-tipped pubescent, 4-seeded. Seeds ca. 2.5 × 2.5 mm, lenticular, pubescent. Fl. Aug–Feb(–Apr).

Thickets on limestone hills, streamsides, thickets by streams; 200–2200 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Laos, Myanmar, Thailand, Vietnam].

*Strobilanthes dimorphotricha* has mistakenly been considered to be synonymous with *Goldfussia* (= *Strobilanthes*) *penstemonoides* by many authors.

- 1a. Leaf blade ovate, elliptic, or elliptic-lanceolate, pairs at each node quite unequal in size, apex acuminate to caudate ..... 108a. subsp. *dimorphotricha*
- 1b. Leaf blade oblong to oblong-elliptic, pairs at each node equal to subequal in size, apex acute ..... 108b. subsp. *rex*

**108a. *Strobilanthes dimorphotricha* subsp. *dimorphotricha***

球花马蓝(原亚种) qiu hua ma lan (yuan ya zhong)

*Goldfussia chaffanjonii* (H. Léveillé) E. Hossain; *G. dimorphotricha* (Hance) Bremekamp; *G. equitans* (H. Léveillé) E. Hossain; *G. geniculata* (C. B. Clarke) Bremekamp; *G. psilostachys* (C. B. Clarke ex W. W. Smith) Bremekamp; *G. seguinii* (H. Léveillé) C. Y. Wu & C. C. Hu; *Strobilanthes burkilii* Dunn;

*S. chaffanjonii* H. Léveillé; *S. equitans* H. Léveillé; *S. geniculata* C. B. Clarke; *S. geniculata* var. *integra* C. B. Clarke; *S. gracilis* T. Anderson (1867), not Beddome (1864); *S. laxicalyx* Hayata; *S. marchandii* H. Léveillé; *S. psilostachys* C. B. Clarke ex W. W. Smith; *S. seguinii* H. Léveillé.

Leaf blade ovate, elliptic, or elliptic-lanceolate, pairs at each node quite unequal in size, apex acuminate to caudate. Fl. Aug–Nov(–Apr).

Thickets on limestone hills, streamsides; 200–2200 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Vietnam].

**108b. *Strobilanthes dimorphotricha* subsp. *rex*** (C. B. Clarke) J. R. I. Wood, Kew Bull. 61: 19. 2006.

泰国马蓝 tai guo ma lan

*Strobilanthes rex* C. B. Clarke, Bot. Jahrb. Syst. 41: 68. 1907; *Goldfussia anfractuosa* (C. B. Clarke) Bremekamp; *G. rex* (C. B. Clarke) Bremekamp; *S. anfractuosa* C. B. Clarke; *S. penstemonoides* (Nees) T. Anderson var. *anfractuosa* (C. B. Clarke) Benoist; *S. penstemonoides* var. *rex* (C. B. Clarke) Benoist.

Leaf blade oblong to oblong-elliptic, pairs at each node equal to subequal in size, apex acute. Fl. Dec–Feb.

Thickets by streams; 600–1600 m. Yunnan [Laos, Myanmar, Thailand, Vietnam].

**109. *Strobilanthes glandibracteata*** D. Fang & H. S. Lo, Guihaia 17: 38. 1997.

腺苞马蓝 xian bao ma lan

*Goldfussia glandibracteata* (D. Fang & H. S. Lo) C. Y. Wu ex C. C. Hu.

Herbs to 50 cm tall, anisophyllous. Stems 4-angled, sulcate, bifariously pubescent. Petiole (0–)3–7 mm, sparsely pubescent; leaf blade ovate-elliptic to rarely narrowly ovate or lanceolate, smaller of pair 2–3.5 × 0.4–2.9 cm and larger one 5.5–12.5 × 2–4.5 cm, glabrous or sparsely pubescent along veins, cystoliths prominent, secondary veins 4–7 on each side of midvein, base attenuate, margin serrulate, apex caudate to acuminate. Inflorescences axillary, pedunculate heads; peduncle 0.6–3.5 cm, simple or 3-furcately branched, sulcate, bifariously pubescent, apically thickened; bracts elliptic to ovate-elliptic, 6–13 mm, caducous, multicellular gland-tipped pubescent, abaxially densely covered with cystoliths, apex acute; bracteoles lanceolate, ca. 5 × 1 mm. Calyx 5-lobed almost to base; lobes lanceolate to linear, 6–8 mm, unequal with one longer than others, outside multicellular gland-tipped pubescent. Corolla purple, ca. 3.5 cm, outside sparsely gland-tipped pilose but subglabrous at anthesis, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 8 mm then gradually widened to ca. 1.2 cm at mouth; lobes ovate, ca. 3 mm, apex emarginate. Stamens 4, included; filaments pilose; short filament pair ca. 2 mm, equal, incurved; longer filament pair 7–8 mm, unequal; anther thecae subspherical, ca. 1.3 mm in diam., nodding. Ovary brownish gland-tipped pilose; style ca. 2.8 cm, gland-tipped pilose. Capsule not seen. Fl. Oct.

- Limestone hills; 400–600 m. Guangxi (Lingyun).

Known only from the type, *Strobilanthes glandibracteata* is very close to and may be conspecific with the very variable *S. dimorphotricha*, differing only in the densely gland-tipped bracts.

**110. *Strobilanthes formosana*** S. Moore, J. Bot. 15: 294. 1877.

台湾马蓝 tai wan ma lan

*Goldfussia formosana* (S. Moore) C. F. Hsieh & T. C. Huang.

Herbs to 80 cm tall, perennial, branched, isophyllous. Stems stout, 4-angled, sulcate, hirsute, basally rooting at nodes. Petiole (0–)2–6 mm; leaf blade lanceolate-ovate to obovate, 3.5–14 × 1–5 cm, sparsely pubescent, secondary veins 5–9 on each side of midvein, base attenuate and decurrent onto petiole, margin serrate, apex acuminate. Inflorescences axillary, headlike spikes, compact, 1–3-flowered, sometimes several spikes forming a terminal panicle; peduncle 1–4 cm, pubescent; bracts variable in shape and size; outermost bracts linear-lanceolate; inner bracts imbricate, broadly ovate, 5–9 × 4–5 mm, concave, caducous but sometimes persistent after anthesis, margin ciliate, apex acuminate. Calyx ca. 1 cm, 5-lobed almost to base; lobes linear, unequal, sometimes slightly long hirsute. Corolla purplish blue, 3–3.5 cm, slightly bent, outside sparsely pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 3 mm wide for ca. 6 mm then slightly ventricose and gradually widened to ca. 1 cm at mouth; lobes oblong, ca. 5 × 6 mm, apex emarginate. Stamens 4, included; short filament pair ca. 2 mm, equal, incurved, glabrous; longer filament pair ca. 6 mm, unequal, erect, pilose; anther thecae spherical, ca. 1.2 mm in diam., incurved; pollen type 3. Capsule ellipsoid, ca. 2 cm, 4-seeded. Seeds ovate in outline, ca. 2 mm, densely appressed pubescent. Fl. Aug–Oct.

- Forests in ravines; 700–2300 m. Taiwan.

**111. *Strobilanthes ovatibracteata*** H. S. Lo & D. Fang, Guihaia 17: 40. 1997.

卵苞马蓝 luan bao ma lan

*Goldfussia ovatibracteata* (H. S. Lo & D. Fang) C. Y. Wu ex C. C. Hu.

Herbs or subshrubs, 0.5–2 m tall, branched, anisophyllous. Stems 4-angled to subterete, sulcate, retrorsely pubescent. Petiole 3–10 mm, grooved, pubescent; leaf blade ovate-elliptic to rarely ovate, smaller of pair 1–4 × 0.5–2 cm and larger one 3–10.5 × 1.5–4.5 cm, glabrous, cystoliths prominent, whitish, and dense along veins, secondary veins 3–6 on each side of midvein, base attenuate and oblique, margin serrulate, apex acute. Inflorescences axillary, pedunculate heads, 3- or 4-flowered, sometimes forming small axillary panicles; peduncle 1–3 cm, simple or 3-furcate, pubescent, apically thickened; bracts broadly ovate to rarely obovate, 4–13 mm, caducous, abaxially subglabrous and densely covered with cystoliths, margin ciliate, apex acute; bracteoles linear, ca. 5 × 2 mm. Calyx 5-lobed almost to base; lobes linear to lanceolate, 6–7 mm, slightly unequal with one longer than others, pilose. Corolla purple, 3.5–4.3 cm, ventricose, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2

mm wide for ca. 8 mm then gradually widened to ca. 1 cm at mouth; lobes ovate, ca. 4 mm, apex emarginate. Stamens 4, included; filaments glabrous; shorter filament pair ca. 2 mm, incurved; longer filament pair 7–8 mm, unequal, erect; anther thecae subspherical, ca. 1.3 mm in diam. Ovary gland-tipped pilose at tip; style 2.8–3.5 mm. Capsule 15–16 × 3–4 mm, oblong, apically gland-tipped pilose, 4-seeded. Seeds ovate in outline, ca. 2 × 2 mm, pubescent. Fl. Oct, fr. Dec.

- Forests; 300–900 m. Guangxi.

**112. *Strobilanthes hupehensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 193. 1918.

湖北马蓝 hu bei ma lan

Herbs 40–60 cm tall, isophyllous. Stems erect, glabrous. Petiole ca. 1 cm, glabrous; leaf blade lanceolate to ovate-lanceolate, 9–14 × 2.5–4 cm, glabrous, secondary veins 5–8 on each side of midvein, base cuneate, margin serrate, apex acuminate. Inflorescences axillary, headlike spikes, compact, simple; peduncle 1–11 cm, very slender; bracts ovate, ca. 5 × 3 mm, caducous, apex acute; bracteoles absent. Calyx 5–8 mm, outside gland-tipped pilose, 5-lobed almost to base; lobes linear-oblong with one much longer than others, apex acute. Corolla purplish blue, 2.5–3.5 cm, straight, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then gradually widened to ca. 1 cm at mouth; lobes oblong, ca. 4 × 4 mm, apex obtuse. Stamens 4, included; filaments glabrous; shorter filament pair ca. 3 mm, equal, incurved; longer filament pair 6–7 mm, unequal, erect; anther thecae spherical, ca. 1.2 mm in diam., nodding; pollen type 3. Ovary sparsely pilose; style ca. 2.6 cm. Capsule oblong, ca. 1 cm, 4-seeded. Seeds ovate in outline, ca. 3 × 3 mm, pubescent. Fl. Jul–Oct.

- Forests; 200–1800 m. Hubei, Hunan.

The very slender peduncles combined with the isophyllous habit make *Strobilanthes hupehensis* very distinctive.

**113. *Strobilanthes oxycalycina*** J. R. I. Wood, Edinburgh J. Bot. 51: 250. 1994.

尖萼马蓝 jian e ma lan

Subshrubs 1–2.5 m tall, forming small bushes, isophyllous or slightly anisophyllous. Stems rounded, somewhat sulcate, glabrous, apically densely covered with whitish cystoliths. Petiole 0.5–1.7 cm, glabrous; leaf blade broadly elliptic to oblong-elliptic, 5–14 × 2–7 cm, both surfaces glabrous with prominent cystoliths, secondary veins 6–9 on each side of midvein, base cuneate, margin serrate, apex acuminate. Inflorescences terminal, abbreviate to headlike spikes, simple or 3-furcate branched, often with a few flowers some distant below head; peduncle 2–4 cm, glabrous; bracts ovate, ca. 7 × 3 mm, herbaceous, caducous, thinly pubescent, apex shortly acuminate; bracteoles oblong-obovate, ca. 3 × 1–2 mm, apex acute. Calyx ca. 9 mm, accrescent to ca. 1.1 cm in fruit, 5-lobed almost to base; lobes linear to narrowly oblong-elliptic, equal, outside pubescent with gland-tipped trichomes, inside glabrous, apex acute. Corolla blue, 3–4 cm, straight or slightly curved, outside gland-tipped pubescent, inside glabrous except for trichomes retaining style;

tube basally cylindric and ca. 1 mm wide for ca. 1 cm then gradually widened to ca. 9 mm at mouth; lobes ovate, ca. 5 × 5 mm, apex obtuse. Stamens 4; filaments finely pubescent, shorter pair ca. 4 mm, longer pair 7–8 mm, unequal, and slightly exerted; anther thecae spherical, ca. 1.3 mm in diam., incurved; pollen type 3. Ovary gland-tipped pilose at tip; style ca. 2.5 cm, pilose. Capsule oblong, 1.1–1.3 cm, gland-tipped pubescent on apical half especially near tip, 4-seeded. Seeds ovate in outline, ca. 3 × 3 mm, densely covered with appressed trichomes. Fl. Dec–Feb.

● Forests; 600–1000 m. Xizang (Mêdog).

**114. *Strobilanthes discolor*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 477. 1867.

异色马蓝 yì se ma lan

*Goldfussia discolor* Nees in A. Candolle, Prodr. 11: 172. 1847; *Difflugossa nagaensis* Bremekamp; *Strobilanthes discolor* var. *nudicalyx* C. B. Clarke.

Subshrubs to 1.8 m tall, strongly anisophyllous. Stems and branches 4-angled to subterete, sulcate, glabrous, apically somewhat zigzag. Petiole 0.5–2.5 cm, sulcate, glabrous; leaf blade elliptic to ovate-elliptic, 3–14 × 2–6.5 cm, glabrous, both surfaces with prominent cystoliths, abaxially whitish, adaxially dark green, secondary veins 6–8 on each side of midvein, base attenuate, shortly decurrent onto petiole, and often slightly oblique, margin serrate, apex acuminate to caudate and often falcate. Inflorescences axillary, pedunculate heads, often with secondary branching and becoming paniculate; floral bracts oblanceolate to spatulate, 3–5 × 1–2 mm, rapidly caducous, glabrous; bracteoles oblanceolate but often apparently absent. Calyx 5-lobed almost to base; lobes at anthesis linear-oblong, 5–7 × ca. 1 mm, subequal, apically pilose but otherwise glabrous, apex obtuse; lobes in fruit subspatulate, accrescent to ca. 1 cm, often gland-tipped pilose. Corolla violet, 3.2–3.8 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for 8–10 mm then gradually widened to ca. 1 cm at mouth; lobes ovate, 5–6 × 6–7 mm, apex rounded. Stamens 4; shorter filament pair 1.5–2 mm, strongly reflexed, glabrous; longer filament pair 7–8 mm, glabrous or with a few trichomes; anther thecae obliquely ellipsoid, ca. 1.2 mm, incurved; pollen type 3. Ovary glabrous; style 2.3–2.8 cm, hirsute. Capsule narrowly obovoid, ca. 10 × 2.5 mm, glabrous except for a few apical glands, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, pilose. Fl. Nov–Feb.  $2n = 22$ .

Forests. Xizang (Cona) [India].

**115. *Strobilanthes rhombifolia*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 461. 1884.

短柄马蓝 duan bing ma lan

*Goldfussia sessilis* Nees.

Herbs or subshrubs, strongly anisophyllous. Stems 4-angled, erect, glabrous. Petiole 0–10 mm but apical leaves sessile; leaf blade rhomboidal-elliptic, 2–15 × 1.5–10 cm, both surfaces green and with abundant cystoliths, secondary veins ca. 6 on each side of midvein, base cuneate and shortly decurrent onto petiole, margin serrate, apex acute. Inflorescences axillary, capi-

tula borne on simple or 2(or 3)-furcately branched peduncles, 2–10 cm; peduncle sulcate, bifariously pubescent with trichomes in sulci; sterile bracts leaflike, ovate, ca. 0.5 × 0.5 mm, relatively persistent; floral bracts obovate to oblong-obovate, ca. 6 × 1.5 mm, soon scarious and caducous; bracteoles not observed. Calyx subequally 5-lobed to base; lobes linear-elliptic, 7–12 × ca. 1.2 mm, pubescent and with sessile glands. Corolla blue, 4–4.5 cm, outside sparsely gland-tipped pilose but glabrescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then widened to 1.2–1.7 cm at mouth; lobes suborbicular, ca. 6 × 7 mm. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm, longer pair ca. 5 mm; anther thecae obliquely ovoid, ca. 1.5 × 1.2 mm, incurved. Ovary narrowly ovoid, apically gland-tipped; style ca. 2.7 cm, slender, glabrous apart from a few trichomes on basal part. Capsule not seen. Fl. Dec.

Forests. Xizang (Cona) [India].

**116. *Strobilanthes multidens*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 461. 1884.

分枝马蓝 fen zhi ma lan

*Goldfussia multidens* (C. B. Clarke) Bremekamp; *Pteracanthus agrestis* (C. B. Clarke) Bremekamp; *Strobilanthes agrestis* C. B. Clarke; *S. agrestis* var. *hemiotis* C. B. Clarke; *S. penstemonoides* (Nees) T. Anderson var. *multidens* (C. B. Clarke) Kuntze.

Subshrubs to 2 m tall, usually pubescent, strongly anisophyllous. Leaf blade ovate-elliptic, 2–20 × 1–9.5 cm, usually pubescent at least on veins, base attenuate and oblique, margin serrate, apex shortly acuminate and sometimes falcate. Inflorescences axillary, usually capitate, borne on 3-furcate axillary gland-tipped pilose peduncles, sometimes with scattered flower pairs below heads, rarely of branched spikes with flower pairs only; bracts ovate-suborbicular, 3–6 mm, concave, caducous, gland-tipped pilose, apex acute; bracteoles absent. Calyx 6–10 mm at anthesis, gland-tipped pubescent; lobes linear, accrescent to ca. 1.6 cm with one lobe 2–3 mm longer than others, apex acute. Corolla blue, 3.5–4.8 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow then widened to ca. 1.5 cm at mouth. Stamens 4; shorter filament pair ca. 1 mm, recurved; longer filament pair 5–6 mm, slightly unequal, glabrous; anther thecae subspherical, ca. 1 mm, incurved; pollen type 3. Ovary gland-tipped; style ca. 2.5 cm, glabrous except for a few trichomes basally. Capsule oblong, 13–18 × ca. 3 mm, apically gland-tipped pilose, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, appressed pubescent. Fl. Sep–Apr.

Streamsides; 1500–2000 m. Xizang (Cona) [Bhutan, India, Nepal].

**117. *Strobilanthes oligocephala*** T. Anderson ex C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 461. 1884.

菱叶马蓝 ling ye ma lan

*Difflugossa paupera* (C. B. Clarke) Bremekamp; *Goldfussia oligocephala* (T. Anderson ex C. B. Clarke) Bremekamp; *G. thomsonii* Hooker; *Strobilanthes oligocephala* var. *treutleri* C. B. Clarke; *S. paupera* C. B. Clarke.

Subshrubs 30–50 cm tall, much branched, anisophyllous. Stems decumbent and basally rooting at nodes but eventually erect, pubescent to subglabrous. Petiole 0.5–4 cm but apicalmost leaves sessile; leaf blade rhombic, elliptic, narrowly ovate, or apicalmost suborbicular, 4–12 × 1.5–6 cm, abaxially glaucous and glabrous or pilose along veins and margin, adaxially green, glabrous, and densely covered with prominent cystoliths, secondary veins 5–7 on each side of midvein, base attenuate and decurrent onto petiole, margin serrate, apex abruptly acuminate and falcate. Inflorescences terminal or arising from apical leaf axil, simple or branched, subcapitate with ca. 2 flower pairs to shortly spicate, 4–5 cm; peduncle 1–5 cm, glabrous or pubescent; bracts ovate to oblong, 0.8–1.5 × 0.7–1.3 cm, caducous, green when young but soon scarious, often becoming gland-tipped pilose, apex acute; bracteoles ca. 2 × 1 mm, caducous so often appearing absent. Calyx 1–1.8 cm, gland-tipped pilose, 5-lobed almost to base; lobes narrowly lanceolate with one slightly longer than others, apex acuminate. Corolla blue or white, 3.5–5 cm, ventricose, outside gland-tipped pubescent but sometimes only on lobes, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2.5 mm wide for 1–1.5 cm then bent and widened to ca. 1 cm at mouth; lobes oblong, ca. 6 × 5 mm, apex obtuse. Stamens 4, included; filaments sparsely hirsute, shorter pair ca. 4 mm, longer pair ca. 7 mm; anther thecae oblong-ovoid, ca. 2 × 1.2 mm. Ovary comose; style 2.8–3.2 cm. Capsule ca. 1.4 cm, apically gland-tipped pilose, 4-seeded. Seeds ovate in outline, ca. 3 × 2.5 mm, densely pubescent. Fl. Jul–Nov.

Thickets on limestone hills; 2600–2800 m. Xizang (Cona) [Bhutan, India, Nepal].

**118. *Strobilanthes medogensis*** (H. W. Li) J. R. I. Wood & Y. F. Deng, Bot. J. Linn. Soc. 150: 383. 2006.

墨脱马蓝 mo tuo ma lan

*Goldfussia medogensis* H. W. Li, Fl. Xizang. 4: 413. 1985.

Subshrubs 2–3 m tall, anisophyllous. Stems erect, slightly sulcate, bifariously puberulent. Petiole 0–5 mm with smaller leaves subsessile; leaf blade ovate, 3–13 × 2–5.5 cm, smaller of pair ca. 2/3 size of larger one, both surfaces glabrous, abaxially pale green, adaxially green and with numerous cystoliths, base rounded to subcordate, margin serrulate, apex acuminate and falcate. Inflorescences axillary, spikes, 3–6 cm, simple or 2-furcate; peduncle 2–5 cm; rachis bifariously pubescent; bracts obovate-oblancoate, 2.5–3 mm, herbaceous, caducous, glabrous; bracteoles similar to bracts but ca. 1.5 mm. Flowers 3–11 mm apart on rachis. Calyx ca. 1.2 cm in flower, 5-lobed to base; lobes narrowly oblong-elliptic, subequal, glabrous or gland-tipped pubescent, apex acuminate. Corolla yellowish white but dull purple on lobes, campanulate, ca. 2.5 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then gradually widened to 1–1.5 cm at mouth; lobes broadly ovate, ca. 3 × 8 mm, apex rounded. Stamens 4, ± exserted; filaments basally pilose, apically glabrous, shorter pair 7–8 mm, longer pair 9–10 mm; anther thecae ca. 1 mm, incurved; pollen type 3. Ovary glabrous; style 2.7–2.8 cm, glabrous. Capsule not seen. Fl. Jul–Aug.

• Forests; 1900–2500 m. Xizang (Mêdog).

**119. *Strobilanthes thomsonii*** T. Anderson, J. Linn. Soc., Bot. 9: 478. 1867.

汤氏马蓝 tang shi ma lan

Subshrubs 1–2 m tall, pliestesial, anisophyllous. Stems and branches 4-angled, sulcate, glabrous or thinly pubescent. Petiole 2–14 mm or leaves sessile, glabrous; leaf blade ovate to narrowly ovate-elliptic, 12–20 × 4–7 cm, abaxially pale, adaxially glabrous with abundant cystoliths, secondary veins 5–7 on each side of midvein, base cuneate and decurrent onto petiole, margin serrate, apex long acuminate and usually falcate. Inflorescences axillary, simple or branched spikes, 3–9 cm; floral bracts variable in shape, ovate, elliptic, oblanceolate, or spatulate, 4–6 × 2–3 mm, caducous, glabrous or gland-tipped pubescent; bracteoles linear, ca. 2.5 × 0.8 mm, caducous. Flowers imbricate on rachis or to 1 cm apart. Calyx 5–9 mm, accrescent to ca. 1.3 cm in fruit, subequally 5-lobed almost to base; lobes linear, glabrous or pilose, apex acute. Corolla purple, funnel-shaped, 2.5–3.2 cm, curved, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then curved and widened to 1–1.3 cm at mouth; lobes ovate, ca. 4 × 4 mm, apex rounded. Stamens 4; filaments glabrous, shorter pair ca. 2 mm and strongly incurved, longer pair 3.5–4 mm; anther thecae subspherical, ca. 1 mm, incurved; pollen type 3. Ovary pubescent; style 2.5–3 cm, basally thinly pilose, apically glabrous. Capsule narrowly obovoid, gland-tipped pubescent, 4-seeded. Seeds orbicular in outline, ca. 2 mm in diam., densely covered with appressed trichomes. Fl. Sep–Nov.

Dry forests; ca. 2500 m. Xizang (Cona) [Bhutan, India].

**120. *Strobilanthes longgangensis*** D. Fang & H. S. Lo, Guihaia 17: 33. 1997.

弄岗马蓝 nong gang ma lan

*Perilepta longgangensis* (D. Fang & H. S. Lo) C. Y. Wu & C. C. Hu.

Subshrubs to 40 cm tall, strongly anisophyllous. Petiole 2–14 mm; leaf blade narrowly elliptic to rarely ovate-elliptic, smaller of pair (1.5–)3–8.5 × 0.8–3 cm and larger one 6–11.5 × 2.5–4.5 cm, both surfaces glabrous with prominent cystoliths, abaxially paler, secondary veins 4–6 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin denticulate, apex acuminate. Inflorescences axillary, spikes, 2–4 cm, 1–5-flowered; peduncle ca. 8 mm; bracts narrowly triangular, 3–4 × 1–1.5 mm, persistent, apex acute; bracteoles oblong, 5–6 × ca. 1 mm, glabrous. Flowers distant on rachis, usually only 1 sterile per node. Calyx ca. 5 mm, 5-lobed to near base; lobes resembling bracteoles, glabrous. Corolla purple, campanulate, ca. 2.5 cm, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and narrow for ca. 5 mm then gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 4 mm, apex emarginate. Stamens 4, included; filaments sparsely pilose, shorter pair ca. 2 mm, longer pair 6–8 mm; anther thecae subspherical, ca. 1 mm, incurved. Ovary glabrous; style ca. 1.8 cm, hirsute. Capsule not seen. Fl. Nov.

- Limestone slopes; 300–600 m. Guangxi (Longzhou).

**121. *Strobilanthes secunda*** T. Anderson, J. Linn. Soc., Bot. 9: 480. 1867.

偏花马蓝 pian hua ma lan

Shrubs 0.6–1.5 m tall, strongly but variably anisophyllous. Stems and branches 4-angled, often zigzag, sulcate, glabrous on ridges but rufous scurfy pubescent in channels. Petiole 3–8 cm, appressed pubescent; leaf blade oblong-elliptic, 4–18 × 1.5–7.5 cm, abaxially glabrous except for pubescent midvein, adaxially glabrous, secondary veins 6–9 on each side of midvein, base narrowly cuneate, margin entire to sinuate, apex acuminate. Inflorescences axillary, spikes, 3–18 cm, lax; sterile bracts resembling reduced leaves; floral bracts and bracteoles caducous, presence only known from presence of scars. Flowers solitary or in opposite pairs, 1.5–3 cm apart on rachis. Pedicel ca. 1 mm. Calyx 1.6–2 cm, subequally lobed to 3–4 mm above base; lobes linear-lanceolate, 1.2–1.6 cm, glabrous, apex finely acuminate. Corolla yellow, 2.6–3 cm, curved and somewhat ventricose, outside pubescent, inside glabrous except for trichomes retaining style; tube basally cylindric and 2–3 mm wide for ca. 6 mm then gradually widened to ca. 1.5 cm at mouth; lobes broadly ovate, ca. 9 × 4 mm, apex rounded. Stamens 4, included; shorter filament pair ca. 3 mm, glabrous; longer filament pair ca. 5 mm, basally villous; anther thecae oblong, ca. 2 × 1 mm, erect; pollen type 3. Ovary clavate, comose; style ca. 2.6 cm, pilose. Capsule narrowly oblong, ca. 20 × 2–2.5 mm, very shortly pubescent, 4-seeded, apex acute. Seeds ovate in outline, ca. 3.5 × 2.5 mm, pilose; areola densely pilose. Fl. Dec–Jan, fr. Jan–Apr.

Forests. Xizang (Mêdog) [Myanmar].

**122. *Strobilanthes mastersii*** T. Anderson, J. Linn. Soc., Bot. 9: 481. 1867.

瑞丽叉花草 rui li cha hua cao

*Difflugossa scoriarum* (W. W. Smith) E. Hossain; *D. shweliensis* (W. W. Smith) E. Hossain; *Goldfussia scoriarum* (W. W. Smith) Bremekamp; *Strobilanthes aborensis* Dunn; *S. scoriarum* W. W. Smith; *S. shweliensis* W. W. Smith.

Herbs 1–1.5 m tall, anisophyllous. Stems 4-angled, erect, sulcate, glabrous to gland-tipped pilose. Petiole 0–2 cm with apical leaves sessile, subglabrous; leaf blade ovate to ovate-lanceolate, 10–15 × 4–7 cm, glabrous except for a few cilia in teeth sinus, secondary veins 5–10 on each side of midvein, base broadly cuneate on basal leaves and rounded on apical leaves, margin serrate, apex acuminate. Inflorescences terminal, panicles of spikes, narrowly ovoid, to 30 cm; peduncle and rachis glabrous when young, densely gland-tipped pilose at maturity; sterile bracts leaflike, lanceolate to ovate, 5–15 × 3–8 mm, tardily caducous, apex acuminate; floral bracts elliptic, 5–6 × 2–3 mm, caducous, apex obtuse; bracteoles oblong, ca. 3 × 1 mm, caducous, abaxially glabrous. Flowers in opposite pairs or solitary through abortion. Calyx 0.8–1.2 cm, subglabrous with sessile glands when young but becoming densely gland-tipped pilose and accrescent, 5-lobed almost to base; lobes lanceolate, with 3 lobes slightly longer than other 2, apex acuminate. Corolla purple, 2.5–3 cm, straight, ventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally

cylindric and ca. 2 mm wide for 1–1.3 cm then widened to ca. 1 cm at mouth; lobes orbicular, ca. 5 mm in diam. Stamens 4, included; filaments glabrous, shorter pair ca. 3 mm, longer pair ca. 6 mm; anther thecae obliquely ellipsoid, ca. 0.8 × 1 mm, incurved; pollen type 3. Ovary slightly pilose at tip; style ca. 2.1 cm, slender, sparsely pilose on basal part. Capsule clavate, ca. 1.5 cm, apically gland-tipped pilose, 4-seeded. Seeds brown, ovate in outline, ca. 2.5 × 2 mm; areola small, verrucose. Fl. Sep–Jan.

Forests on mountain slopes; ca. 1500 m. Xizang (Mêdog), Yunnan [India].

*Strobilanthes mastersii*, like *S. hamiltoniana*, commonly has a glabrous inflorescence when it is young but becomes gland-tipped pilose as it matures.

**123. *Strobilanthes tenax*** Dunn, Bull. Misc. Inform. Kew 1920: 209. 1920.

结壮马蓝 jie zhuang ma lan

Subshrubs to 1 m tall. Stems 4-angled, sulcate, gland-tipped pubescent. Petiole 2–5 mm but apical leaves sessile; leaf blade lanceolate, 8–10 × 2.5–4 cm, glabrous, cystoliths numerous, linear, and prominent, secondary veins 4–6 on each side of midvein, base cuneate, margin serrate, apex acuminate. Inflorescences terminal, a panicle of branched spikes, 3–12 cm; rachis gland-tipped pilose; sterile bracts sessile, leaflike, oblong-lanceolate to ovate, 8–12 × 3–5 mm; floral bracts oblong-elliptic, 5–7 × ca. 2 mm, scarious and early caducous, sparsely gland-tipped pilose, apex obtuse; bracteoles apparently absent. Flowers sessile, with opposite pairs 1–2.5 cm apart on rachis. Calyx ca. 1 cm, outside gland-tipped pubescent, 5-lobed almost to base; lobes linear, apex acute. Corolla color unknown, ca. 3 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and 1–2 mm wide for ca. 0.8 cm then abruptly widened to ca. 1 cm at mouth; lobes broadly ovate, 5–6 × ca. 3 mm, apex rounded. Stamens 4, included; filaments glabrous, shorter pair 1–2 mm, longer pair 3–4 mm; anther thecae obliquely ellipsoid, ca. 1.5 mm, incurved; pollen type 3. Ovary obovoid, ca. 2.5 mm, gland-tipped with a few apical trichomes; style ca. 1.9 cm, thinly pilose. Capsule narrowly obovoid, ca. 1.5 cm, gland-tipped pubescent, 4-seeded. Seeds immature. Fl. Mar.

- Forests; ca. 800 m. Xizang (Mêdog).

*Strobilanthes tenax* is only known from the type, and there are many errors in the protologue.

**124. *Strobilanthes hamiltoniana*** (Steudel) Bosser & Heine, Bull. Mus. Natl. Hist. Nat., B, Adansonia, Sér. 4, 10: 148. 1988.

叉花草 cha hua cao

*Ruellia hamiltoniana* Steudel, Nomencl. Bot., ed. 2, 2: 481. 1841, based on *Goldfussia colorata* Nees in Wallich, Pl. Asiat. Rar. 3: 89. 1832, not *Ruellia colorata* Blume (1826), nor Vellozo (1829); *Difflugossa colorata* (Nees) Bremekamp; *Strobilanthes colorata* (Nees) T. Anderson (1867), not Nees (1837).

Shrubs 0.5–1.5 m tall, much branched, anisophyllous. Stems 4-angled, sulcate, glabrous. Leaves petiolate or apical ones sessile or subsessile; petiole (0–)0.8–5(–8) cm, glabrous;

leaf blade lanceolate to ovate, smaller pair at least 2/3 size of larger one, 5–19 × 2–8.5 cm, glabrous, densely covered with linear cystoliths, secondary veins 4–7 on each side of midvein, base oblique to rarely slightly oblique and attenuate or on very large leaves subcordate, margin serrulate, apex acuminate. Inflorescences axillary or terminal, panicles, to 30 cm, much branched; rachis angled at ca. 60°, glabrous or rarely pubescent, gland-tipped in fruit; bracts green, broadly obovate, 3–5 × ca. 2 mm, concave, caducous, glabrous, becoming gland-tipped in fruit, margin entire, apex retuse; bracteoles green, oblanceolate to narrowly elliptic, 3–4 × ca. 1 mm, concave, caducous, glabrous, margin entire, apex retuse. Flowers solitary on each node, distant on rachis. Pedicel 1.5–5 mm, glabrous. Calyx 8–10 mm, accrescent to ca. 1.3 cm in fruit, glabrous, sometimes apically gland-tipped pubescent, becoming densely gland-tipped in fruit, 5-lobed almost to base; lobes narrowly elliptic with one longer than others, apex acute to sometimes retuse. Corolla white, lilac, or (in cultivated forms) deep pink with a white tube, 3.5–4 cm, subventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.3 cm then slightly ventricose and gradually widened to 1.4–1.8 cm at mouth; lobes ovate, 4–5 × ca. 6 mm, apex rounded to retuse. Stamens 4, included; filaments glabrous; shorter filament pair ca. 1 mm, equal; longer filament pair 7–9 mm, unequal, erect; anther thecae white, spherical, ca. 1.2 mm in diam., partially recurved; pollen type 3. Ovary ca. 2.5 mm, glabrous; style ca. 3.8 cm, sparsely pubescent. Capsule green then dark purple, fusiform, 1–1.5 cm, glabrous or with gland-tipped trichomes, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, with long trichomes; areola small. Fl. Dec–Jan.

Forests on mountain slopes; 800–2000 m. Xizang (Cona) [Bhutan, India, Myanmar, Nepal].

*Strobilanthes hamiltoniana* is an ornamental plant. It is widely cultivated in tropical countries and in conservatories in temperate climates. The species is sometimes naturalized, occasionally becoming an invasive weed as on the island of Réunion. Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals.

"*Goldfussia tengyuehensis*" (C. Y. Wu, Index Fl. Yunnan. 2: 1675. 1984) belongs here but was not validly published.

**125. *Strobilanthes tenuiflora*** J. R. I. Wood, Kew Bull. 58: 691. 2003.

纤序马蓝 xian xu ma lan

Subshrubs to 1 m tall, anisophyllous. Stems 4-angled, sulcate, glabrous. Petiole 0.1–3.4 cm, usually very short on smaller leaves, often sulcate, glabrous; leaf blade ovate to ovate-elliptic, 1–13 × 0.5–8 cm, smaller of pair 1/4–1/3 size of larger one, glabrous except for multicellular trichomes in teeth sinuses, adaxially cystoliths prominent, secondary veins 5–7 on each side of midvein and abaxially prominent, base oblique and broadly cuneate, rounded, or slightly cordate, margin slightly serrate to subentire, apex acuminate. Inflorescences terminal, panicles, to 10 cm; peduncle to 3 cm, glabrous; rachis slender, glabrous, repeatedly 3-forked and bent to ca. 90°; bracts subulate, ca. 1 mm, caducous; bracteoles similar to bracts. Flowers 1 per node.

Calyx 4–6 mm, accrescent to ca. 8 mm in fruit, glabrous, 5-lobed almost to base; lobes oblong to oblong-lanceolate with one slightly longer than others, margin pale, apex emarginate. Corolla white, 3.2–4 cm, straight, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1.5 mm wide for 6–10 mm then slightly ventricose and gradually widened to ca. 1.5 cm at mouth; lobes ovate, ca. 5 × 5 mm, apex acute. Stamens 4, included; filaments glabrous, shorter pair ca. 0.5 mm, longer pair 4–5 mm; anther thecae spherical, ca. 1 mm in diam., partially recurved. Ovary glabrous; style 2.5–3.2 mm, glabrous. Capsule oblong, ca. 1.5 cm, glabrous, 4-seeded, apex acuminate. Seeds ovate in outline, ca. 2 × 1.5 mm, puberulent. Fl. Oct.

Forests; ca. 900 m. Yunnan (Cangyuan) [Thailand].

**126. *Strobilanthes euantha*** J. R. I. Wood, Kew Bull. 58: 697. 2003.

腾冲马蓝 teng chong ma lan

Herbs 0.5–1.5 m tall, perennial, slightly anisophyllous. Stems dark green, deeply sulcate and ridged, glabrous. Petiole 0–2.6 cm, glabrous; leaf blade ovate to ovate-elliptic, 4–20 × 3–12 cm, abaxially paler green and sparsely pilose along veins, adaxially dark green, pilose along margin, and with prominent cystoliths, secondary veins 5–8 on each side of midvein, base cordate to abruptly narrowed and often somewhat oblique, margin serrate, apex acuminate. Inflorescences terminal, open panicles, to 15 cm; peduncle ca. 3 cm, gland-tipped pilose; rachis gland-tipped pilose; bracts obovate, 1–2 mm, caducous before flowers open, apex rounded; bracteoles similar to bracts. Flowers distant on rachis, usually 1 per node. Pedicel ca. 3 mm, gland-tipped pilose. Calyx ca. 4 mm, accrescent to ca. 7 mm in fruit, glabrous, 5-lobed to ca. 1 mm from base; lobes oblong to oblanceolate, apex truncate to emarginate. Corolla pale lavender to pale pink, 2.2–3.5 cm, arcuate, glabrous; tube basally cylindric and narrow for 0.6–1.9 cm then ventricose and widened to 8–10 mm at mouth; lobes ovate, ca. 4 × 4 mm, apex acute. Stamens 4; filaments glabrous; shorter filament pair ca. 2 mm, incurved; longer filament pair 1–1.2 cm, erect, slightly exerted; anther thecae spherical, ca. 1 mm in diam. Ovary glabrous; style 2.2–2.7 cm, glabrous. Capsule narrowly oblong-obovoid, ca. 1.4 cm, glabrous, 4-seeded, apex acuminate. Seeds ovate-suborbicular in outline, ca. 2.5 × 2 mm, pubescent. Fl. Sep–Oct, fr. Dec.

Forests; 1500–2100 m. Yunnan (Gaoligong Shan) [Myanmar].

**127. *Strobilanthes parvifolia*** J. R. I. Wood, Kew Bull. 64: 25. 2009.

小叶马蓝 xiao ye ma lan

Herbs, perennial, anisophyllous. Stems somewhat sulcate with distinct small parallel ridges, glabrous, basally geniculate. Petiole 0–4 mm, glabrous; leaf blade lanceolate, ovate, or ovate-elliptic, 1–3.5 × 1–1.8 cm, smaller of pair ca. 1/3 size of larger one, both surfaces glabrous and with somewhat obscure cystoliths or rarely abaxially with a few gland-tipped trichomes on veins, base broadly to narrowly cuneate and somewhat decurrent onto petiole, margin undulate to slightly crenate, apex acute. Inflorescences leaflike with long few-flowered branches; branches strict, densely covered with short stalked glands,

sparingly 3-forked with subsessile flowers in opposite pairs (rarely solitary) in axils of leaflike bracts at tips of ultimate branches; basal sterile bracts variable in size and shape, sessile or nearly so, oblong-lanceolate to sometimes ovate, elliptic, or oblong, 0.5–3.5 × 0.3–1.5 cm, often very unequal at each pair, abaxially densely stalked gland-tipped pubescent toward base, base attenuate, margin undulate and sparsely covered with stalked glands, apex acute; floral bracts oblong, ca. 5 × 1 mm, caducous, gland-tipped pilose; bracteoles oblong, ca. 2 × 1 mm. Calyx ca. 1.1 cm at anthesis, accrescent to ca. 2 cm in fruit, 5-lobed almost to base; lobes narrowly oblong-lanceolate, 1–1.5 mm wide, subequal, densely covered with relatively short gland-tipped trichomes, apex obtuse. Corolla white flushed violet, 2.5–3 cm, outside glabrous, inside pubescent; tube basally cylindric and ca. 3 mm wide for ca. 1 cm then gradually widened to ca. 1.2 cm and bent to ca. 90° and then and widened to 1.2–1.5 cm at mouth; lobes broadly ovate, ca. 6 × 6 mm, apex obtuse. Stamens 4, included; filaments glabrous, shorter pair 1.5–2 mm, longer pair 5–6 mm; anther thecae oblong, ca. 2 × 0.5 mm; pollen type 16. Ovary glabrous; style ca. 1.5 cm, glabrous. Capsule narrowly clavate, ca. 2.2 cm, glabrous, 4-seeded. Mature seeds not seen. Fl. Sep, fr. Sep–Oct.

• Forest margins on hills; ca. 1600 m. Xizang (Mêdog).

**128. *Strobilanthes ferruginea*** D. Fang & H. S. Lo, *Guihaia* 17: 29. 1997.

锈背马蓝 xiu bei ma lan

*Perilepta ferruginea* (D. Fang & H. S. Lo) C. Y. Wu & C. C. Hu.

Shrubs to 4 m tall, almost glabrous throughout, anisophyllous. Stems 4-angled, sulcate. Petiole to 3 cm; leaf blade broadly elliptic, elliptic, or rarely ovate-elliptic, 4–18 × 2–8 cm, smaller of pair ca. 1/3 size of larger one, both surfaces densely covered with cystoliths, abaxially ferruginous when dry, adaxially dark green, secondary veins 7–11 on each side of midvein, base broadly cuneate, margin apically remotely crenate, apex acuminate to caudate. Inflorescences axillary or terminal, spikes, 1–2.5 cm, few flowered; bracts elliptic to oblong, 3.5–4 × ca. 2 mm, persistent, margin ciliate, apex truncate to rounded; bracteoles oblong to elliptic, ca. 7 × 2.5 mm. Flowers distant on rachis, usually only 1 fertile per node. Calyx ca. 9 mm; lobes oblong-oblongate, ca. 4 mm, margin ciliolate, apex obtuse. Corolla purple, 3–3.5 cm, ventricose, outside glabrous; tube basally cylindric and ca. 2 mm wide for ca. 6 mm then gradually widened to ca. 1.4 cm at mouth; lobes ca. 5 mm, apex emarginate. Stamens 4, included; filaments sparsely hirsute, shorter pair ca. 2 mm, longer pair ca. 8 mm; anther thecae oblong, ca. 2 mm. Ovary glabrous; style ca. 1.8 cm, densely hirsute. Capsule oblong, 1.7–2 cm, glabrous, 4-seeded. Seeds ovate in outline, ca. 3 mm, densely covered with appressed trichomes. Fl. Oct–Dec.

• Dense forests on rocky mountains; 400–800 m. Guangxi (Longzhou).

## 8. PHAULOPSIS Willdenow, Sp. Pl. 3: 4, 342. 1800 [*Phaylopsis*], nom. cons.

肾苞草属 shen bao cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Aetheilema* R. Brown; *Micranthus* J. C. Wendland; *Theileamea* Baillon.

Herbs, perennial [or annual], prostrate [to erect], with cystoliths, often anisophyllous. Leaves opposite, long petiolate; leaf blade margin entire or crenate. Inflorescences terminal [or axillary], second strobilate spikes; bracts subleaflike, orbicular or reniform, imbricate; bracteoles [present or] absent. Flowers sessile. Calyx 5-lobed almost to base; lobes unequal, posterior one largest. Corolla small; tube cylindric, slender; limb ± 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes contorted in bud. Stamens 4, didynamous, included in corolla tube; filaments coherent at base; anthers 2-theous; thecae parallel, base minutely mucronate [or not mucronate]. Ovary with 2 ovules per locule; style hairy; stigma 2-lobed, lobes unequal. Capsule shortly stipitate, 4-seeded; retinacula present; septa with attached retinacula separating from inner wall of mature capsule. Seeds discoid, densely covered with hygroscopic trichomes.

Twenty-two species: tropical Africa, E, SE, and S Asia; one species in China.

**1. *Phaulopsis dorsiflora*** (Retzius) Santapau, *Kew Bull.* [3]: 276. 1948.

肾苞草 shen bao cao

*Ruellia dorsiflora* Retzius, *Observ. Bot.* 6: 31. 1791; *Aetheilema anisophyllum* (Jussieu) E. Meyer (1837), not R. Brown (1810); *A. parviflorum* Sprengel; *A. reniforme* Nees; *Blechnum anisophyllum* Jussieu; *Micranthus dorsiflorus* (Retzius) C. E. C. Fischer; *M. oppositifolius* J. C. Wendland; *Phaulopsis oppositifolia* (J. C. Wendland) Lindau; *P. parviflora* Willdenow, nom. illeg. superfl.

Herbs 30–50 cm tall, slightly anisophyllous. Stems as-

ending, 4-angled, brown retrorsely pubescent. Petiole 4–6 cm; leaf blade ovate to elliptic, 7.5–11 × 3.5–5 cm, papery, abaxially pubescent along veins, adaxially hirsute, secondary veins ca. 6 on each side of midvein, base cuneate to attenuate and slightly oblique, margin entire, apex acuminate. Spikes terminal, 3–6 cm; bracts orbicular to reniform, ca. 1 × 1.4 cm, gland-tipped pubescent. Calyx lobes outside gland-tipped pubescent; posterior lobe ovate-elliptic, 8–10 mm, bractlike, other lobes linear to subulate and 5–6 mm. Corolla white, ca. 6 mm; lower lip 3-lobed, lobes ovate-oblong and 1–2.4 × 0.6–1 mm; upper lip narrow, 2-lobed. Staminal filaments glabrous. Ovary apex sparsely gland-tipped pubescent; style pilose. Capsule ellipsoid, ca. 6

mm, apex gland-tipped pubescent. Seeds ca.  $2 \times 1.5$  mm. Fl. Nov–May, fr. Feb–Jul.  $2n = 56$ , ca. 64, 70.

Thickets, roadsides, along streams; 300–800 m. S and W Yunnan

[Bangladesh, Bhutan, India, Myanmar, Thailand, Vietnam; ?South Africa, Indian Ocean islands (Réunion), ?Madagascar].

Collections identified as *Phaulopsis dorsiflora* from South Africa and Madagascar remain questionable as to their source.

## 9. *HYGROPHILA* R. Brown, Prodr. 479. 1810.

水蓼衣属 shui suo yi shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Adenosma* Nees (1847), not R. Brown (1810); *Asteracantha* Nees; *Cardanthera* Buchanan-Hamilton ex Benth. & J. D. Hooker; *Hemidelphis* Nees; *Kita* A. Chevalier; *Nomaphila* Blume; *Physichilus* Nees; *Polyechma* Hochstetter; *Santapaua* N. P. Balakrishnan & K. Subramanyam; *Synnema* Benth.; *Tenoria* Dehnhardt & Giordano (1832), not Sprengel (1813).

Herbs, annual or perennial, often aquatic or hygrophilous, sometimes with axillary spines, cystoliths present. Leaves sessile or shortly petiolate; leaf blade margin entire, crenulate, or sometimes undulate. Flowers sessile, in terminal spikes or several in axillary clusters; bracteoles present or absent. Calyx 5-lobed. Corolla ventricose; limb 2-lipped, lower lip 3-lobed, upper lip apex shallowly dentate; lobes contorted in bud. Stamens 2 or 4, didynamous (posterior pair similar to anterior pair or smaller); anthers 2-theous; thecae equally inserted; staminodes 0 or 2. Ovary with 4 to many ovules per locule; stigma entire or 2-dentate. Capsule linear-ellipsoid to narrowly oblong, many seeded; retinacula present. Seeds discoid, covered with long mucilaginous trichomes.

About 100 species: widely distributed in tropical and subtropical regions; six species (one endemic) in China.

- 1a. Stamens 2 ..... 1. *H. polysperma*
- 1b. Stamens 4.
  - 2a. Flowers in terminal spikes ..... 2. *H. biplicata*
  - 2b. Flowers solitary or clustered in leaf axils.
    - 3a. Leaf blade glabrous or scabrous-hirsute.
      - 4a. Leaf blade glabrous or slightly pubescent ..... 3. *H. ringens*
      - 4b. Leaf blade scabrous-hirsute ..... 4. *H. pogonocalyx*
    - 3b. Leaf blade densely strigose or hirsute on both surfaces.
      - 5a. Calyx ca. 0.7 cm; corolla ca. 1.5 cm ..... 5. *H. erecta*
      - 5b. Calyx ca. 1.1 cm; corolla 1.8–2.2 cm ..... 6. *H. phlomoideis*

1. *Hygrophila polysperma* (Roxburgh) T. Anderson, J. Linn. Soc., Bot. 9: 456. 1867.

小狮子草 xiao shi zi cao

*Justicia polysperma* Roxburgh, Fl. Ind. 1: 120. 1820; *Adenosma polysperma* (Roxburgh) Sprengel; *Hemidelphis polysperma* (Roxburgh) Nees.

Annuals [or perennials] 10–20 cm tall. Stems often prostrate, 4-angled, slightly swollen above nodes, puberulent, soon glabrescent. Petiole to 5 mm; leaf blade oblong-lanceolate to ovate,  $2\text{--}3.5 \times 0.6\text{--}1.3$  cm, glabrous, base attenuate, margin entire, apex subobtus. Inflorescences terminal spikes, 1.3–5 cm; bracts imbricate, ovate, elliptic, or obovate,  $5\text{--}10 \times 1.5\text{--}3.5$  mm, both surfaces densely hirtellous, apex obtuse; bracteoles lanceolate,  $3.5\text{--}5 \times 0.5\text{--}1$  mm, margin ciliate. Calyx 3.5–6 mm; lobes lanceolate, 2.5–3 mm, unequal, pubescent, apex acuminate. Corolla white, ca. 6 mm; tube ca. 3.5 mm; lower lip ca. 2 mm, 3-lobed, lobes orbicular and subequal; upper lip oblong-ovate, ca. 1 mm, 2-lobed. Stamens 2, slightly exserted; filaments ca. 1 mm, coherent into a membrane near base; anther thecae subequal; staminodes 2, bristlelike, short. Capsule linear-oblong, 5.5–8 mm, pubescent with non-gland-tipped trichomes (also glabrous?), 20–30-seeded. Seeds ca.  $1 \times 0.5$  mm. Fl. Sep–Nov, fr. Oct–Jan.  $2n = 32$ .

Streamsides; below 600 m. Guangdong, Guangxi, Taiwan, Yunnan [Bhutan, India, Myanmar, Sri Lanka, Vietnam].

*Hygrophila polysperma* is a problematic (e.g., invasive) naturalized weed in some tropical and temperate regions outside of its native range.

2. *Hygrophila biplicata* (Nees) Sreemadhavan, Bull. Bot. Surv. India 10: 223. 1969.

连丝草 lian si cao

*Adenosma biplicata* Nees in Wallich, Pl. Asiat. Rar. 3: 79. 1832; *Cardanthera avana* (Wallich ex Benth.) Benth. ex C. B. Clarke; *Hygrophila avana* (Wallich ex Benth.) E. Hossain; *Pedicularis avana* Wallich ex Benth.; *Synnema avanum* (Wallich ex Benth.) Benth.

Annuals to 30 cm tall, ascending. Stems 4-angled, hirsute. Leaves sessile; leaf blade oblong,  $2.5\text{--}3.8 \times 1\text{--}1.8$  cm, white pubescent, secondary veins 3–5 on each side of midvein, base truncate to subcordate, margin crenulate, apex obtuse. Inflorescences terminal spikes, 2.5–10 cm; bracts narrowly elliptic, 6–8  $\times$  3–4 mm, margin crenulate or dentate; bracteoles linear, ca. 8  $\times$  3 mm. Calyx 8–9 mm, inside white hirsute; lobes linear, margin ciliate. Corolla purple, 1.2–1.6 cm, outside pilose; lower lip elliptic, ca. 8  $\times$  5 mm, 3-dentate, lobes triangular and ca. 1  $\times$  1 mm; upper lip oblong-ovate, ca. 6  $\times$  3 mm, 2-dentate. Stamens 4, slightly exserted; filaments with longer pair ca. 3 mm and shorter pair ca. 2 mm; anther thecae ca. 1 mm. Ovary ca. 3 mm, comose; style ca. 1 cm, hirsute. Capsule ca. 8 mm, pubescent. Fl. Dec, fr. Mar.

Paddy fields, wet places; 800–1000 m. Yunnan [Myanmar, Thailand].

**3. *Hygrophila ringens*** (Linnaeus) R. Brown ex Sprengel, Syst. Veg. 2: 828. 1825.

水蓼衣 shui suo yi

Perennials to 80 cm tall, branched. Stems erect or decumbent at base, 4-angled, striate, slightly pubescent. Petiole 0.5–1 cm, glabrous; leaf blade narrowly lanceolate to oblanceolate, 3–10 × 0.5–1.5 cm, both surfaces with numerous cystoliths and glabrous or slightly pubescent, secondary veins 8–11 on each side of midvein, base attenuate and decurrent onto petiole, margin entire or slightly undulate, apex acute to obtuse. Flowers (solitary or) 2–10 clustered in leaf axils, sessile; bracteoles narrowly ovate, 3–5 mm, margin pubescent, apex obtuse. Calyx narrowly campanulate, ca. 6 mm, 5-lobed to middle; lobes linear-lanceolate, grayish pubescent or fulvous strigose, apex acuminate. Corolla pale purple, 1–2.5 cm; tube ca. 7 mm, ca. 2 mm wide, glabrous; limb 2-lipped; lower lip obovate, ca. 3 mm, 3-lobed to middle, lobes ovate with an obtuse apex; upper lip elliptic, ca. 3 mm, shallowly 2-lobed, outside puberulent. Stamens 4, included; filaments glabrous, longer pair ca. 5 mm, shorter pair ca. 3 mm; anther thecae 1–2 mm. Ovary glabrous; style filiform, ca. 8 mm, included; stigma unequally 2-lobed. Capsule narrowly oblong, 0.8–2.2 cm, ca. 1.5 mm wide, glabrous, 12–18-seeded. Seeds ca. 1 mm, pubescent. Fl. Aug–Oct, fr. Dec–Feb.

Along streams, wet places; below 1000 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam].

- 1a. Bracts and calyx grayish pubescent ..... 3a. var. *ringens*  
1b. Bracts and calyx fulvous strigose ..... 3b. var. *longihirsuta*

**3a. *Hygrophila ringens* var. *ringens***

水蓼衣(原变种) shui suo yi (yuan bian zhong)

*Ruellia ringens* Linnaeus, Sp. Pl. 2: 635. 1753; *Dipteracanthus ringens* (Linnaeus) Abeyewickrama; *Hygrophila angustifolia* R. Brown; *H. lancea* (Thunberg) Miquel; *H. megalantha* Merrill; *H. quadrivalvis* (Buchanan-Hamilton) Nees; *H. salicifolia* (Vahl) Nees; *H. salicifolia* var. *megalantha* (Merrill) H. S. Lo & L. D. Chou; *Justicia lancea* Thunberg; *R. quadrivalvis* Buchanan-Hamilton; *R. salicifolia* Vahl.

Calyx grayish pubescent. Corolla to 1.2 cm.

Along streams, wet places; below 1000 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam].

**3b. *Hygrophila ringens* var. *longihirsuta*** (H. S. Lo & D. Fang) Y. F. Deng, **comb. nov.**

贵港水蓼衣 gui gang shui suo yi

Basionym: *Hygrophila salicifolia* (Vahl) Nees var. *longihirsuta* H. S. Lo & D. Fang, Guihaia 17: 41. 1997.

Flowers 2 to several in a cluster; bracts and calyx fulvous strigose. Corolla 1.2–1.7 cm.

- Along streams; 200–300 m. Guangxi.

**4. *Hygrophila pogonocalyx*** Hayata, Icon. Pl. Formosan. 9: 81. 1920.

大安水蓼衣 da an shui suo yi

Annuals to 50 cm tall. Stems erect, 4-angled, internodes subglabrous, nodes densely hirsute. Leaves sessile; leaf blade linear-lanceolate, 5–9 × 0.7–1.2 cm, papery, both surfaces scabrous-hirsute, secondary veins 5–7 on each side of midvein, base broadly attenuate, margins subentire, apex obtuse. Flowers several clustered in leaf axils, sessile; bracteoles ovate to lanceolate, ca. 1.5 × 0.4–0.6 cm, abaxially glabrous, adaxially strigose, apex acuminate. Calyx ca. 1.5 cm, 5-lobed to middle; lobes linear, subequal, apex acuminate. Corolla ca. 2.5 cm; lower lip ± spreading, 3-lobed; lobes of lower lip oblong, 2.5–3 × ca. 2 mm, subequal, inside barbate, apex obtuse; upper lip erect, ca. 1 cm, 2-lobed. Stamens 4; anther thecae ca. 3 mm. Ovary ca. 2.5 mm, glabrous; style glabrous. Fl. Aug–Oct, fr. Oct–Jan.

- Wet places. Taiwan.

**5. *Hygrophila erecta*** (N. L. Burman) Hochreutiner, Candollea 5: 230. 1934.

小叶水蓼衣 xiao ye shui suo yi

*Ruellia erecta* N. L. Burman, Fl. Indica, 135. 1768; *Hygrophila phlomoides* Nees var. *roxburghii* C. B. Clarke.

Perennials to 1 m tall. Stems erect, 4-angled, 2-sulcate. Petiole (0–)3–5 mm, sulcate, hispid; leaf blade elliptic, obovate, or oblong, 2–9 × 1–3 cm, with numerous cystoliths, both surfaces densely strigose, secondary veins 8–15 on each side of midvein and abaxially prominent, base decurrent onto petiole, margin entire or slightly undulate, apex acute to obtuse. Flowers several clustered in leaf axils, sessile; bracteoles linear-oblong, ca. 6 mm, densely hispid-ciliate. Calyx ca. 1.1 cm, 5-lobed to middle; lobes linear-lanceolate, densely white hispid-ciliate. Corolla purplish blue, 1.8–2.2 cm, pilose; tube basally cylindric for ca. 5 mm and ca. 2 mm wide then gradually widened to ca. 6 mm at mouth; limb 2-lipped; lower lip oblong, 3-lobed, lobes ovate and ca. 2 × 2 mm; upper lip triangular, 2-lobed. Stamens 4; filaments glabrous, longer pair ca. 6 mm, shorter pair ca. 3 mm; anther thecae ca. 2 mm. Ovary glabrous; style pilose. Capsule 1.2–1.5 cm. Seeds blackish brown, ca. 1.5 × 1 mm, pubescent.

Wet places; below 1000 m. Guangdong, Hainan, Yunnan [India, Laos, Myanmar, Thailand, Vietnam].

**6. *Hygrophila phlomoides*** Nees in Wallich, Pl. Asiat. Rar. 3: 80. 1832.

毛水蓼衣 mao shui suo yi

Perennials to 1 m tall, erect. Stems 4-angled, brown strigose. Petiole 0–3 mm, hirsute; leaf blade elliptic, obovate, or oblong, 2–9 × 1–3 cm, papery, cystoliths dense, both surfaces hirsute, secondary veins 8–15 on each side of midvein, base

usually attenuate and decurrent onto petiole, margin entire or undulate, apex acute to sometimes obtuse. Flowers axillary, several clustered or in whorls upward; bracteoles linear-oblong, ca.  $5 \times 2$  mm, hirsute. Calyx ca. 1.1 cm, white hirsute, 5-lobed to middle; lobes linear. Corolla 1.8–2.2 cm, pubescent; lower lip oblong, sparsely pilose, 3-lobed; upper lip triangular, 2-lobed.

Stamens 4; filaments glabrous, longer pair ca. 5 mm, shorter pair ca. 3 mm; anther thecae ca. 2 mm. Ovary glabrous; style ca. 1.8 cm, pubescent. Capsule not seen.

Wet places; below 1200 m. Yunnan [Cambodia, India, Indonesia, Laos, Myanmar, Pakistan, Philippines, Thailand, Vietnam].

## 10. *ERANTHEMUM* Linnaeus, Sp. Pl. 1: 9. 1753.

可爱花属 ke ai hua shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Daedalacanthus* T. Anderson; *Pigafetta* Adanson; *Upudalia* Rafinesque.

Shrubs or perennial erect herbs with cystoliths. Leaves petiolate; leaf blade margin entire or crenate. Inflorescences terminal or rarely axillary, spikes, lax, sometimes several forming a panicle; bracts sometimes colored, subleafflike, large; bracteoles small, narrow. Calyx 5-lobed; lobes narrow, subequal. Corolla subsalverform; tube basally cylindric, long, slender, throat sometimes inconspicuous; limb 5-lobed; lobes obovate, subequal, contorted in bud. Stamens 2, inserted below throat; anthers 2-theous; thecae parallel, muticous; staminodes 2, clavate or filiform. Ovary with 2 ovules per locule; style filiform, glabrous or pubescent; stigma 2-lobed, lobes unequal. Capsule with a solid stalk at base, clavate, 4-seeded; retinacula present. Seeds discoid, compressed, pubescent with hygroscopic trichomes.

About 15 species: tropical and subtropical Asia; two species (one endemic) in China.

The Himalayan species *Eranthemum splendens* (T. Anderson) Bremekamp & Nannenga-Bremekamp reported from S Yunnan (FRPS 70: 60. 2002) is not treated here because no material has been seen by the authors. *Eranthemum pulchellum* Andrews is widely cultivated in S and SW China as an ornamental.

- 1a. Petiole ca. 0.5 cm; bracts oblong to lanceolate; stamens included; capsule gland-tipped pubescent ..... 1. *E. tetragonum*  
1b. Petiole 0.7–2.5 cm; bracts ovate to elliptic; stamens exserted; capsule glabrous ..... 2. *E. austrosinense*

**1. *Eranthemum tetragonum*** A. Dietrich ex Nees in A. Candolle, Prodr. 11: 454. 1847.

云南可爱花 yun nan ke ai hua

Herbs to 1 m tall. Stems 4-angled, glabrous or pubescent. Petiole ca. 5 mm; leaf blade lanceolate to linear-lanceolate to oblong,  $6\text{--}20 \times 2\text{--}4$  cm, glabrous, secondary veins ca. 5 on each side of midvein, base attenuate and decurrent onto petiole, margin entire or crenulate, apex acuminate. Spikes 3–8 cm; peduncle 2–37 mm, gland-tipped pubescent; bracts yellowish white with green along veins, oblong to lanceolate,  $1\text{--}2.2 \times 0.2\text{--}0.9$  cm, apex acuminate; bracteoles lanceolate, ca. 4 mm, gland-tipped pubescent. Calyx ca. 6 mm, outside pilose, 5-lobed to middle; lobes lanceolate, ca. 1 mm wide. Corolla blue to light purple, ca. 4.5 cm, gland-tipped pubescent; tube basally cylindric for ca. 3 cm; lobes obovate, ca.  $6 \times 5$  mm. Stamens included; filaments ca. 3 mm, glabrous. Ovary gland-tipped pubescent; style hirsute. Capsule 1–1.4 cm, gland-tipped pubescent. Seeds gold to reddish brown to blackish,  $3\text{--}3.5 \times 2.2\text{--}2.7$  mm. Fl. Dec–Mar.

Forests or thickets; 400–800 m. Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

*Eranthemum tetragonum*, at least under this name, was not included by C. C. Hu (FRPS 70: 1–397. 2002).

**2. *Eranthemum austrosinense*** H. S. Lo, Acta Phytotax. Sin. 17(4): 85. 1979.

华南可爱花 hua nan ke ai hua

Herbs to 50 cm tall. Stems 4-angled, pubescent. Petiole 0.7–2.5 cm, pilose; leaf blade elliptic, ovate, or elliptic-ovate,  $2\text{--}10 \times 1\text{--}4.5$  cm, abaxially pubescent along veins, adaxially glabrous and cystoliths obviously subulate, secondary veins 4–6 on each side of midvein, base cuneate to subrounded and usually decurrent onto petiole, margin entire, apex acute to acuminate. Spikes 3–11 cm; peduncle 1.5–3 cm, densely villous; bracts yellowish white with green along veins, ovate to elliptic,  $1.2\text{--}2 \times 0.4\text{--}0.8$  cm, abaxially villous, adaxially glabrous, margin ciliate; bracteoles triangular-ovate,  $5\text{--}6 \times$  ca. 1.5 mm, margin ciliate, apex acute. Calyx 5–7 mm, outside pilose, 5-lobed to middle; lobes lanceolate, ca. 1 mm wide. Corolla bluish purple, glabrous or pubescent; tube basally cylindric for 2.5–3 cm, throat ca. 4 mm; lobes obovate,  $6\text{--}8 \times 5\text{--}8$  mm, apex 2-lobed. Stamens exserted; filaments 3–4 mm. Ovary glabrous or pubescent; style pilose. Capsule 1–1.5 cm, glabrous or pubescent. Seeds black, ca.  $4 \times 3$  mm.

• Forests, thickets in ravines; 100–700 m. Guangdong, Guangxi, Guizhou, Yunnan.

- 1a. Corolla glabrous; ovary pilose ..... 2a. var. *austrosinense*  
1b. Corolla pubescent; ovary glabrous .... 2b. var. *pibipetalum*

**2a. *Eranthemum austrosinense* var. *austrosinense***

华南可爱花(原变种) hua nan ke ai hua (yuan bian zhong)

Corolla glabrous. Ovary pilose.

• Guangdong, Guangxi, Guizhou, Yunnan.

**2b. *Eranthemum austrosinense* var. *pubipetalum*** (S. Z. Huang ex H. P. Tsui) T. L. Li & Y. F. Deng, J. Trop. Subtrop. Bot. 15: 260. 2007.

毛冠可爱花 mao guan ke ai hua

*Eranthemum pubipetalum* S. Z. Huang ex H. P. Tsui, Fl. Reipubl. Popularis Sin. 70: 347. 2002.

Corolla pubescent. Ovary glabrous.

• Forests, thickets in ravines; 100–700 m. Guangxi, Guizhou, Yunnan.

## 11. *ECHINACANTHUS* Nees in Wallich, Pl. Asiat. Rar. 3: 75, 90. 1832.

恋岩花属 *lian yan hua shu*

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs or perennial herbs. Leaves opposite; leaf blade margin entire. Inflorescence axillary or terminal, branched cymes; bracts narrow to subleaflike; bracteoles inconspicuous or absent. Calyx often gland-tipped hairy, deeply 5-lobed; lobes equal or subequal. Corolla purple or yellow, funnel-shaped to campanulate; tube ventricose; limb 5-lobed; lobes subequal, contorted in bud. Stamens 4, didynamous; filaments connate at base into 2 pairs; anthers 2-theous; thecae parallel, hirsute, spurred at base. Ovary with 4–8 ovules per locule; stigma 2-lobed, one lobe reduced. Capsule linear-cylindric to linear-oblong, 8–16-seeded; retinacula present. Seeds subovate in outline, compressed, covered with hygroscopic trichomes.

Four species: Bhutan, China, India, Nepal, Vietnam; three species (two endemic) in China.

1a. Herbs to 20 cm tall ..... 1. *E. longipes*

1b. Subshrubs or shrubs more than 50 cm tall.

2a. Corolla purple, 2–2.5 cm, outside glabrous; anther thecae each with 2 basal spurs ..... 2. *E. longzhouensis*

2b. Corolla yellow, ca. 4 cm, outside pubescent; anther thecae each with 1 basal spur ..... 3. *E. lofouensis*

**1. *Echinacanthus longipes*** H. S. Lo & D. Fang, Acta Bot. Yunnan. 7: 138. 1985.

长柄恋岩花 *chang bing lian yan hua*

Herbs 5–20 cm tall, perennial, caulescent or acaulescent. Petiole 1.8–4.5(–5.5) cm, densely hirsute; leaf blade oblong to lanceolate-oblong, rarely ovate or oblanceolate, 3–7(–11) × 1.5–3(–4) cm, papery, both surfaces densely covered with cystoliths, abaxially pilose or sometimes only hairy along veins, adaxially dark grayish brown when dry and subglabrous, midvein raised on both surfaces, secondary veins 5–7 on each side of midvein and raised on both surfaces, base oblique and rounded to broadly cuneate, margin entire or slightly crenulate, apex acuminate to obtuse. Cymes axillary, (1 or)2–4(or 5)-flowered; peduncle 2–10 cm, densely hirsute; bracts subleaflike, ovate to ovate-elliptic, 8–10 × 4–7 mm. Calyx lobes linear, 1–1.2 cm but to 1.7 cm in fruit, white pilose. Corolla purple, ca. 4 cm, straight, outside subglabrous; tube cylindric and ca. 2.5 mm wide for 1.3–1.5 cm then gradually widened to ca. 1 cm at mouth; lobes oblong, 6–8 × 5–6 mm. Staminal filaments 5–6 mm; anther thecae ovoid, ca. 3 mm, subequal, ciliate, each with 1 spur at base. Ovary densely pilose; style ca. 3.2 cm, pilose; stigma 2-lobed, with one lobe longer. Capsule cylindric, ca. 1.1 cm, densely pilose, 12–16-seeded. Seeds elliptic in outline, ca. 1.5 mm, margin white. Fl. Apr–Jun, fr. Aug–Sep.

Limestone hills in forests; 500–2000 m. Guangxi, Yunnan [Vietnam].

**2. *Echinacanthus longzhouensis*** H. S. Lo, Acta Bot. Yunnan. 7: 140. 1985.

龙州恋岩花 *long zhou lian yan hua*

Shrubs to 3 m tall. Older stems grayish brown, subterete, lenticellate and tuberculate; young stems 4-angled, pilose. Peti-

ole 1–2(–3.5) cm, pubescent; leaf blade elliptic to ovate, 4.5–8.5 × 1.5–4.5 cm, leathery, both surfaces glabrous, secondary veins 6 or 7 on each side of midvein and slender, base broadly cuneate, margin entire, apex acute. Cymes axillary, 1–3-flowered; peduncle 1.5–3 cm, pubescent; bracts narrowly lanceolate, 10–15 × ca. 1 mm, pubescent. Calyx 1–1.2 cm, abaxially gland-tipped hirsute, adaxially hirsute; lobes linear, apex acuminate. Corolla purple, 2–2.5 cm, both surfaces glabrous; tube basally cylindric and ca. 1.5 mm wide for 5–8 mm then gradually widened to ca. 8 mm at mouth; lobes oblong, ca. 4 × 3 mm, apex retuse. Staminal filament longer pair ca. 1 cm and shorter pair ca. 0.6 cm, pilose; anther thecae with 2 spurs at base. Ovary pubescent; style ca. 1.4 cm, pubescent. Capsule linear-oblong, 1.3–1.4 cm, densely pubescent, usually 8-seeded. Seeds globose, ca. 3 × 3 mm. Fl. Aug.

• Limestone hills in forests; 300–400 m. Guangxi.

**3. *Echinacanthus lofouensis*** (H. Léveillé) J. R. I. Wood, Edinburgh J. Bot. 51: 186. 1994.

黄花恋岩花 *huang hua lian yan hua*

*Strobilanthes lofouensis* H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 99. 1913; *Echinacanthus flaviflorus* H. S. Lo & D. Fang.

Shrubs 1–3 m tall. Stems 4-angled, lenticellate, subglabrous. Petiole 0.5–2 cm, shortly hirsute; leaf blade ovate, lanceolate, or narrowly lanceolate, (2–)6–12 × (1–)1.5–3 cm, abaxially pubescent in vein axils, adaxially glabrous, midvein usually barbate, secondary veins 5 or 6 on each side of midvein, base broadly cuneate to subrounded, margin entire, apex acuminate. Cymes axillary, usually (1–)3-flowered; peduncle 1–2 cm, pubescent; bracts subleaflike, 1–1.5 × 0.5–1 cm, caducous. Calyx 1.2–1.4 cm but to 1.8 cm in fruit, both surfaces densely white pubescent; lobes linear, apex acuminate. Corolla yellow,

ca. 4 cm, outside pubescent; tube basally ca. 3 mm wide for ca. 1 cm then expanding to mouth; lobes semicircular, ca. 5 mm. Staminal filaments 1–1.3 cm, densely villous; anther thecae ovoid, ca. 3 mm, each with 1 spur at base. Ovary densely vil-

lous; style pilose. Capsule linear-oblong, ca. 1.5 cm, densely pubescent, 8–12-seeded. Fl. May–Oct.

● Limestone hills in forests; 500–1000 m. Guangxi, Guizhou.

## 12. *PARARUELLIA* Bremekamp & Nannega-Bremekamp, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Sect. 2, 45(1): 25. 1948.

地皮消属 di pi xiao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, perennial. Stems short. Leaves opposite, rosulate, petiolate; leaf blade margin undulate, crenulate, or rarely subentire. Inflorescences terminal, spikes or thyrses; bracts usually subleaflike; bracteoles present. Flowers sessile. Calyx subequally to equally 5-lobed. Corolla white, bluish, or pink; tube basally cylindric and slender, apically expanded into a throat; limb 5-lobed; lobes subequal, contorted in bud, apex rounded or obtuse. Stamens 4, didynamous, inserted at base of throat; filaments glabrous; anthers 2-theous; thecae usually widely separated by a broad connective,  $\pm$  parallel; staminodes absent. Ovary glabrous, with 4–8 ovules per locule; style pubescent; stigma pubescent, 2-cleft, upper lobe very short or reduced. Capsule cylindric, not stipitate, 8–16-seeded; retinacula present. Seeds lenticular, pubescent with hygroscopic hairs.

About ten species: SE Asia, China; five species (all endemic) in China.

*Pararuellia* is purported to differ from *Ruellia* by its pollen, which has “minute prickles, papillae or granules (not a honey-combed pattern)” (C. B. Clarke, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 649. 1908) or at least papillae on the muri of reticulations (C. C. Hu et al., Acta Phytotax. Sin. 43: 123–150. 2005). Because such structures are also known from some species of *Ruellia* (C. A. Furness & M. C. Grant, Grana 35: 231–239. 1996), the generic status of *Pararuellia* is questionable and deserves additional study.

- 1a. Bracts longer than rachis internodes, imbricate, homomorphic; spikes cylindric; flowers imbricate on rachis ..... 1. *P. glomerata*
- 1b. Bracts shorter than rachis internodes, distant, usually heteromorphic; spikes not cylindric; flowers distant on rachis.
- 2a. Spikes usually with 1 or 2(or 3) nodes ..... 5. *P. delavayana*
- 2b. Spikes with 4 to many nodes.
- 3a. Rachis usually zigzag, winged below nodes ..... 2. *P. alata*
- 3b. Rachis straight, wingless.
- 4a. Bracts oblong, elliptic, or ovate, usually subtending many flowers ..... 3. *P. cavaleriei*
- 4b. Bracts cordate to suborbicular, usually subtending only 1 flower ..... 4. *P. hainanensis*

1. *Pararuellia glomerata* Y. M. Shui & W. H. Chen, Bot. Stud. (Taipei) 50: 261. 2009.

云南地皮消 yun nan di pi xiao

Herbs to 20 cm tall, often rooting at nodes. Stems 1–2 cm, with 2–4 internodes; internodes constricted, 0.5–1.1 cm. Petiole 1.3–3.4 cm, densely hispid; leaf blade oblanceolate, obovate-oblong, or spatulate, 4–6.2  $\times$  1.8–3.2 cm, abaxially densely hispid, adaxially slightly hispid, secondary veins 6–9 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin erose to crenate, apex rounded to obtuse. Spikes cylindric, (0.6–)3.2–5.4 cm, several flowered; peduncle 0.7–5 cm and elongating to 13 cm in fruit, densely hispid; rachis (0.6–)3–5.5 cm and elongating in fruit, densely hispid, with (3 or)4–10 nodes; bracts imbricate, ovate to spatulate, 8–10  $\times$  6–9 mm, densely hispid, apex acute; bracteoles linear-lanceolate, 3–4  $\times$  ca. 1 mm, abaxially hispid especially apically, apex acuminate. Calyx ca. 5 mm; lobes linear, ca. 4  $\times$  0.7 mm and elongating to ca. 6 mm in fruit, subequal, outside hispid. Corolla light purple, bluish, or pink, 1.4–1.7 cm, outside slightly hispid, inside glabrous; lobes suborbicular, 7–8  $\times$  5–7 mm, equal, apex rounded to truncate. Stamen longer pair 1.5–3 mm, shorter pair ca. 0.5 mm; anther thecae ca. 1.1 mm. Ovary 2–2.5 mm, with 5 or 6 ovules per locule; style 0.8–1.4 cm. Capsule 1–1.5 cm, pu-

bescent, 10–12-seeded. Seeds broadly ovate to subcircular in outline, 1–1.5  $\times$  1–1.5 mm, covered with dense long white appressed trichomes. Fl. Apr–Jul, fr. Jun–Aug.

● Thickets on limestone hills in hot dry valleys; 200–500 m. SE Yunnan (Hong He valley).

2. *Pararuellia alata* H. P. Tsui, Novon 18: 33. 2008.

节翅地皮消 jie chi di pi xiao

Herbs to 27 cm tall. Stems hispid. Petiole 2.5–3.5 cm; leaf blade oblong-elliptic to oblanceolate-elliptic, 5–8.5  $\times$  1.5–3.5 cm, glabrous, secondary veins 7–10 on each side of midvein, base cuneate, margin entire, apex rounded to acute. Spikes 3–5 cm, with 4–6 nodes; rachis usually zigzag, winged for ca. 2 mm below nodes; bracts ovate to elliptic, 1.2–6  $\times$  0.8–3 cm, reduced in size apically on rachis, glabrous except for ciliate margin, base rounded, apex acute; bracteoles lanceolate, ca. 5  $\times$  2.5 mm, glabrous except for ciliate margin, margin serrate. Calyx ca. 7 mm, glabrous; lobes linear-triangular, ca. 6  $\times$  1.5 mm, equal. Corolla pink, ca. 1 cm, glabrous; tube basally cylindric and ca. 2 mm wide for ca. 5 mm; lobes oblong, ca. 2  $\times$  2 mm, equal, apex emarginate. Staminal filaments ca. 1 mm; anther thecae ca. 1 mm. Ovary ca. 2 mm; style ca. 7 mm. Capsule ca. 15  $\times$  2.7 mm, glabrous. Seeds broadly ovate to subcircular in outline, ca.

1.3 × 1.3 mm, covered with dense long white appressed trichomes. Fl. Aug–Oct, fr. Nov–Jan.

- Streamsides in forests; 700–800 m. Chongqing, Hubei, Yunnan.

**3. *Pararuellia cavaleriei*** (H. Léveillé) E. Hossain, Notes Roy. Bot. Gard. Edinburgh 32: 409. 1973.

罗甸地皮消 *luo dian di pi xiao*

*Ruellia cavaleriei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 21. 1913.

Herbs to 15 cm tall. Stems ca. 1.5 cm. Petiole 0.7–2.7 cm; leaf blade oblanceolate to spatulate, 4–12 × 1–3 cm, both surfaces sparsely strigose, secondary veins 4–6 on each side of midvein, base attenuate and decurrent onto petiole, margin undulate, apex rounded to acute. Spikes ca. 3 cm, with 4–6 nodes; rachis sparsely strigose; bracts ovate, 1–4 × 0.5–1.5 cm, reduced in size apically on rachis, glabrous, 4–6-veined, base broadly cuneate, apex acute; bracteoles triangular-lanceolate, ca. 3.5 × 1 mm, glabrous. Calyx ca. 5 mm, outside apically glandular pubescent; lobes triangular-lanceolate, ca. 3 × 0.7 mm, equal. Corolla purple, light blue, yellow, or white, ca. 1.5 cm, outside pubescent but soon glabrescent on limb and throat; tube basally cylindric and narrow for ca. 6 mm, throat ca. 4 mm; lobes oblong, ca. 6 × 6 mm, equal, apex emarginate. Stamen longer pair ca. 3 mm, shorter pair ca. 1.5 mm; anther thecae glabrous. Ovary ca. 3 mm; style ca. 1 cm. Capsule ca. 15 × 3 mm, glabrous, 8–12-seeded. Seeds broadly ovate in outline, ca. 1.4 × 1 mm, covered with dense appressed trichomes. Fl. Aug–Oct, fr. Nov–Jan.

- Thickets, forests; 100–1400 m. Guangxi, Guizhou, Yunnan.

**4. *Pararuellia hainanensis*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 593. 1974.

海南地皮消 *hai nan di pi xiao*

Herbs. Petiole 0.5–1.5 cm; leaf blade obovate to oblanceolate, ca. 4.5 × 2.5–4.3 cm, abaxially pubescent, adaxially sparsely strigose, secondary veins ca. 6 on each side of midvein, base cuneate, margin entire, apex rounded, sometimes obtuse, or rarely acute. Spikes with 2–6 nodes; rachis pubescent; bracts cordate-ovate to orbicular, 0.5–3(–6.5) × 0.5–1.8(–6.5)

cm, abaxially strigose, adaxially glabrous; bracteoles lanceolate, 2.5–3 × ca. 0.6 mm. Calyx 5–6 mm, inside sparsely strigose; lobes linear-lanceolate, ca. 3 × 1 mm. Corolla white or blue, ca. 1.2 cm, outside pubescent, inside glabrous; tube basally cylindric and ca. 1 mm wide for ca. 7 mm, throat ca. 2.3 × 4 mm; lobes oblong, ca. 2.5 × 2 mm, subequal. Stamen longer pair ca. 1.9 mm, shorter pair ca. 1 mm; anther thecae ca. 1 mm, glabrous. Ovary ca. 3 mm; style ca. 1.6 cm, white comose. Capsule ca. 1.4 cm, glabrous. Seeds obovate in outline, ca. 1 × 1 mm, covered with dense appressed trichomes. Fl. Jun–Sep, fr. Dec–Mar.

- Rocks or wet places along streams, forests; 100–600 m. Guangxi, Hainan.

**5. *Pararuellia delavayana*** (Baillon) E. Hossain, Notes Roy. Bot. Gard. Edinburgh 32: 409. 1973.

地皮消 *di pi xiao*

*Ruellia delavayana* Baillon, Hist. Pl. 10: 408. 1891; *Hemigraphis drymophila* Diels; *Pararuellia drymophila* (Diels) C. Y. Wu & H. S. Lo; *R. arcuata* Lingelsheim & Borza; *R. drymophila* (Diels) Handel-Mazzetti; *R. esquirolii* H. Léveillé.

Herbs. Stems 1–2 cm. Petiole 0.5–2 cm; leaf blade oblong to oblong-elliptic, sometimes obovate, elliptic, or lanceolate, 4–12 × 2.5–4 cm, abaxially pubescent, adaxially strigose, secondary veins 7–9 on each side of midvein, base cuneate and decurrent onto petiole, margin undulate to crenate, apex acute, obtuse, or rounded. Spikes ca. 4 cm, with 1–3 nodes; bracts elliptic to ovate, 1–4.7 × 0.5–2.5 cm, reduced in size apically on rachis, both surfaces sparsely strigose, base rounded, margin ciliate, apex acute to obtuse; bracteoles linear, ca. 7 × 1 mm. Calyx ca. 8 mm; lobes triangular-lanceolate, ca. 7 × 1 mm, margin apically ciliate. Corolla white, light blue, or pink, ca. 1.3 cm; tube basally cylindric and narrow for ca. 4 mm, throat ca. 5 mm; lobes orbicular, ca. 4 × 4 mm, subequal, apex emarginate. Stamen longer pair ca. 3.5 mm, shorter pair ca. 1.5 mm; anther thecae oblong, ca. 1 mm. Ovary ellipsoid; style ca. 1.4 cm, white hirsute. Capsule to 2 cm, 16-seeded. Seeds ovate to sub-circular in outline, 1.1–1.4 × 1.1–1.4 mm, covered with dense appressed trichomes. Fl. Jul–Sep, fr. Nov–Feb.

- Forests, slopes; 700–3000 m. Guizhou, S Sichuan, Yunnan.

### 13. *RUELLIA* Linnaeus, Sp. Pl. 2: 634. 1753.

芦莉草属 *lu li cao shu*

Hu Jiaqi (胡嘉琪 *Hu Chia-chi*), Deng Yunfei (邓云飞); Thomas F. Daniel

*Blechnum* P. Browne; *Cryphiacanthus* Nees; *Dipteracanthus* Nees.

Herbs [or shrubs], perennial, prostrate to erect, with cystoliths. Leaves sessile or petiolate; leaf blade margin entire, crenulate, or dentate. Inflorescences axillary or terminal, reduced or expanded dichasia, sometimes forming dichasiate spikes, thyrses, or panicles, sometimes reduced to a solitary flower; bracts opposite, usually green, margin entire; bracteoles 2 [or absent]. Flowers [sessile or] subsessile to pedicellate. Calyx deeply 5-lobed; lobes equal or subequal. Corolla funnel-shaped; tube basally with a narrowly cylindric portion, usually expanded apically into a distinct throat; limb 5-lobed; lobes usually ovate to orbicular, equal to unequal in size, contorted in bud. Stamens 4, didynamous, usually included in corolla tube; filaments sometimes connate in pairs at base; anthers 2-thealous; thecae equal, parallel to subsagittate, muticous at base; staminode 1 or absent. Ovary with up to 10 ovules per locule; style usually included in corolla tube or slightly exserted; stigma 2-lobed, lobes equal or unequal. Capsule stipitate or not stipitate, [4–]12–26-seeded; retinacula present; septa with attached retinacula remaining attached (or separating in *Ruellia blechnum*) to inner wall of mature capsule. Seeds discoid, usually pubescent with hygroscopic trichomes.

About 250 species: tropical to temperate regions worldwide; four species (one endemic, two introduced) in China.

*Blechum* and *Dipteracanthus* are included in *Ruellia* based on morphological and molecular data (C. Ezcurra, Ann. Missouri Bot. Gard. 80: 787–845. 1993; E. Tripp, Syst. Bot. 32: 628–649. 2007; E. Tripp et al., Taxon 58: 893–906. 2009).

- 1a. Flowers in terminal dense 4-sided spikes; septa with retinacula separating from inner wall of mature capsule ..... 1. *R. blechum*  
 1b. Flowers otherwise; septa with retinacula remaining attached to inner wall of mature capsule.  
     2a. Creeping herbs; corolla white, 1.2–2 cm ..... 2. *R. repens*  
     2b. Erect herbs; corolla purplish, 2.2–5.5 cm.  
         3a. Roots lacking tuberlike swellings; flowers sessile ..... 3. *R. venusta*  
         3b. Roots with tuberlike swellings; flowers pedicellate ..... 4. *R. tuberosa*

**1. *Ruellia blechum*** Linnaeus, Syst. Nat., ed. 10, 2: 1120. 1759.

赛山蓝 sai shan lan

*Barleria pyramidata* Lamarck; *Blechum brownei* Jussieu;  
*B. pyramidatum* (Lamarck) Urban.

Herbs to 50 cm tall. Roots lacking tuberlike swellings. Stems slightly 4-angled, often prostrate and rooting at nodes, sparsely pubescent to subglabrous. Petiole 0.5–2.5 cm, strigose; leaf blade ovate, 3–6 × 2–4 cm, abaxially paler and subglabrous, adaxially green, sparsely strigose and densely pilose along veins, secondary veins 5–8 on each side of midvein, base obtuse to rounded and slightly decurrent onto petiole, margin entire, apex acute. Inflorescences terminal, dense spikes, 2–6 cm, subsessile to shortly pedunculate; rachis strigose; bracts subleaflike, ovate, ca. 1.5 × 1.3 cm, abaxially slightly pubescent, margin ciliate; bracteoles 2, lanceolate-ovate, 5–9 × 1.5–3 mm, margin ciliate. Calyx lobes linear to subulate, outside pilose. Corolla white to pale blue, ca. 1.5 cm (cleistogamous flowers sometimes present, these much smaller and budlike), outside puberulent on lobes; lobes ovate, ca. 3 × 2 mm. Stamens with longer pair ca. 4 mm and shorter pair ca. 3 mm; filaments glabrous; anther thecae ca. 1 mm. Ovary comose; style 6–10 mm, slightly hirsute; stigma usually with only 1 lobe evident. Capsule substipitate, ovoid to ellipsoid, ca. 6 mm, puberulent, 8–12-seeded; septa with attached retinacula separating from inner wall of mature capsule. Seeds ca. 1.5 mm in diam., margin with a conspicuous band of appressed hygroscopic trichomes. Fl. Nov, fr. Nov.  $2n = 34$ .

Disturbed sites, drainage ditches; sea level to below 100 m. Naturalized in Taiwan [native to tropical America].

*Ruellia blechum* is widely naturalized in tropical and subtropical areas.

**2. *Ruellia repens*** Linnaeus, Syst. Nat., ed. 12, 2: 424; Mant. Pl. 1: 89. 1767.

楠草 nan cao

*Dipteracanthus lanceolatus* Nees; *D. repens* (Linnaeus) Hasskarl.

Herbs 15–50 cm tall, perennial, creeping. Roots lacking tuberlike swellings. Stems almost 4-angled, finely pubescent or glabrescent. Petiole 3–5 mm; leaf blade ovate to linear-lanceolate, 1.4–4 × 0.8–2 cm, thinly papery, both surfaces sparsely strigose, secondary veins 4 or 5 on each side of midvein, base broadly cuneate to rounded, margin subentire, apex acuminate to acute. Flowers axillary, solitary [or clustered]; bracteoles subleaflike, ovate to ovate-oblong, 8–10 mm. Pedicel to 1 mm.

Calyx lobes lanceolate, ca. 5 mm, margin sparingly ciliate. Corolla white [or pink to light purple], 1.2–2 cm, outside pilose; tube basally ca. 2 mm wide for ca. 5 mm then ventricose and gradually widened to ca. 5 mm at mouth; lobes ovate, ca. 3 × 3 mm, apex obtuse. Stamens with longer pair ca. 5 mm and shorter pair ca. 2 mm; filaments glabrous; anther thecae ca. 1 mm. Ovary comose; style ca. 1 cm, hirsute; stigma lobes unequal. Capsule brownish yellow, stipitate, ca. 1.2 cm, slightly pilose, 12–16-seeded; septa with attached retinacula remaining attached to inner wall of mature capsule. Seeds discoid, ca. 3 mm in diam., margin with a conspicuous band of appressed hygroscopic trichomes. Fl. May–Aug, fr. Jul–Aug.  $2n = 24$ .

Grasslands, roadsides; 100–900 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam].

**3. *Ruellia venusta*** Hance, J. Bot. 6: 92. 1868.

飞来蓝 fei lai lan

*Leptosiphonium venustum* (Hance) E. Hossain; *Ruellia seclusa* S. Moore.

Herbs to 70 cm tall, unbranched or rarely branched. Petiole 3–8 mm; leaf blade oblong-lanceolate, lanceolate, or oblanceolate, 4–14 × 1–3.5 cm, both surfaces glabrous, secondary veins 5–8 on each side of midvein, base cuneate to attenuate and decurrent onto petiole, margin slightly undulate to crenate, apex acute to acuminate. Flowers in axils of leaves or leaflike bracts, solitary or in dichasial clusters, sessile; bracteoles subleaflike, lanceolate to elliptic, 7–30 × 1.5–6.5 mm, abaxially glabrous. Calyx 7–8 mm; lobes lanceolate, outside sparsely pubescent with non-glandular trichomes, adaxially gland-tipped puberulent. Corolla purplish white, 4–5.5 cm; tube basally cylindric and ca. 2 mm wide for 2.2–3.5 cm; lobes 7–17 × 4–6 mm, subequal, apically undulate. Stamens with longer pair ca. 7 mm and shorter pair ca. 4 mm; filaments glabrous; anther thecae ca. 2 mm. Ovary glabrous; style sparsely villous. Capsule ca. 1.3 cm. Fl. Aug–Sep.

• Forests, along streams; 100–800 m. Anhui, Fujian, Guangdong, Guangxi, Hubei, Hunan, Jiangxi.

*Ruellia venusta* was treated under *Leptosiphonium* F. Mueller by C. C. Hu (FRPS 70: 56–58. 2002). *Leptosiphonium* is often treated as a section of *Ruellia*. The generic distinctions between *Leptosiphonium* and most *Ruellia* are based on floral form and color (white or yellowish corollas that are hypocrateriform in *Leptosiphonium*) and likely reflect different pollinators. It is doubtful that the genera are distinct, but the Chinese plants (with their purplish and funnel-form corollas) more closely resemble those of *Ruellia* than *Leptosiphonium*.

**4. *Ruellia tuberosa* Linnaeus, Sp. Pl. 2: 635. 1753.**

芦莉草 *lu li cao*

Herbs to 45 cm tall, perennial, erect. Roots with elongate tuberlike swellings. Stems slightly swollen above nodes, almost 4-angled, strigulose on angles. Petiole to 8 mm, glabrous; leaf blade oblong-obovate, 4–8 × 1.5–4.2 cm, both surfaces glabrous, veins abaxially somewhat prominent, base cuneate and tapering onto petiole, margin undulate to subentire, apex acute. Inflorescences axillary, lax dichotomous cymes; peduncle to 2.3 cm; bracts oblong-lanceolate, to 3–9 × 1–3 mm; bracteoles linear-oblong, to 1.5 mm. Pedicel 6–10 mm, minutely pilose. Calyx tube to 6 mm, outside tomentose; lobes linear-lanceolate, 0.9–2 cm. Corolla pale blue, 2.2–5.5 cm, outside hirtellous;

lobes suborbicular, ca. 1.6 × 1.5 cm. Stamens with longer pair ca. 8 mm and shorter pair ca. 4 mm; filaments glabrous; anther thecae white, hairy on dorsal side. Ovary glabrous except for a few gland-tipped trichomes at apex; style ca. 2.1 cm, sparsely hirsute; stigma 2-lamellate. Capsule not stipitate, linear-ellipsoid, 1.8–2.5 × 0.3–0.4 cm, glabrous except for a few gland-tipped trichomes at apex, 20–26-seeded; septa with attached retinacula remaining attached to inner wall of mature capsule. Seeds discoid, ca. 2 × 2 mm, covered with appressed hygroscopic trichomes. Fl. Dec–Jan, fr. May–Jul.  $2n = 32, 34$ .

Disturbed sites such as roadsides; below 100 m. Naturalized in Taiwan and Yunnan (Hekou) [native to tropical America].

*Ruellia tuberosa* is widely naturalized in tropical areas.

**14. *ASYSTASIA* Blume, Bijdr. 796. 1826.**

十万错属 *shi wan cuo shu*

Hu Jiaqi (胡嘉琪 *Hu Chia-chi*), Deng Yunfei (邓云飞); Thomas F. Daniel

*Intrusaria* Rafinesque.

Herbs or subshrubs, with cystoliths. Leaves petiolate; leaf blade margin entire to crenate. Inflorescences terminal or axillary, unilateral spikes or racemes, or panicles of these; bracts small, shorter than calyx; bracteoles similar to bracts or sometimes absent. Calyx 5-lobed; lobes equal to subequal. Corolla funnel-shaped; tube expanded distally into a throat; limb ± 2-lipped, often appearing subactinomorphic with 5 ± equal lobes; lobes ascending cochlear in bud. Stamens 4, included in or partially exerted from corolla tube; anthers 2-theous; thecae parallel to sagittate to subperpendicular, equally to unequally inserted, base mucous or with a small basal appendage; staminodes 0. Ovary with 2 ovules per locule; stigma capitate, 2-lobed or 2-dentate. Capsule with a solid stalk at base, clavate, up to 4-seeded; retinacula present. Seeds lenticular, lacking trichomes.

About 40 species: tropical and subtropical regions of Old World; four species (one introduced) in China.

- 1a. Corolla ± subsalverform with cylindric basal portion of tube at least 1.5 × as long as throat and limb combined .... 1. *A. neesiana*
- 1b. Corolla ± campanulate with cylindric basal portion of tube less than 1.5 × as long as throat and limb combined.
  - 2a. Leaf blade ovate to elliptic, base truncate to rounded; corolla yellow or white ..... 2. *A. gangetica*
  - 2b. Leaf blade lanceolate to ovate-lanceolate or narrowly ovate, base attenuate; corolla red or purplish red.
    - 3a. Leaf blade (1.2–)1.8–2.8 cm wide, margin entire; corolla 3.5–4 cm, lobes ca. 5 mm wide ..... 3. *A. salicifolia*
    - 3b. Leaf blade 3–5 cm wide, margin undulate-crenulate; corolla ca. 2.2 cm, lobes ca. 3.2 mm wide ..... 4. *A. nemorum*

**1. *Asystasia neesiana* (Wallich) Nees in Wallich, Pl. Asiat. Rar. 3: 89. 1832.**

白接骨 *bai jie gu*

*Ruellia neesiana* Wallich, Pl. Asiat. Rar. 1: 73. 1831; *Asystasia chinensis* S. Moore; *Asystasiella chinensis* (S. Moore) E. Hossain; *A. neesiana* (Wallich) Lindau.

Herbs to 1 m tall. Stems 4-angled, sulcate, 2-fariously puberulent to subglabrous. Petioles 0.5–5 cm, glabrous or sparsely pubescent; leaf blade lanceolate to ovate to elliptic to oblong or uppermost sometimes ovate-cordate, 4–25 × 2–11 cm, both surfaces glabrous or slightly pubescent, secondary veins 6–8, base attenuate and decurrent onto petiole (or cordate for uppermost leaves), margin entire to sinuate-crenate to subdentate, apex acuminate. Inflorescences terminal, spikes or racemes, unbranched or with one or more basal branches forming a panicle, 6–15 cm; rachis usually gland-tipped pubescent; bracts and bracteoles triangular, 1–2 × ca. 1 mm, minutely pubescent. Pedicel (0–)1–3 mm. Calyx 4–6.5 mm; lobes linear-lanceolate, usually gland-tipped pubescent. Corolla pink to purplish blue,

4–6 cm, outside gland-tipped pubescent; tube with cylindric basal portion narrow, elongate, 3–4 cm, at least 2 × as long as throat and limb combined; lobes of lower lip ovate, ca. 6 × 8 mm; lobes of upper lip suborbicular, ca. 7 × 7 mm. Stamens with longer pair ca. 5 mm, shorter pair ca. 2 mm; anther thecae subequally inserted. Style 3.6–5.2 cm, glabrous. Capsule 1.8–2.8 cm, gland-tipped pubescent, 4-seeded, basal stalk 1–1.5 cm. Seeds ovate in outline, ca. 4 × 3 mm, compressed. Fl. Jul–Sep, fr. Oct–Jan.

Evergreen broad-leaved forests, moist banks, streamsides, disturbed sites, ditches, trails; 100–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

*Asystasia neesiana* is sometimes treated in *Asystasiella* Lindau, a genus of two species with spheroidal, 4- or 5-porate, and spinulate (vs. prolate-spheroidal to subprolate, 3-colporate, and reticulate) pollen (see K. Ensermu et al., Kew Bull. 47: 669–675. 1992). The generic position of *Asystasia neesiana* s.l. and some of its relatives has yet to be thoroughly investigated.

This species is used medicinally.

**2. *Asystasia gangetica*** (Linnaeus) T. Anderson, Enum. Pl. Zeyl. 235. 1860.

宽叶十万错 kuan ye shi wan cuo

Herbs to 0.5 m tall, ascending. Stems 4-angled, pilose. Petiole 3–5 mm, pubescent; leaf blade ovate to elliptic, 3–12 × 1–5 cm, glabrous or sparsely pilose especially on veins, adaxially with numerous cystoliths, base truncate to rounded, margin entire or slightly crenulate, apex acuminate. Racemes axillary or terminal, to 16 cm; bracts triangular, ca. 5 mm, pilose; bracteoles linear-lanceolate, 1–2.5 mm, pilose. Pedicel 2–3 mm, pilose. Calyx ca. 7 mm; lobes linear-lanceolate, 5–7 × 1–1.2 mm, outside glandular pilose, margin ciliate. Corolla yellow or white, 1.2–3.5 cm, outside gland-tipped pilose, inside glabrous; tube basally cylindric and ca. 3 mm wide for ca. 8 mm then gradually widened to ca. 1 cm; lobes obovate to semicircular, 0.7–1.2 × 0.8–1 cm; middle lobe of lower lip with violet or maroon markings. Stamens included; filaments glabrous, longer pair ca. 5 mm, shorter pair ca. 3 mm; anther thecae ca. 3 × 1 mm. Ovary ellipsoid, ca. 3.5 mm; style ca. 1.8 cm, velutinous; stigma slightly capitate, 2-lobed. Capsule ca. 1.3 × 2 cm, pubescent. Seeds irregularly obovate in outline, 3–5 × 0.5–3 mm, tuberculate-rugose. Fl. Sep–Dec, fr. Dec–Mar.  $2n = 26, 52$ .

Forest margins, roadsides. Naturalized in Guangdong, Guangxi, Taiwan, and Yunnan [paleotropical; SW Asia].

Cultivated plants of *Asystasia gangetica* have corollas that vary from white to cream to lavender to purple.

- 1a. Corolla 3–3.5 cm, ca. 1 cm wide at mouth, lobes erect ..... 2a. subsp. *gangetica*
- 1b. Corolla 1.2–1.5 cm, ca. 0.5 cm wide at mouth, middle lobe of lower lip slightly reflexed ..... 2b. subsp. *micrantha*

**2a. *Asystasia gangetica* subsp. *gangetica***

宽叶十万错(原亚种) kuan ye shi wan cuo (yuan ya zhong)

*Justicia gangetica* Linnaeus, Cent. Pl. 2: 3. 1756; *Asystasia coromandeliana* Nees.

Corolla 3–3.5 cm, ca. 1 cm wide at mouth, lobes erect.

Forest margins. Naturalized in Guangdong, Guangxi, and Yunnan [tropical Asia; Pacific islands].

*Asystasia gangetica* subsp. *gangetica* occurs from India and Sri Lanka through SE Asia and Malesia to several Pacific islands. Exactly where the subspecies is native in E Asia and eastward is not confirmed.

**2b. *Asystasia gangetica* subsp. *micrantha*** (Nees) Ensermu in Seyani & Chikuni, Proc. XIII Plenary Meeting AETFAT 1: 343. 1994.

小花十万错 xiao hua shi wan cuo

*Asystasia coromandeliana* var. *micrantha* Nees in A. Can-dolle, Prodr. 11: 165. 1847; *A. micrantha* (Nees) Y. F. Deng & N. H. Xia.

Corolla 1.2–1.5 cm, ca. 0.5 cm wide at mouth, middle lobe of lower lip slightly reflexed.

Forest margins, roadsides. Naturalized in Guangdong and Taiwan [Africa, SW Asia, Indian Ocean islands, Madagascar].

**3. *Asystasia salicifolia*** Craib, Bull. Misc. Inform. Kew 1918: 367. 1918.

囊管花 nang guan hua

Herbs to 1 m tall. Stems 4-angled, pilose. Petiole ca. 5 mm, sparsely hirsute; leaf blade lanceolate, (5–)12–18 × (1.2–)1.8–2.8 cm, glabrous or hirsute along veins, secondary veins 6–9 on each side of midvein, base attenuate and decurrent onto petiole, margin entire, apex acuminate. Racemes terminal or rarely axillary, 5–10 cm; bracts triangular, 2–3 × ca. 1 mm, pilose with gland-tipped trichomes; bracteoles similar to bracts. Pedicel 1–3 mm, pilose. Calyx 5–6 mm, outside pilose with gland-tipped trichomes; lobes lanceolate. Corolla red to purplish red, 3.5–4 cm, outside gland-tipped pilose, inside pubescent in throat; lobes ovate, 5–6 × ca. 5 mm. Stamens included; filaments glabrous, longer pair ca. 1 cm, shorter pair ca. 0.8 cm; anther thecae oblong, ca. 3 mm. Ovary pilose; style ca. 2.8 cm, base pilose; stigma apically 2-cleft. Capsule and seeds not seen. Fl. Aug–Oct, fr. Nov–Jan.

Forests. Yunnan [India, Laos, Myanmar, Thailand].

Specimens identified as "*Asystasia henryi*" (C. Y. Wu, Index Fl. Yunnan. 2: 1669. 1984), which is not a validly published name, belong here.

Outside of China variation in *Asystasia salicifolia* also includes corollas pinkish to purplish (or rarely entirely white) and leaf blade margins entire to subsinuate.

**4. *Asystasia nemorum*** Nees in Wallich, Pl. Asiat. Rar. 3: 90. 1832.

十万错 shi wan cuo

Herbs to 1 m tall, perennial. Stems pilose. Leaf blade narrowly ovate to ovate-lanceolate, 6–12 × 3–5 cm, abaxially pilose along veins, adaxially glabrous or pilose along veins, secondary veins 6–9 on each side of midvein, base attenuate, margin undulate-crenulate, apex acuminate. Racemes terminal or axillary, 5–9 cm; bracts triangular, 2–3 × ca. 1 mm, pilose with gland-tipped trichomes; bracteoles similar to bracts. Pedicel 1–2 mm. Calyx 5–6 mm, outside pilose with gland-tipped trichomes; lobes lanceolate. Corolla red to purplish red, ca. 2.2 cm, outside pilose with gland-tipped trichomes, inside barbate in throat; lobes ovate, 4–5 × ca. 3.5 mm, unequal. Ovary and style pilose; stigma slightly 2-cleft. Capsule 1.8–2.2 cm. Seeds irregularly obovate in outline, 2–4 × ca. 2.5 mm, tuberculate-rugose. Fl. Aug–Oct, fr. Nov–Feb.

Paddy fields, streamsides, thickets. Guangdong, Guangxi, Yunnan [India, Laos, Myanmar, Thailand, Vietnam].

The plants misidentified as *Asystasia chelonoides* Nees by C. C. Hu (FRPS 70: 215. 2002) belong here.

*Asystasia salicifolia* can be difficult to distinguish from *A. nemorum*, and Chinese plants treated as these taxa might be conspecific. Indeed, according to R. Kiew and K. Vollesen (Kew Bull. 52: 965–971. 1997), *A. nemorum* has a compact inflorescence with flowers clustered toward the apex, a long and slender corolla tube, blue corollas, and is known only from Peninsular Malaysia (where cultivated) and Java (where native). It is possible that the plants treated here as *A. nemorum* are either not that species or represent cultivated plants of that species (which is used medicinally). *Asystasia* remains much in need of revisionary studies.

**15. PSEUDERANTHEMUM** Radlkofer, Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 13: 282. 1883.

山壳骨属 shan ke gu shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs or shrubs, with cystoliths. Leaves sessile or petiolate; leaf blade margin entire or subentire [or lobed]. Flowers in axillary or terminal thyrses, racemes, or spikes; bracts and bracteoles present, mostly shorter than calyx. Calyx deeply 5-lobed; lobes equal to subequal. Corolla salverform; tube slender, not or scarcely apically enlarged; limb 5-lobed or 2-lipped; lobes  $\pm$  equal or 3 of lower lip slightly larger than 2 of upper lip, ascending cochlear in bud. Stamens 2, included in corolla tube or exerted from corolla mouth (some species heterostylous); anthers 2-theous; thecae equal to subequal, parallel, inserted at same height, mucous; staminodes 2 or absent. Style included or exerted; stigma 2-lobed, lobes equal. Capsule clavate with a long solid stalk, 4-seeded; retinacula present. Seeds lenticular, ornamented or smooth, lacking trichomes.

About 50 species; pantropical; seven species (two endemic) in China.

- 1a. Flowers in thyrses, imbricate on rachis.
  - 2a. Calyx lobes pubescent with gland-tipped trichomes ..... 1. *P. polyanthum*
  - 2b. Calyx lobes pubescent with non-glandular trichomes.
    - 3a. Bracts ca. 7 mm; ovary pubescent; leaf blade 5–15 cm ..... 2. *P. crenulatum*
    - 3b. Bracts ca. 3 mm; ovary glabrous; leaf blade 2.5–5.5 cm ..... 3. *P. shweliense*
- 1b. Flowers in racemes (thyrses in *P. coudercii*), distant on rachis.
  - 4a. Racemes terminal or axillary ..... 4. *P. teysmannii*
  - 4b. Racemes terminal only (or terminal and also rarely in apical leaf axils in *P. haikangense*).
    - 5a. Leaf blade lanceolate, length greater than  $4 \times$  width; filaments of fertile and sterile stamens connate at base ..... 5. *P. coudercii*
    - 5b. Leaf blade elliptic-ovate or elliptic, length less than  $3.5 \times$  width; filaments of fertile and sterile stamens distinct at base. ~
      - 6a. Stems terete, glabrous; bracts and bracteoles 1–3 mm; corolla ca. 4 cm ..... 6. *P. haikangense*
      - 6b. Stems 4-angled, pubescent; bracts and bracteoles 4–6 mm; corolla 2–3 mm ..... 7. *P. latifolium*

**1. *Pseuderanthemum polyanthum*** (C. B. Clarke ex Oliver) Merrill, Brittonia 4: 175. 1941.

多花山壳骨 duo hua shan ke gu

*Eranthemum polyanthum* C. B. Clarke ex Oliver, Hooker's Icon. Pl. 20: t. 2000. 1891.

Herbs. Stems grayish, subterete, glabrescent. Petiole ca. 2.5 cm; leaf blade broadly ovate to oblong,  $7\text{--}17 \times (3\text{--})4\text{--}9$  cm, both surfaces glabrous, secondary veins 7–9 on each side of midvein, base cuneate and decurrent onto petiole, margin entire, apex acute. Thyrses 5–12 cm; bracts triangular,  $3.5\text{--}4 \times$  ca. 1.5 mm; bracteoles ca.  $2 \times 0.5$  mm. Pedicel 1.5–2.5 mm. Calyx ca. 1 cm; lobes lanceolate. Corolla bluish purple; tube 3–3.5 cm; lower lip 3-lobed, lobes oblong and ca.  $1.5 \times 0.6$  cm; upper lip 2-lobed, lobes ca.  $11 \times 3$  mm. Staminal filaments short, distinct, inserted at throat. Ovary pilose; style basally pilose; stigma spherical. Capsule clavate, ca. 2.5 cm, pubescent. Seeds ovate in outline, ca.  $3 \times 3$  mm, verrucose, glabrous. Fl. Apr–Jun, fr. Aug.

Forests, thickets; 300–1600 m. Guangxi, Yunnan [India, Malaysia, Myanmar, Thailand, Vietnam].

Plants misidentified as *Rhinacanthus calcaratus* (Wallich) Nees by C. C. Hu (FRPS 70: 268. 2002) belong here.

**2. *Pseuderanthemum crenulatum*** (Wallich ex Lindley) Radlkofer, Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 13: 286. 1883.

云南山壳骨 yun nan shan ke gu

*Eranthemum crenulatum* Wallich ex Lindley, Bot. Reg. 11: t. 879. 1825; *E. graciliflorum* Nees; *E. malaccense* C. B. Clarke; *Pseuderanthemum graciliflorum* (Nees) Ridley; *P. malaccense* (C. B. Clarke) Lindau.

Subshrubs or shrubs, to 3 m tall. Stems blackish brown, subterete, pubescent. Petiole 1–4 cm, puberulent; leaf blade ovate-elliptic to oblong-lanceolate,  $5\text{--}15 \times 3\text{--}5.5$  cm, abaxially light green and pubescent along veins, adaxially slightly pubescent, secondary veins ca. 7 on each side of midvein, base cuneate to broadly cuneate, margin entire, apex acute to acuminate. Thyrses 3–10 cm, densely flowered; bracts triangular, ca.  $7 \times 3$  mm, brown tomentose; bracteoles subulate,  $3\text{--}4 \times$  ca. 1.5 mm, brown tomentose. Pedicel 1–3 mm, pubescent. Calyx 4–5 mm; lobes linear-lanceolate, densely pubescent with non-glandular trichomes. Corolla white or light purplish,  $3.5\text{--}4.5$  cm, outside finely and sparingly pubescent with gland-tipped trichomes; tube 2.5–3.5 cm; lower lip 3-lobed, lobes oblong and ca. 1 cm; upper lip 2-lobed to middle. Stamens slightly exerted; filaments ca. 3 mm, glabrous; anther thecae ovoid. Ovary pilose; style basally white pilose; stigma spherical. Capsule clavate, ca. 2.5 cm. Seeds subcircular in outline, ca. 3.5 mm in diam., verrucose, glabrous. Fl. Apr–Jun, fr. Aug.

Forests, thickets; 200–1700 m. Guangxi, Guizhou, Yunnan [India, Laos, Malaysia, Thailand, Vietnam].

**3. *Pseuderanthemum shweliense*** (W. W. Smith) C. Y. Wu & C. C. Hu, Fl. Reipubl. Popularis Sin. 70: 226. 2002.

瑞丽山壳骨 rui li shan ke gu

*Eranthemum shweliense* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 176. 1918.

Shrubs 1–2 m tall. Stems woody, grayish, hispid when young. Petiole 3–5 mm, densely brownish hirsute; leaf blade lanceolate, ovate-lanceolate, or elliptic, 2.5–5.5 × 1–2 cm, abaxially sparsely pilose or glabrous but densely brown hairy along veins, adaxially sparsely pilose along veins, base cuneate and decurrent onto petiole, margin entire, apex obtuse to acute. Inflorescences terminal, 7–15 cm; rachis densely yellowish pilose, with flowers fascicled at each node; bracts linear to linear-lanceolate, ca. 3 mm, pilose; bracteoles subulate, ca. 2 mm. Pedicel ca. 2 mm, pilose. Calyx ca. 5 mm; lobes linear-oblong, pilose, apex acute. Corolla white with violet spot on 2 lobes; tube ca. 2.2 cm, outside and inside pilose; lobes 5, ovate, 1.8–1.9 cm. Stamens exserted. Ovary glabrous; style basally sparsely pilose; stigma slightly 2-cleft. Capsule clavate, ca. 2.5 cm. Seeds ovate in outline, ca. 3 mm, verrucose, glabrous. Fl. Feb–May, fr. Jun–Aug.

● Thickets, forest margins; 1200–1800 m. Yunnan.

**4. *Pseuderanthemum teysmannii*** (Miquel) Ridley, Fl. Malay. Penin. 2: 592. 1923 [*“teysmanni”*].

红河山壳骨 hong he shan ke gu

*Strobilanthes teysmannii* Miquel, Fl. Ned. Ind. 2: 799. 1858 [*“teysmanni”*].

Shrubs. Stems reddish brown, 4-angled, glabrous. Petiole to 2.5 cm; leaf blade ovate, 3.5–9.5 × 1.5–4.5 cm, abaxially pubescent along veins, adaxially sparsely pubescent along midvein, secondary veins 8–10 on each side of midvein, base broadly cuneate and decurrent onto petiole, margin subentire, apex acuminate. Racemes terminal or axillary; rachis with flowers 0.5–1.5 cm apart, yellowish brown pubescent; bracts triangular, 2–3 mm, margin ciliate; bracteoles similar to bracts. Pedicel 0–4 mm, pilose. Calyx ca. 5 mm, pubescent; lobes linear, slightly unequal. Corolla pale purple, ca. 3.5 cm; tube ca. 2.5 cm; limb 5-lobed, slightly 2-lipped. Stamens inserted at corolla throat; anthers as long as filaments. Ovary pilose; style ca. 2 cm, slightly white villous; stigma 2-cleft. Capsule clavate, ca. 2.3 cm, sparsely pubescent. Seeds ovate in outline, ca. 3 × 3 mm, verrucose, glabrous. Fl. Apr–Jun, fr. Aug.

Thickets; 100–300 m. Yunnan [Indonesia, S Thailand].

**5. *Pseuderanthemum coudercii*** Benoist, Notul. Syst. (Paris) 5: 111. 1936 [*“couderci”*].

狭叶钩粉草 xia ye gou fen cao

Subshrubs or perennial herbs, 30–50 cm tall. Stems subterete to 4-angled, pubescent, glabrescent. Petiole ca. 5 mm; leaf blade oblong, lanceolate, or linear, 3–11 × 0.2–2.5 mm, both surfaces glabrous, secondary veins 6–12 on each side of midvein, base cuneate, margin entire or slightly undulate, apex acuminate to rarely acute. Thyrses terminal, to 20 cm; rachis pubescent; dichasia 1–4-flowered; basal bracts 1–3, large, leaflike, longer than calyx; apical bracts linear, shorter than calyx, villous; bracteoles linear, villous. Calyx 5–6 mm; lobes linear, vil-

lous. Corolla light purplish red, slightly pubescent; tube ca. 3 cm; lower lip ca. 1.2 cm, lobes ovate to ovate-elliptic; upper lip 2-lobed, lobes oblong. Stamens 2; filaments connate at base; staminodes 2, smaller than stamens. Capsule ca. 1.8 cm, sparsely pubescent. Seeds obovate in outline, ca. 3.5 mm, tuberculate-punctate, glabrous. Fl. Jun–Aug, fr. Sep.

Forests, streamsides; 100–400 m. Hainan [Cambodia].

**6. *Pseuderanthemum haikangense*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 595. 1974.

海康钩粉草 hai kang gou fen cao

Shrubs 40–100 cm tall. Stems terete, glabrous; bark straw-yellow. Petiole 0.5–1.5 cm; leaf blade elliptic-orbicular, oblong, ovate, or rarely lanceolate-elliptic, 5–11.5 × 2–3.5 cm, both surfaces glabrous, secondary veins 5–7 on each side of midvein, base broadly cuneate to rounded, margin entire or inconspicuously undulate, apex shortly acuminate to caudate. Racemes terminal or rarely in apical leaf axils, to 30 cm; bracts narrowly triangular, 2–3 mm; bracteoles 1–2 mm. Pedicel 0–3 mm. Calyx ca. 5 mm; lobes linear-lanceolate, apex acuminate. Corolla white or pink and with red spots on lobes of lower lips, ca. 4 cm, pilose; tube basally ca. 1.5 mm wide for ca. 3 cm; lower lip 3-lobed, lobes narrowly elliptic, ca. 10 × 4 mm, and apex obtuse; upper lip 2-lobed, lobes elliptic, ca. 10 × 6 mm, and apex obtuse. Stamens 2; filaments ca. 2 mm; anther thecae oblong, ca. 1.5 mm; staminodes ca. 1.3 mm. Ovary pilose; style ca. 3 cm, slightly pubescent; stigma slightly 2-cleft. Capsule clavate, 1.9–2 cm, pubescent. Seeds broadly ovate in outline, ca. 3.5 mm, tuberculate-punctate. Fl. Jun–Aug, fr. Sep.

● Forests; 200–900 m. Guangdong, Hainan, Yunnan.

**7. *Pseuderanthemum latifolium*** (Vahl) B. Hansen, Nordic J. Bot. 9: 213. 1989.

山壳骨 shan ke gu

*Justicia latifolia* Vahl, Symb. Bot. 2: 4. 1791; *Antheliacanthus micranthus* Ridley; *Eranthemum palatiferum* (Wallich) Nees; *J. palatifera* Wallich; *Pseuderanthemum palatiferum* (Wallich) Radlkofer.

Herbs to 1 m tall, perennial. Stems 4-angled, pubescent. Petiole 1–2.5 mm; leaf blade elliptic, 11.5–12 × 3.5–6 cm, abaxially glabrous except villous on midvein, adaxially glabrous, secondary veins 5 or 6 on each side of midvein, base cuneate, margin subentire to slightly undulate-crenulate, apex acuminate. Racemes to 30 cm; rachis pubescent, usually with 3-flowered clusters at nodes; bracts triangular, 4–6 × ca. 2 mm, pubescent; bracteoles similar to bracts. Pedicel 0.5–2 mm. Calyx 5–6 mm, outside pubescent; lobes linear, 4.5–5.5 × ca. 1 mm. Corolla light purple with purple dots on lower lip, 2–3 cm; tube linear, 1.5–2.5 cm; lobes 3–4 × ca. 3 mm. Style basally pubescent. Capsule ca. 2.5 cm, pubescent. Seeds ovate in outline, ca. 4 × 4 mm, rugose. Fl. Apr–Jun, fr. Aug–Sep.

Forests; 100–1600 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Laos, Malaysia, Myanmar, Thailand, Vietnam].

# 16. **MACKAYA** Harvey, Thes. Cap. 1: 8. 1859, nom. cons., not Arnott (1838), nor *Mackaia* Gray (1821).

太平爵床属 *tai ping jue chuang shu*

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, perennial, with cystoliths. Leaves petiolate. Inflorescences axillary or terminal, secund racemes; bracts linear-lanceolate [or narrowly deltoid]; bracteoles 2, borne at base of pedicel. Calyx much shorter than corolla tube, 5-lobed almost to base; lobes linear-lanceolate. Corolla subactinomorphic; tube basally cylindric, campanulate toward apex; limb 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes suborbicular [ovate or oblong], ascending cochlear in bud. Stamens 2, inserted at base of campanulate portion of corolla tube, subincluded; anthers 2-theous; thecae oblong, dorsally pubescent; staminodes 2, lacking anthers. Disk obsolete. Ovary subellipsoid, with ovules 2 per locule; style subglabrous or pubescent near base; stigma 2-lobed. Capsule (not seen for *Mackaya tappingensis*) stipitate, 2- or 4-seeded; retinacula present. Seeds (not seen for *M. tappingensis*) somewhat rugose.

Three species: disjunctly distributed in Himalayan region and South Africa; one species in China.

**1. *Mackaya tappingensis*** (W. W. Smith) Y. F. Deng & C. Y. Wu, Novon 19: 308. 2009.

太平爵床 *tai ping jue chuang*

*Eranthemum tappingense* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 177. 1918; *Pseuderanthemum tappingense* (W. W. Smith) C. Y. Hu & H. S. Lo.

Herbs to 1 m tall, perennial. Stems subterete, glabrous or subglabrous. Petiole 2–3.5 cm, sparsely puberulent or glabrescent; leaf blade lanceolate to oblong-lanceolate, 12–17 × 3–5(–7) cm, membranous, both surfaces glabrous or glabrescent, abaxially paler, adaxially dark green, secondary veins 8–12 on

each side of midvein, base cuneate, margin entire to undulate, apex acuminate. Inflorescences axillary or terminal, racemes, 7–20 cm; peduncle sparsely pilose or glabrescent; bracts linear-lanceolate, 2–3 mm, pilose or glabrescent; bracteoles linear, ca. 1 mm. Pedicel 2–3 mm. Calyx 6–8 mm; lobes linear-lanceolate, 3–4 × 1.5–2 mm, glabrous, apex acuminate. Corolla rose, 3–4 cm, outside glabrous; tube basally cylindric for ca. 1 cm; lobes suborbicular, 7–12 mm, subequal, margin dentate. Staminal filaments 6–12 mm, pilose; anther thecae 4–5 mm, muticous at base; staminodes 1–4 mm. Ovary glabrous; style ca. 1.8 cm, pubescent. Capsule not seen. Fl. Oct–Jan.

Forests; 600–1800 m. Yunnan [Myanmar].

# 17. **ISOGLOSSA** Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1854: 155. 1854, nom. cons.

叉序草属 *cha xu cao shu*

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Chingiacanthus* Handel-Mazzetti; *Ecteinanthus* T. Anderson; *Leda* C. B. Clarke (1908), not Bory (1822) [Algae]; *Rhytiglossa* Nees; *Strophacanthus* Lindau.

Shrubs or herbs, with cystoliths, isophyllous or slightly anisophyllous. Leaves petiolate. Inflorescences terminal and/or sometimes axillary, open panicles or thyrses; bracts small, shorter than calyx. Calyx deeply 5-lobed, lobes similar. Corolla funnel-shaped, 2-lipped; lower lip 3-lobed; upper lip shortly 2-lobed, lacking a stylar furrow (i.e., erugulate); lobes ascending cochlear in bud. Stamens 2; anthers 2-theous; thecae equal or unequal, parallel (to perpendicular), subequally to unequally inserted, base muticous; staminodes absent; pollen 2-porate [elsewhere also 3-colporate and 6-pseudocolporate]. Ovary with 2 ovules per locule. Capsule clavate with a solid sterile basal stalk, 4-seeded; retinacula present; septa with attached retinacula remaining attached to inner wall of mature capsule. Seeds subdiscoid.

About 50 species: tropical Africa and Asia; two species (one endemic) in China.

- 1a. Calyx lobes subulate, widest at base; inflorescence long branched, widely paniculate ..... 1. *I. collina*  
1b. Calyx lobes spatulate-oblongate, widest above middle; inflorescence shortly branched, narrowly paniculate or  
thyrsoid ..... 2. *I. glabra*

**1. *Isoglossa collina*** (T. Anderson) B. Hansen, Nordic J. Bot. 5: 12. 1985.

叉序草 *cha xu cao*

*Justicia collina* T. Anderson, J. Linn. Soc., Bot. 9: 515. 1867; *Chingiacanthus patulus* Handel-Mazzetti; *Dianthera collina* (T. Anderson) C. B. Clarke; *D. sinensis* W. W. Smith.

Herbs 40–100 cm tall. Stems prostrate and rooting at base

but apically erect, terete, slender, slightly puberulent when young, later glabrescent. Petiole 1–3 cm, brownish pubescent; leaf blade ovate to ovate-elliptic, 3.5–11 × 2–4.8 cm, abaxially sparsely puberulent especially along veins, adaxially glabrous, secondary veins 5–7 on each side of midvein, base cuneate or on uppermost leaves rounded, margin ± entire, apex acuminate. Inflorescences terminal or axillary from upper leaf axils, panicles, 5–18 × 3–10 cm; rachis gland-tipped puberulent or subglabrous.

brous with few sessile glands; branches slightly flattened; bracts lanceolate,  $1.5\text{--}2 \times \text{ca. } 0.5$  mm, glabrous or slightly gland-tipped pubescent. Calyx  $5\text{--}8$  mm; lobes subulate, glabrous or gland-tipped puberulent. Corolla white with purplish dots,  $1.7\text{--}4.5$  cm, outside glabrous; tube basally cylindric for ca.  $1/3$  of its length then gradually widening into a funnel-shaped throat; lips  $8\text{--}10$  mm; lobes of lower lip oblong-elliptic,  $3\text{--}6$  mm, unequal with lateral 2 narrower. Staminal filaments  $4\text{--}10$  mm, glabrous; anther thecae to  $4.5$  mm, equal, parallel, overlapping for ca.  $1/2$  their length or more. Ovary glabrous; style glabrous. Capsule  $1\text{--}1.4$  cm, glabrous. Seeds coarsely corrugated with irregular ridges and often with minute acute protuberances. Fl. Aug–Nov.

Evergreen broad-leaved forests, wetlands by streams;  $300\text{--}2200$  m. Guangdong, Guangxi, Hunan, Jiangxi, Xizang, Yunnan [Bhutan, India, Thailand].

**2. *Isoglossa glabra*** (Handel-Mazzetti) B. Hansen, *Nordic J. Bot.* 5: 12. 1985.

光叉序草 *guang cha xu cao*

*Chingiacanthus glaber* Handel-Mazzetti, *Sinensia* 5: 12. 1934.

Herbs  $40\text{--}100$  cm tall, erect. Stems terete, glabrous. Petiole  $0.8\text{--}1.5$  cm, minutely puberulent; leaf blade ovate-elliptic,  $5.8\text{--}7.5 \times 3\text{--}3.5$  cm, glabrous except puberulent on margin and midvein, secondary veins 6 or 7 on each side of midvein, base rounded to constricted cuneate, apex attenuate. Inflorescences terminal, interrupted panicles composed of cymes, ca.  $10 \times 2$  cm; rachis glabrous; bracts triangular, ca.  $1.2 \times 1$  mm, glabrous. Calyx ca.  $4.5$  mm; lobes spatulate-ob lanceolate, glabrous, apex acute. Corolla to  $3.5$  cm, outside glabrous, inside pubescent; tube basally cylindric for ca.  $1/3$  of its length then gradually widening into a funnel-shaped throat; lobes of lower lip  $3\text{--}5$  mm. Staminal filaments  $4\text{--}6$  mm, glabrous; anther thecae to  $2.5$  mm,  $\pm$  equal or with lower theca smaller,  $\pm$  parallel, slightly or not overlapping. Ovary glabrous; style glabrous. Capsule not seen. Fl. Aug–Sep.

• Forests; ca.  $1000$  m. Guangxi.

## 18. CLINACANTHUS Nees in A. Candolle, *Prodr.* 11: 511. 1847.

鳄嘴花属 *e zui hua shu*

Hu Jiaqi (胡嘉琪 *Hu Chia-chi*), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs or perennial herbs, with cystoliths. Leaves petiolate; leaf blade margin entire or sinuate-crenate. Inflorescences axillary or terminal, thyrsoid racemes; bracts and bracteoles narrow. Calyx deeply 5-lobed, lobes narrow. Corolla putatively resupinate (apparently by geniculation rather than torsion); tube long, geniculate, apically widened; limb 2-lipped; lower lip slightly recurved, much broader than upper lip, 3-lobed; upper lip shortly 2-lobed; lobes ascending cochlear in bud. Stamens 2; anthers 1-theous, base muticous; staminodes absent. Stigma shortly 2-cleft. Capsule oblong, with a short basal stalk, 4-seeded; retinacula present.

Three species: tropical Asia; one species in China.

**1. *Clinacanthus nutans*** (N. L. Burman) Lindau, *Bot. Jahrb. Syst.* 18: 63. 1893.

鳄嘴花 *e zui hua*

*Justicia nutans* N. L. Burman, *Fl. Indica*, 10. 1768; *Clinacanthus burmanni* Nees, nom. illeg. superfl.; *C. nutans* var. *robinsonii* Benoist.

Shrubs to  $1$  m tall. Stems terete, striate, glabrescent. Petiole  $0.3\text{--}2$  cm, sulcate, bifariously pubescent; leaf blade lanceolate-ovate, lanceolate, or linear-lanceolate,  $7\text{--}12 \times 1\text{--}4$  cm, both surfaces pubescent when young then glabrescent except abaxially pilose along veins, secondary veins  $4\text{--}6$  on each side of midvein and abaxially elevated, base cuneate to rounded, margin subentire to sinuate-crenate, apex acuminate. Racemes 1 to several at or near shoot apex, usually 3 to several forming a terminal panicle; rachis gland-tipped pubescent; bracts and

bracteoles linear, ca.  $8 \times 2$  mm, abaxially gland-tipped pilose, apex acute. Calyx  $0.9\text{--}1.3$  cm; lobes linear, outside gland-tipped pilose, apex acute. Corolla dull red with a green base,  $3\text{--}4.2$  cm, outside gland-tipped pilose, inside glabrous except for a ring of trichomes ca.  $5$  mm above base; tube basally cylindric for ca.  $5$  mm and ca.  $3$  mm wide then gradually widened to ca.  $6$  mm at mouth; lower lip  $1\text{--}2 \times \text{ca. } 1$  cm, with yellow streaks; upper lip triangular,  $1\text{--}2 \times \text{ca. } 0.5$  cm, erect, apex emarginate; lobes ovate,  $3\text{--}5 \times 1\text{--}2$  mm. Stamens exserted from mouth of corolla; filaments  $1\text{--}1.5$  cm, glabrous; anthers ovate-linear,  $4\text{--}5 \times \text{ca. } 1$  mm, muticous. Style  $3\text{--}3.7$  cm, base sparsely pubescent. Capsule ca.  $2$  cm, pilose. Seeds ca.  $2$  mm in diam. Fl. Oct–Jan, fr. Mar.

Thickets; below  $700$  m. Guangdong, Guangxi, Hainan, Yunnan [Indonesia, Malaysia, Thailand, Vietnam].

This species is used medicinally.

## 19. KUDOACANTHUS Hosokawa, *Trans. Nat. Hist. Soc. Formosa* 23: 94. 1933.

银脉爵床属 *yin mai jue chuang shu*

Hu Jiaqi (胡嘉琪 *Hu Chia-chi*), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, decumbent, often rooting at basal nodes. Leaves petiolate. Inflorescences terminal, spikes or sometimes in panicles with spicate branches, bracteate; bracteoles 2. Calyx 5-lobed. Corolla tube short, distally slightly enlarged into a throat; limb 2-lipped; lower lip 3-lobed, lobes subequal; upper lip 2-cleft, lacking a stylar furrow (so far as known); lobes ascending cochlear in bud.

Stamens 2, inserted slightly above throat; anthers 2-theous; thecae equally to subequally inserted, parallel, subequal, base mucous; staminodes absent. Disk without an annulus. Capsule unknown.

- One species: China (Taiwan).

*Kudoacanthus* was recently shown to pertain to the “*Tetramerium* lineage” of Justiceae (L. McDade et al., Amer. J. Bot. 95: 1136–1152. 2008). Whether *K. albonervosa* is generically distinct remains to be determined; it appears very similar to *Leptostachya wallichii*.

**1. *Kudoacanthus albonervosa*** Hosokawa, Trans. Nat. Hist. Soc. Formosa 23: 95. 1933.

银脉爵床 yin mai jue chuang

*Codonacanthus albonervosa* (Hosokawa) Yuen P. Yang.

Herbs to 40 cm tall. Stems hirsute. Petiole 3–15 mm; leaf blade ovate to orbicular-ovate, 0.7–4.5 × 0.7–2.5 cm, membranous, both surfaces pilose, abaxially slightly paler, adaxially green, secondary veins 3–5 pairs on each side of midvein, prominent, and white, base broadly cuneate, margin remotely undulate to entire, apex obtuse to acuminate. Spikes to 4 cm, simple or branched into a panicle, few flowered; rachis gland-tipped pilose; bracts linear to oblanceolate, 2–3 × ca. 1 mm, abaxially gland-tipped pilose, adaxially glandular punctate. Flowers sessile; bracteoles linear, ca. 2 × 0.8 mm, abaxially gland-tipped pilose, adaxially glandular punctate. Calyx ca. 4

mm, outside gland-tipped pilose, inside glandular punctate, 5-lobed almost to base; lobes linear, outside pubescent, margin ciliate. Corolla white, ca. 5 mm, outside glabrous, inside slightly puberulent on throat; tube basally cylindric for 2.5–3 mm then slightly enlarged into a throat; lobes of lower lip obovate-elliptic, spreading, apex obtuse; lobes of upper lip erect, concave. Staminal filaments ca. 1 mm, glabrous; anther thecae ca. 0.8 mm. Ovary oblong-ellipsoid, ca. 1.5 mm, glabrous, with 2 ovules per locule; style filiform, ca. 4 mm, glabrous; stigma minutely 2-cleft. Capsule and seeds unknown. Fl. Apr, Aug.

- Evergreen broad-leaved forests; 600–700 m. Taiwan.

*Kudoacanthus albonervosa* is known from few collections (but collected as recently as 2002) and remains poorly characterized. Its pollen is described as 3-porate (C. F. Hsieh & T. C. Huang, Fl. Taiwan, ed. 2, 4: 669. 1998).

## 20. *RUNGIA* Nees in Wallich, Pl. Asiat. Rar. 3: 77, 109. 1832.

孩儿草属 hai er cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, decumbent to erect, with cystoliths. Leaves petiolate; leaf blade margin entire. Inflorescences axillary or terminal spikes, secund or 4-sided, sometimes reduced to a single flower; bracts 2- or 4-ranked but usually only 2 ranks fertile, homomorphic or heteromorphic, usually imbricate, margin usually scarious or hyaline; bracteoles similar to bracts or narrower. Calyx deeply 5-lobed; lobes equal or subequal. Corolla small; tube basally cylindric, distally ± expanded; limb 2-lipped; lower lip spreading, 3-lobed; upper lip erect, rugula (stylar furrow) present, margin entire to emarginate; lobes ascending cochlear in bud. Stamens 2, inserted in corolla throat; anthers 2-theous; thecae subequal in size, superposed, lower one white spurred at base. Ovary with 2 ovules per locule; stigma entire or slightly 2-cleft. Capsule shortly stalked, ovoid or oblong, 4-seeded; retinacula present; septa (with attached retinacula) separating from inner wall of mature capsule. Seeds compressed, verrucose, lacking trichomes.

About 50 species: Old World tropics and subtropics; 16 species (12 endemic) in China.

- 1a. Flowers solitary in apical leaf axils or in 2-sided spikes; bracts 2- or 4-ranked, all fertile.
  - 2a. Flowers solitary in apical leaf axils ..... 1. *R. axilliflora*
  - 2b. Flowers in axillary or terminal spikes.
    - 3a. Plants 6–10 cm tall; spikes globose or ovoid, 0.5–1 cm ..... 2. *R. mina*
    - 3b. Plants more than 20 cm tall; spikes cylindric, 1–7 cm.
      - 4a. Bracts without hyaline margin ..... 3. *R. densiflora*
      - 4b. Bracts with hyaline margin.
        - 5a. Bracteoles elliptic, ca. 1/2 as long as bracts ..... 4. *R. chinensis*
        - 5b. Bracteoles ovate-lanceolate, as long as bracts ..... 5. *R. stolonifera*
  - 1b. Spikes 1-sided; bracts 4-ranked, each 2 fertile or sterile.
    - 6a. Bract margins not ciliate.
      - 7a. Sterile and fertile bracts different in shape; fertile bracts oblong, ca. 0.7 cm, apex rounded ..... 6. *R. guangxiensis*
      - 7b. Sterile and fertile bracts similar in shape; fertile bracts oblong to elliptic-oblong, ca. 1.5 cm, apex acute ..... 7. *R. pinpiensis*
    - 6b. Bract margins ciliate.
      - 8a. Fertile bracts circular, obovate, elliptic, obovate-elliptic, or spenoid, apex rounded, obtuse, or emarginate.
        - 9a. Fertile bracts circular to obovate, apex rounded to obtuse to emarginate and mucronate ..... 8. *R. pectinata*
        - 9b. Fertile bracts spenoid, elliptic, obovate, or obovate-elliptic, apex rounded and not mucronate.
          - 10a. Fertile bracts spenoid ..... 9. *R. monetaria*

- 10b. Fertile bracts elliptic, obovate-elliptic, or obovate.  
 11a. Fertile bracts elliptic to obovate-elliptic ..... 10. *R. longipes*  
 11b. Fertile bracts obovate ..... 11. *R. bisaccata*  
 8b. Fertile bracts lanceolate-linear, oblong-lanceolate, lanceolate, ovate, or elliptic, apex acute, acuminate, or cuspidate.  
 12a. Bracts abaxially gland-tipped pubescent ..... 12. *R. pungens*  
 12b. Bracts glabrous or non-glandular pubescent.  
 13a. Fertile bracts elliptic, broader at middle.  
 14a. Leaf blade pubescent abaxially ..... 13. *R. napoensis*  
 14b. Leaf blade glabrous on both surfaces ..... 14. *R. yunnanensis*  
 13b. Fertile bracts ovate to ovate-lanceolate to lanceolate-linear, broader at base.  
 15a. Leaf blade glabrous ..... 15. *R. taiwanensis*  
 15b. Leaf blade pubescent along veins and ciliate on margin ..... 16. *R. hirpex*

**1. *Rungia axilliflora*** H. S. Lo, Acta Phytotax. Sin. 16(4): 92. 1978.

腋花孩儿草 ye hua hai er cao

Herbs 10–20 cm tall. Branches slender, bifariously retrorsely pubescent. Petiole 2–7 mm, pubescent; leaf blade ovate to broadly ovate, 5–20 × 4–14 mm, secondary veins ca. 4 on each side of midvein, base cuneate to rounded, margin entire or slightly undulate, apex obtuse to rounded. Flowers solitary in apical leaf axils, sessile; bracteoles 2, broadly ovate, 4–4.5 × ca. 2.5 mm, margin yellow, 0.1–0.2 mm broad, membranous, and ciliate. Calyx 3–3.5 mm; lobes lanceolate, glabrous, apex acuminate. Corolla light bluish, 1.1–1.2 cm, outside glabrous; tube ca. 6 mm, straight; lower lip ca. 6 mm, patent, apex 3-lobed, lobes orbicular and ca. 1.5 mm in diam.; upper lip triangular, erect, apex emarginate. Staminal filaments ca. 5 mm; anther thecae ovoid. Ovary glabrous; style 8.5–9 mm; stigma 2-lobed. Capsule not seen. Fl. Sep–Nov.

• Streamsides; 400–700 m. Guangxi, Guizhou.

**2. *Rungia mina*** H. S. Lo, Acta Phytotax. Sin. 16(4): 93. 1978.

矮孩儿草 ai hai er cao

Herbs 6–10 cm tall. Stems ca. 1 mm in diam., erect, usually unbranched, white retrorsely gland-tipped pubescent. Petiole 2–5 mm, densely pubescent; leaf blade ovate or broadly ovate, 5–20 × 4–10 mm, both surfaces sparsely pubescent, secondary veins 2 or 3 on each side of midvein, base broadly cuneate, margin entire, apex obtuse. Spikes terminal or axillary, sessile, globose to ovoid, 5–10 mm, 2-sided, contracted; bracts all fertile, obovate to spatulate-obovate, ca. 4 × 3 mm, abaxially pilose, margin hyaline and ciliate, apex obtuse to sometimes acute; bracteoles boat-shaped, ca. 3 × 2 mm, concave, margin ciliate. Calyx 5-lobed almost to base; lobes linear-lanceolate, 1.5–1.7 mm, apex acuminate. Corolla purple, ca. 3.8 mm; tube ca. 2 mm; lower lip ca. 1.8 mm, patent, 3-lobed, lobes suborbicular, ca. 0.5 mm in diam., and outside slightly pubescent on central one; upper lip broadly triangular, ca. 1.5 mm, erect, apex emarginate. Staminal filaments ca. 1.5 mm; anther thecae ovoid. Ovary glabrous; style ca. 4 mm, glabrous. Capsule ca. 2.7 mm, glabrous. Fl. Sep.

• Wet places in forests; ca. 1400 m. Yunnan.

**3. *Rungia densiflora*** H. S. Lo, Acta Phytotax. Sin. 16(4): 94. 1978.

密花孩儿草 mi hua hai er cao

Herbs to 50 cm tall. Stems stout, bifariously retrorsely pubescent. Petiole 0.5–2 cm, pubescent; leaf blade elliptic-ovate, ovate, or ovate-lanceolate, 2–8.5 × 1–3 cm, papery, both surfaces glabrous or minutely hirsute, secondary veins 6–8 on each side of midvein, base cuneate and slightly decurrent onto petiole, margin entire, apex acuminate to slightly obtuse. Spikes terminal or axillary, sessile, to 3 cm; bracts 4-ranked, all fertile, homomorphic, usually spatulate to sometimes obovate, 7–11 × 1.5–3 mm, 3-veined, margin not hyaline but ciliate and densely so apically, apex rounded to obtuse; bracteoles 2, obovate, ca. 6 × 2–3 mm, margin hyaline. Calyx ca. 4 mm; lobes linear-lanceolate. Corolla 1.1–1.7 cm, outside pilose; tube basally cylindric for 6–9 mm; lower lip oblong, 5–8 mm, apex 3-lobed, central lobe smaller; upper lip triangular-ovate, erect, shortly 2-lobed. Staminal filaments 5–7 mm, glabrous; anther thecae ovoid. Capsule ca. 6 mm. Fl. Sep–Oct, fr. Nov–Dec.

• Forests, streamsides; 400–800 m. Anhui, Guangdong, Jiangxi, Zhejiang.

**4. *Rungia chinensis*** Benth, Fl. Hongk. 166. 1861.

中华孩儿草 zhong hua hai er cao

Herbs to 70 cm tall, spreading to erect. Stems slender, 4-angled, sulcate, slightly puberulent, usually rooting at basal nodes. Petiole 0.5–3 cm, pubescent; leaf blade ovate to oblong-lanceolate, 2.5–9 × 1.8–3 cm, membranous, glabrous except sparsely hirsute along veins, secondary veins 5 or 6 on each side of midvein, base cuneate to attenuate, margin entire or slightly undulate, apex acute to obtuse. Spikes terminal or axillary, 1–7 cm, 2-sided; bracts 4-ranked, all fertile, elliptic, 7–8 × 2–4 mm, margin sparsely ciliate, apex acute; bracteoles elliptic, 4–5 × ca. 2.5 mm, margin membranous and sparsely ciliate, apex mucronate. Calyx deeply 5-lobed; lobes linear-lanceolate, ca. 5 mm. Corolla bluish, 6–8 mm, outside slightly pilose and glandular punctate; lower lip 3-lobed, lobes ca. 7 mm; upper lip shallowly dentate. Ovary subglabrous; style ca. 1 cm, glabrous; stigma obtuse. Capsule ovoid, ca. 6 mm, 4-seeded. Seeds lenticular, ca. 1.5 mm wide, minutely tuberculate. Fl. Sep–Oct, fr. Nov–Dec.

Grasslands; 300–1200 m. Anhui, Fujian, Guangdong, Guangxi, Jiangxi, Taiwan, Zhejiang [Vietnam].

This species is used medicinally.

**5. *Rungia stolonifera*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 547. 1885.

匍匐鼠尾黄 pu fu shu wei huang

*Justicia stolonifera* (C. B. Clarke) B. Hansen.

Herbs 30–60 cm tall, erect, branched, rooting at basal nodes. Stems 4-angled, sulcate, pubescent along groove. Petiole 5–10 mm; leaf blade ovate, 2.5–7.5 × 1.8–3.8 cm, subglabrous except for some pubescence on margin, secondary veins ca. 5 on each side of midvein, base broadly cuneate, margin entire or undulate, apex acute. Spikes terminal or axillary; bracts obovate to spatulate, ca. 4 × 3 mm, minutely pubescent, margin hyaline, apex rounded; bracteoles ovate-lanceolate, similar to bracts. Calyx ca. 1.3 cm, glabrous; lobes lanceolate, margin hyaline. Corolla 1.2–1.6 cm; tube basally cylindric, 2–3 mm in diam., and straight for ca. 8 mm; limb ca. 4 mm; lower lip 3-lobed, pendent, lobes oblong and ca. 1 × 1 mm; upper lip triangular, erect, subentire. Staminal filaments white, glabrous; anther thecae purplish black. Ovary sparsely hirsute; style 1.5–1.8 cm, exserted; stigma orbicular. Capsule 3–4 mm, subglabrous. Seeds ovate in outline, ca. 2 × 1.5 mm, minutely gland-tipped papillose. Fl. Sep–Oct, fr. Nov–Dec.

Forests, trailsides; 200–2300 m. Yunnan [Bangladesh, India].

**6. *Rungia guangxiensis*** H. S. Lo & D. Fang, Guihaia 17: 46. 1997.

广西孩儿草 guang xi hai er cao

Herbs to 70 cm tall, erect. Stems subterete, subglabrous or pubescent when young. Petiole 0.5–2.5 cm, bifariously pubescent; leaf blade elliptic to ovate, 9–17 × 2.5–4 cm, abaxially puberulent, adaxially glabrous, secondary veins ca. 7 on each side of midvein, base cuneate, margin entire, apex shortly acuminate. Spikes terminal, 1-sided; peduncle absent or less than 3 mm; bracts 4-ranked; fertile bracts oblong, ca. 7 × 3.5 mm; sterile bracts broadly obovate, 7–8 × 4–5 mm, glabrous, apex rounded. Calyx ca. 2.5 mm, 5-lobed. Corolla red, ca. 1.7 cm, outside glabrous; tube basally cylindric and ca. 1.5 mm in diam.; lower lip 3-lobed, patent; upper lip ovate-triangular, apex obtuse. Stamens slightly exserted; anther thecae ovoid, lower thecae spurred. Capsule not seen. Fl. Jan–Apr.

• Dense forests; 500–600 m. Guangxi.

**7. *Rungia pinpienensis*** H. S. Lo, Acta Phytotax. Sin. 16(4): 91. 1978.

屏边孩儿草 ping bian hai er cao

Herbs to 1 m tall, erect. Stems 4-angled when young then subterete, subglabrous. Petiole 2–5 cm, subglabrous; leaf blade elliptic to broadly elliptic, 13–15 × 6–8 cm, cystoliths white, abaxially glabrous or puberulent along veins, adaxially glabrous, secondary veins 9 or 10 on each side of midvein and netted near margin, base broadly cuneate, margin slightly undulate, apex cuspidate. Spikes terminal, ca. 9 cm, 1-sided; peduncle ca. 1 cm; bracts 4-ranked, each 2 sterile or fertile, oblong to elliptic-oblong, ca. 15 × 4–5 mm, homomorphic, glabrous, margin narrowly hyaline, apex acute. Calyx ca. 5 mm; lobes linear.

Corolla not seen. Capsule ca. 1.2 cm, glabrous. Seeds blackish brown, ovate in outline, densely verrucose. Fr. Apr–Jun.

• Streamsides; 900–1900 m. Yunnan.

**8. *Rungia pectinata*** (Linnaeus) Nees in A. Candolle, Prodr. 11: 470. 1847.

孩儿草 hai er cao

*Justicia pectinata* Linnaeus, Amoen. Acad. 4: 299. 1760; *Rungia parviflora* Nees subsp. *pectinata* (Linnaeus) L. H. Cramer; *R. parviflora* var. *pectinata* (Linnaeus) C. B. Clarke; *R. pectinata* var. *clarkeana* Handel-Mazzetti.

Herbs 20–50 cm tall, annual or perennial. Stem basally prostrate and rooting at nodes then erect, minutely pubescent. Petiole 0–7 mm; leaf blade oblong-elliptic, 1–4 × 0.4–1.4 cm, glabrous except for a few trichomes along veins, secondary veins ca. 4 on each side of midvein, base cuneate and decurrent onto petiole, margin entire, apex acute. Spikes axillary or terminal, 0.5–2 cm, 1-sided, solitary or sometimes 2 or 3 compound; bracts dimorphic; sterile bracts green, elliptic, ca. 4 × 0.7 mm, glabrous, apex acute; fertile bracts circular to obovate, 4–5 × ca. 2 mm, pubescent, margin broadly hyaline, apex obtuse to rounded to emarginate and mucronulate; bracteoles elliptic, 2–3 mm, margin ciliate, apex 2-cleft and subacute. Calyx colorless, pubescent; lobes linear-lanceolate, ca. 3 × 0.5 mm, margin narrowly hyaline, apex mucronulate. Corolla blue or white, ca. 5 mm, outside pubescent; lower lip 3-lobed, lobes triangular; upper lip ovate, 1–2 mm, apex emarginate. Staminal filaments glabrous. Ovary glabrous. Capsule ellipsoid, ca. 2.5 mm, glabrous, 2–4-seeded, apex apiculate. Seeds orbicular in outline, ca. 1 mm in diam., minutely verrucose. Fl. Nov–Jan, fr. Jan–Apr. *2n* = 26, 52.

Wastelands. Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

*Rungia pectinata* is a common weed in disturbed habitats.

This species is used medicinally.

**9. *Rungia monetaria*** (Benoist) B. Hansen, Nordic J. Bot. 9: 211. 1989.

中越孩儿草 zhong yue hai er cao

*Justicia monetaria* Benoist, Bull. Soc. Bot. France 81: 605. 1934.

Herbs to 1.5 m tall, perennial. Stems sulcate, glabrescent. Petiole 1–2.5 cm; leaf blade elliptic to ovate-elliptic, 6–17 × 3–8.5 cm, both surfaces densely covered with prominent cystoliths and glabrous, secondary veins 4–7 on each side of midvein, base cuneate and to decurrent and asymmetric or symmetric, margin entire, apex acute to acuminate. Spikes terminal or borne from leafless lateral branches, (2–)5–8(–19) cm; peduncle ca. 1 cm, glabrous; rachis glabrous; bracts 4-ranked; sterile bracts yellowish green, circular, rhombic, or obovate, 1.2–1.6 × 1.1–1.6 cm, glabrous, base rounded to cuneate, margin entire or apically serrate, apex rounded to acute; fertile bracts yellowish brown, sphenoid, 1.2–1.4 × 0.8–1.1 cm, glabrous, base cuneate, margin entire, apex rounded; bracteoles yellowish brown, narrowly lanceolate, 9–11 × ca. 2 mm, mem-

branous, abaxially glabrous, margin ciliate. Calyx yellowish brown, 6–7 mm, glabrous, 5-lobed almost to base; lobes 5–6 × ca. 1 mm. Corolla white with purple dotted stripe in throat, ca. 1.5 cm; tube ca. 6 × 3 mm; lower lip oblong, ca. 7 × 6 mm, 3-lobed, middle lobe ca. 3 × 2 mm, lateral lobes ca. 2 × 1 mm; upper lip triangular, ca. 5 × 6 mm, apex emarginate. Stamens 2, inserted at base of throat; filaments ca. 3 mm, glabrous; anther thecae ovoid. Ovary ca. 1.5 × 1 mm, glabrous; style ca. 8 mm, glabrous. Capsule obovoid-ellipsoid, ca. 10 × 3 mm, glabrous, 2-seeded. Seeds orbicular in outline, ca. 3 mm in diam., glabrous. Fl. Sep–Oct, fr. Nov–Jan.

Streamsides; 300–900 m. Yunnan [Vietnam].

**10. *Rungia longipes*** D. Fang & H. S. Lo, Guihaia 17: 49. 1997.

长柄孩儿草 chang bing hai er cao

Herbs to 50 cm tall. Stems subterete, bifariously pubescent. Petiole (1–)4–4.5 cm, pubescent; leaf blade ovate to elliptic, 10–17 × 4–8.5 cm, thinly papery to papery, abaxially pubescent along veins, adaxially densely covered with white linear cystoliths and glabrous, secondary veins 6 or 7 on each side of midvein, base broadly cuneate and slightly oblique, margin undulate-denticulate, apex acuminate. Spikes axillary, 2.5–11 cm, 1-sided; bracts 4-ranked, heteromorphic; sterile bracts elliptic to ovate-elliptic, (6–)10–12 × 3–4 mm, abaxially subglabrous, hyaline margin ca. 0.5 mm and ciliate, apex obtuse; fertile bracts elliptic to obovate-elliptic, ca. 12 × 5 mm, abaxially puberulent, margin slightly ciliate, apex rounded; bracteoles obovate-elliptic, ca. 7 × 3 mm, apex obtuse. Calyx 6–10 mm; lobes subulate, margin ciliate. Corolla not seen. Capsule ca. 1 cm, pubescent. Seeds ovate in outline, ca. 2 × 2 mm, verrucose. Fr. Apr–Jun.

• Forests in valleys. Guangxi.

**11. *Rungia bisaccata*** D. Fang & H. S. Lo, Guihaia 17: 48. 1997.

囊花孩儿草 nang hua hai er cao

Herbs 20–40 cm tall. Stems subterete when young then 4-angled, 2-sulcate, pubescent along furrow. Petiole 0.8–2.5 cm, pubescent; leaf blade ovate-elliptic, 5–13 × 2.3–5.7 cm, papery, abaxially subglabrous or puberulent along veins, adaxially glabrous, secondary veins 5–7 on each side of midvein, base broadly cuneate to attenuate, margin slightly undulate, apex acuminate to obtuse. Spikes axillary, 1-sided; bracts 4-ranked, sterile and fertile ones similar, obovate, 7–11 × 4–8 mm, abaxially glabrous, margin slightly ciliate, apex rounded; bracteoles oblong-elliptic, ca. 10 × 4 mm, margin hyaline and ciliate. Calyx ca. 7 mm; lobes subulate, margin ciliate. Corolla white with rose dots, ca. 1.8 cm, outside and inside slightly gland-tipped puberulent; tube cylindric and ca. 2.5 mm in diam. for ca. 9 mm, inside with a saccate papilla; lower lip ca. 6 × 3 mm, patent, 3-lobed, central lobe larger; upper lip ca. 5 mm, erect, 2-lobed. Staminal filaments ca. 5 mm, glabrous; anther thecae ca. 2 mm. Ovary glabrous; style ca. 1.3 cm, glabrous. Capsule not seen. Fl. Jan–Feb.

• Rocky mountains. Guangxi.

**12. *Rungia pungens*** D. Fang & H. S. Lo, Guihaia 17: 47. 1997.

尖苞孩儿草 jian bao hai er cao

Herbs 0.5–1.5 m tall, isophyllous. Stems erect or basal portion prostrate and rooting at nodes, 4-angled, glabrous or bifariously pubescent. Petiole 0.4–5.5 cm, glabrous; leaf blade elliptic to ovate-elliptic, 2.5–16 × 0.9–5.5 cm, densely covered with linear cystoliths, glabrous, secondary veins 4–9 on each side of midvein, base broadly cuneate, margin slightly undulate, apex acuminate. Spikes terminal or axillary, 2–5 cm, 1-sided; peduncle 1–9 cm; rachis pubescent or gland-tipped pubescent; bracts 4-ranked, heteromorphic; sterile bracts elliptic, 7.5–8 × 4–6 mm, abaxially gland-tipped puberulent, hyaline margin 0.8–1.5 mm broad and ciliate, apex cuspidate; fertile bracts lanceolate, 6.5–7.5 × ca. 4 mm, abaxially gland-tipped puberulent, hyaline margin ca. 1 mm wide and ciliate, apex cuspidate; bracteoles elliptic, ca. 6 × 4 mm, abaxially scabrid, adaxially glabrous. Calyx 6–7 mm; lobes linear, unequal, scabrid. Corolla light yellowish green outside and white with purple dots inside, ca. 1.5 cm, gland-tipped pubescent and pubescent; tube ca. 7 mm; lower lip 3-lobed, middle lobe larger; upper lip ca. 6 mm, apex emarginate. Staminal filaments ca. 5 mm, glabrous; anther thecae ca. 1.5 mm. Ovary hirsute; style ca. 1 cm, basal portion hirsute. Capsule ca. 8 mm, gland-tipped puberulent or puberulent. Seeds ovate in outline, ca. 2 × 1.5 mm, verrucose. Fl. Dec–Feb, fr. Apr–May.

• Limestone hills, forests; 600–1000 m. Guangxi, Yunnan.

**13. *Rungia napoensis*** D. Fang & H. S. Lo, Guihaia 17: 46. 1997.

那坡孩儿草 na po hai er cao

Herbs 70–90 cm tall. Stems 4-angled when young then subterete, sulcate, bifariously pubescent. Petiole 0.5–2.5 cm, bifariously pubescent; leaf blade narrowly elliptic to lanceolate, 3–10 × 1–4 cm, papery, both surfaces densely covered with linear cystoliths, abaxially pubescent along veins, adaxially glabrous, secondary veins 4–7 on each side of midvein, base cuneate, margin subentire, apex acuminate. Spikes axillary or terminal, 1–5 cm, 1-sided; peduncle 3–5 mm, pubescent; bracts 4-ranked; sterile bracts lanceolate-elliptic, ca. 4 × 1–2 mm, abaxially glabrous, margin hyaline and ciliate, apex acute; fertile bracts purplish, elliptic, ca. 9 × 4 mm, covered with cystoliths, abaxially glabrous, hyaline margin ca. 0.5 mm broad and ciliate, apex acute; bracteoles purple at tip, elliptic, ca. 9 × 5 mm, abaxially puberulent. Calyx ca. 6 mm; lobes linear. Corolla white, ca. 1.6 cm, outside sparsely pubescent; tube ca. 7 × 2 mm; lower lip ca. 7 mm, 3-lobed, central lobe larger; upper lip triangular, ca. 6 mm, apex emarginate. Staminal filaments ca. 3 mm, glabrous; anther thecae ca. 1.5 mm. Ovary glabrous; style ca. 1.2 cm, subglabrous. Capsule not seen. Fl. Dec–Mar.

• Limestone hills, streamsides; 200–500 m. Guangxi.

**14. *Rungia yunnanensis*** H. S. Lo, Acta Phytotax. Sin. 16(4): 92. 1978.

云南孩儿草 yun nan hai er cao

Herbs. Stems stout, subterete, sulcate, bifariously re-

trorsely pubescent. Petiole 1.5–2 cm, pubescent; leaf blade ovate, 6–10 × 2.5–3.5 cm, papery, both surfaces glabrous, secondary veins 10–12 on each side of midvein and netted near margin, base attenuate and slightly decurrent onto petiole, margin entire, apex acuminate. Spikes terminal or axillary, to 8 cm, 1-sided; bracts 4-ranked; sterile bracts ovate, 10–12 × 5–6 mm, hyaline margin broad, apex acuminate; bracts fertile, elliptic, ca. 9 × 3 mm, margin hyaline; bracteoles elliptic, ca. 6.5 × 3 mm. Calyx ca. 7 mm; lobes linear, slightly scabrid, apex acuminate. Corolla ca. 1 cm, outside pilose. Staminal filaments glabrous; anther thecae ovoid. Ovary hirsute; style glabrous. Capsule ca. 9 mm, tomentose. Fl. Nov–Dec, fr. Jan–Mar.

- Thickets, valleys, streamsides; 400–1000 m. Yunnan.

**15. *Rungia taiwanensis*** T. Yamazaki, J. Jap. Bot. 43: 61. 1968.

台湾明萼草 tai wān míng ē cǎo

Herbs 30–50 cm tall. Stems prostrate and rooting at nodes on basal portion, bifariously hirsute. Petiole 1–3 cm, pubescent; leaf blade ovate-oblong to oblong-lanceolate, 2.5–8 × 2.1–3.5 cm, membranous, glabrous, secondary veins 4–7 on each side of midvein, base cuneate to attenuate, margin entire or slightly undulate, apex acuminate. Spikes terminal or axillary, to 4 cm, often solitary; peduncle 1–2 cm; bracts 4-ranked; sterile bracts oblong-lanceolate, 8–9 × 2–3 mm, hyaline margin narrow and ciliate; fertile bracts ovate to ovate-lanceolate, hyaline margin broad and ciliate; bracteoles ovate, ca. 6 × 3.5 mm. Calyx ca. 5 mm, 5-lobed almost to base; lobes lanceolate. Corolla blue, ca.

1.5 cm, outside slightly gland-tipped pubescent; throat ca. 3 mm; lower lip 3-lobed; upper lip broad. Stamens exserted; filaments ca. 5 mm, glabrous. Ovary glabrous; style ca. 1 cm, glabrous. Capsule ovoid, ca. 6 mm. Seeds suborbicular, ca. 1.5 × 1.5 mm, minutely tuberculate.

- Thickets, streamsides; 1000–1500 m. Taiwan.

**16. *Rungia hircex*** Benoist, Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 149. 1930.

金沙鼠尾黄 jin sha shu wei huang

Herbs to 60 cm tall. Stems 4-angled, sulcate, bifariously pubescent along sulcae. Petiole 1–3 cm, pubescent; leaf blade ovate to oblong, 2.5–9 × 1.5–4.5 cm, slightly pubescent along veins, secondary veins 3–5 on each side of midvein and inconspicuous, base cuneate and decurrent onto petiole, margin entire and ciliate, apex acuminate. Spikes terminal, 3–5 cm; bracts homomorphic but sterile ones slightly larger than fertile ones, lanceolate-linear, 10–14 × 2–2.5 mm, abaxially pubescent, margin ciliate, apex acute; bracteoles oblong-lanceolate, ca. 6 × 2 mm, margin ciliate, apex acuminate. Calyx 5-lobed almost to base; lobes linear, ca. 5 × 2 mm, glabrous, apex acute. Corolla ca. 1.4 cm; tube cylindric; lower lip ca. 2 × 3 mm, 3-lobed, lobes ovate and apex rounded; upper lip 2-lobed. Stamens white, ca. 4 mm, glabrous. Ovary glabrous. Capsule 7–8 mm, glabrous. Seeds ovate in outline, ca. 1 mm in diam. Fl. Aug–Oct, fr. Oct–Dec.

- Streamsides; 500–600 m. Yunnan.

**21. *LEPTOSTACHYA*** Nees in Wallich, Pl. Asiat. Rar. 3: 76, 105. 1832, nom. cons. prop., not *Leptostachia* Adanson (1763).

纤穗爵床属 xian sui jue chuāng shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, perennial with cystoliths. Leaves petiolate. Inflorescences a panicle of spikes, usually reduced to a single terminal spike; bracts mostly shorter than calyx; bracteoles linear, minute. Calyx deeply 5-lobed, lobes similar (or posterior lobe shorter). Corolla tube cylindric, short; limb 2-lipped; lower lip 3-lobed; upper lip emarginate and galeate, lacking a stylar furrow; lobes ascending cochlear in bud. Stamens 2; anthers 2-theous; thecae equally to subequally inserted, parallel, muticous at base; staminodes 0. Pollen 3–5-aperturate. Ovary with 2 ovules per locule. Capsule clavate with a solid sterile stalk at base, 4-seeded; retinacula present, not rising from base. Seeds lenticular.

One species: tropical Asia.

The genus is similar to *Justicia* but differs from it by the combination of its muticous anthers, galeate upper lip of the corolla, and lack of a stylar furrow (rugula) on the upper lip. B. Hansen (Nordic J. Bot. 5: 469–473. 1985) discussed typification, taxonomy, and morphological/geographic variation of this genus.

**1. *Leptostachya wallichii*** Nees in Wallich, Pl. Asiat. Rar. 3: 105. 1832.

纤穗爵床 xian sui jue chuāng

*Codonacanthus spicatus* Handel-Mazzetti; *Dianthera leptostachya* C. B. Clarke; *Justicia wallichii* (Nees) T. Anderson; *Odontonemella leptostachya* (C. B. Clarke) Lindau; *Ptyssiglottis leptostachya* (C. B. Clarke) S. Moore.

Herbs 30–100 cm tall. Stems prostrate at base then ascending. Branches subterete, striate, bifariously pubescent then glabrescent. Petiole 1.5–4 cm, puberulent; leaf blade ovate, lan-

ceolate, or elliptic, 2–11(–17) × 1–5 cm, abaxially subglabrous except sparsely pubescent on margin and veins, adaxially glabrous or with few scattered trichomes, secondary veins 4–7 on each side of midvein, base rounded to broadly cuneate, margin entire, apex acute. Inflorescences with 1–3 spikes, 4–12 cm; rachis gland-tipped pubescent; bracts oblong-lanceolate, oblanceolate, or obovate, 1.2–2.5 mm; bracteoles lanceolate, 1–3 mm, apex acute. Calyx 2.5–3 mm; lobes subulate, outside gland-tipped pubescent. Corolla white, 5–8 mm, outside pilose; tube basal portion narrowly cylindric, 4–5 × ca. 0.5 mm; lobes of lower lip triangular-ovate, subequal. Stamens inserted in co-

rolla throat; filaments 1.5–4 mm, glabrous or puberulent; anther thecae 1–1.5 mm. Ovary glabrous or apically hirsute; style glabrous or hirsute at basal portion; stigma 2-cleft. Capsule 1–1.5 cm, finely pubescent. Seeds ca.  $2 \times 2$  mm, with concentric

ridges of short linear warts. Fl. Jun–Sep.

Moist forests; 900–1600 m. Guangdong, Guangxi, Hainan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

## 22. CODONACANTHUS Nees in A. Candolle, Prodr. 11: 103. 1847.

钟花草属 zhong hua cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, small, erect, perennial, with cystoliths. Leaves petiolate; leaf blade margin entire to subsinuate. Inflorescences of axillary or terminal racemes, loose, when terminal sometimes branched and forming a panicle, pedicellate; bracts and bracteoles minute. Flowers 1(–3 or more) in only 1 axil per node. Calyx deeply 5-lobed; lobes subequal. Corolla white with colored markings on lower lip, broadly campanulate; tube short; limb slightly 2-lipped; lower lip 3-lobed; upper lip 2-lobed; lobes ascending cochlear in bud. Stamens 2, included in to slightly emergent from corolla tube; anthers 2-theous; thecae unequal, subparallel,  $\pm$  equally to subequally inserted; staminodes 2, short. Ovary with 2 ovules per locule; stigma capitate to shallowly 2-lobed. Capsule with a solid stalk at base, fertile region ellipsoid, usually with a medial constriction, up to 4-seeded; retinacula present. Seeds  $\pm$  discoid, surfaces and margin smooth to  $\pm$  rugose, lacking trichomes.

Two species: E and S Asia; one species in China.

**1. Codonacanthus pauciflorus** (Nees) Nees in A. Candolle, Prodr. 11: 103. 1847.

钟花草 zhong hua cao

*Asystasia pauciflora* Nees in Wallich, Pl. Asiat. Rar. 3: 90. 1832; *Codonacanthus acuminatus* Nees; *Leptostachya repanda* Q. H. Chen.

Herbs 20–60 cm tall, much branched or unbranched. Stems 4-angled, sulcate, 2-fariously pubescent. Petiole 3–15 mm, puberulent or glabrous; leaf blade elliptic, ovate, or lanceolate, (2–)4–12  $\times$  (0.5–)1.5–4.5 cm, thin, abaxially pale green and glabrous or sparsely pubescent on major veins, adaxially green, glabrous or with few large-celled hairs, and with numerous cystoliths, secondary veins 5–7 on each side of midvein, base rounded, cuneate, or attenuate and decurrent onto petiole, apex

acute or acuminate. Racemes simple or terminal ones usually forming a panicle up to 15 cm; rachis puberulent; bracts lanceolate to linear, 1–2.5 mm, puberulent; bracteoles lanceolate, 1–2 mm, puberulent. Pedicel 1–7 mm, puberulent. Calyx 2.5–4 mm; lobes lanceolate, puberulent. Corolla white with purple spots at base of lower lip, 6.5–10 mm, glabrous; tube basally cylindric for 1–2 mm and 1–1.5 mm wide then abruptly widened to 3.5–6.5 mm at mouth; lobes of lower lip 3.5–5.5  $\times$  2–3.5 mm. Staminal filaments ca. 2.5 mm, glabrous; anther thecae 1.2–1.4 mm. Ovary glabrous; style 4–6.5 mm. Capsule 1–1.9 cm, glabrous. Seeds 2–3 mm. Fl. and fr. Aug–Apr.

Evergreen broad-leaved forests, wet places in ravines; below 100–1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Taiwan, Yunnan [Bhutan, Cambodia, India, Japan, Myanmar, Thailand, Vietnam].

## 23. COSMIANTHEMUM Bremekamp, Blumea 10: 166. 1960.

秋英爵床属 qiu ying jue chuang shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, often prostrate then ascending, rarely erect, with cystoliths, isophyllous. Leaves petiolate or subsessile; leaf blade margin entire. Inflorescences terminal thyrsoid racemes or thyrses, sometimes with many-flowered cymes proximally and 1–3-flowered cymes distally; bracts small; bracteoles smaller than bracts. Calyx usually deeply 5-lobed; lobes subequal or slightly unequal, posterior or one sometimes shorter. Corolla white, greenish, or yellowish; tube straight or curved, sometimes with a dorsal pouch; throat short or absent; limb 2-lipped; lower lip 3-lobed; upper lip emarginate or 2-lobed [or entire]; lobes ascending cochlear in bud. Stamens 2, inserted at throat; anthers 2-theous; thecae equal or subequal, parallel, muticous at base; staminodes 2, inserted at base of upper lip. Stigma 2-cleft. Capsule stalked, 4-seeded; retinacula present.

About ten species: SE Asia, especially Borneo; three species (two endemic) in China.

*Cosmianthemum* resembles *Pseuderanthemum* in fruit and androecium but differs by the generally smaller corolla being distinctly 2-lipped (the upper lip only shallowly lobed) and lacking an elongate, narrow, cylindric tube; see B. Hansen (Nordic J. Bot. 5: 195–197. 1985) and B. L. Burt and R. M. Smith (Notes Roy. Bot. Gard. Edinburgh 26: 365–381. 1965).

- 1a. Leaf blade ovate to broadly ovate, 4–9 cm wide ..... 1. *C. viriduliflorum*
- 1b. Leaf blade elliptic-lanceolate, ovate-elliptic, or oblong-lanceolate, 1.4–7.3 cm wide.
  - 2a. Bracts abaxially gland-tipped pubescent; calyx outside gland-tipped pubescent ..... 2. *C. knoxiifolium*
  - 2b. Bracts abaxially non-gland-tipped pubescent; calyx outside non-glandular pubescent ..... 3. *C. guangxiense*

**1. *Cosmianthemum viriduliflorum*** (C. Y. Wu & H. S. Lo) H. S. Lo, *Guihaia* 17: 42. 1997.

海南秋英爵床 *hai nan qiu ying jue chuang*

*Graptophyllum viriduliflorum* C. Y. Wu & H. S. Lo, *Fl. Hainan*. 3: 594. 1974.

Herbs to 60 cm tall, erect, perennial. Stems terete, glabrous; branches yellowish brown, pubescent. Petiole 1–2.5 cm, pubescent; leaf blade ovate to broadly ovate, 7–15 × 4–9 cm, both surfaces glabrous, abaxially light green, adaxially dark green and lustrous, secondary veins 5–7 on each side of midvein and netted near margin, base broadly cuneate to subrounded, margin entire or inconspicuously undulate, apex acuminate, caudate, or sometimes acute. Thyrses terminal, 4–10 cm; peduncle 1–4 cm; rachis pubescent; bracts linear, 1–1.5 × ca. 0.5 mm; bracteoles linear, ca. 1 × 0.5 mm. Pedicel 2–2.5 mm. Calyx ca. 5 mm, gland-tipped pubescent; lobes linear-lanceolate, apex acuminate. Corolla light greenish yellow, ca. 1.2 cm, outside and inside pubescent; lobes of lower lip oblong-lanceolate, ca. 3 × 0.6 mm, subacute at apex; upper lip erect, apex 2-cleft to emarginate. Staminal filaments ca. 4 mm, pubescent; anther thecae ca. 2 mm; staminodes ca. 2 mm, sparsely pubescent. Ovary glabrous; style ca. 6 mm, sparsely pubescent. Capsule ca. 2 cm. Seeds not seen. Fl. Jul–Oct.

• Forests; 700–1000 m. Hainan.

**2. *Cosmianthemum knoxiifolium*** (C. B. Clarke) B. Hansen, *Nordic J. Bot.* 5: 195. 1985.

秋英爵床 *qiu ying jue chuang*

*Gymnostachyum knoxiifolium* C. B. Clarke, *J. Asiatic Soc. Bengal*, Pt. 2, Nat. Hist. 74: 663. 1908; *Pseuderanthemum parviflorum* Ridley; *Ptyssiglottis parviflora* (Ridley) Ridley; *Sphinctacanthus malayanus* Ridley.

Shrubs to 50 cm tall or more. Stems terete, puberulent. Petiole 1–1.5 cm, glabrous; leaf blade elliptic-lanceolate, 8–20 × 1.8–7.3 cm, leathery, abaxially puberulent along veins and margin, adaxially glabrous, secondary veins 8–10 on each side of midvein, base cuneate, margin remotely serrate or suben-

tire, apex acuminate to attenuate. Thyrses terminal, (5.5–)10–30(–60) cm; rachis brownish pubescent with few gland-tipped trichomes; bracts lanceolate, 2–3 × 0.5–1 mm, gland-tipped pubescent; bracteoles subulate, 1–2 × ca. 0.5 mm. Pedicels 1–3 mm, pubescent. Calyx 2.5–5 mm, outside gland-tipped pubescent; lobes lanceolate, outside scaly hairy. Corolla white to pale yellow with purple spots on lower lip, ca. 1.5 cm, outside pubescent; tube ca. 5 mm; upper lip erect, apically 2-lobed to emarginate. Staminal filaments 6–7 mm, glabrous; staminodes ca. 1 mm, pubescent. Ovary gland-tipped pubescent; style pubescent. Capsule 2–2.7 cm, puberulent. Seeds ovate in outline, ca. 2 × 2 mm, flattened, irregularly ridged or warty, lacking trichomes. Fl. May–Sep, fr. Sep–Dec.

Dense montane forests; 400–500 m. Hainan [Malaysia, Thailand, Vietnam].

**3. *Cosmianthemum guangxiense*** H. S. Lo & D. Fang, *Guihaia* 17: 42. 1997.

广西秋英爵床 *guang xi qiu ying jue chuang*

*Cosmianthemum longiflorum* D. Fang & H. S. Lo.

Herbs to 70 cm tall, branched or unbranched. Stems 4-angled to subterete, sulcate, sparsely pubescent. Petiole 0.5–1 cm, grooved, pilose; leaf blade ovate-elliptic to oblong-lanceolate, 2–13.5 × 1.4–4 cm, abaxially glabrous, adaxially pilose toward base or along veins, secondary veins 5–7 on each side of midvein, base rounded to cuneate, margin entire, apex acuminate. Thyrses terminal, 3–10 cm; rachis pilose; peduncle (0.5–)1–3 cm, pubescent; cymes 1–6-flowered; bracts triangular-subulate, ca. 1.5 × 0.5 mm, pilose; bracteoles similar to bracts. Pedicel 1–3 mm. Calyx 3–4 mm, outside pilose; lobes linear, apex acute. Corolla white or yellowish green, 1–1.5 cm, outside sparsely pubescent to subglabrous, inside glabrous; tube ca. 1.5 mm wide for 4–5 mm; lower lip 6–7 × 3.5–5 mm, lobes ovate and ca. 1 × 1 mm; upper lip ovate, 5–6 × ca. 5 mm. Staminal filaments 4–5 mm, glabrous; thecae ca. 2 mm. Ovary glabrous; style 0.9–1.1 cm, sparsely hirsute to subglabrous. Capsule and seeds not seen. Fl. Oct.

• Forests; ca. 400 m. Guangxi.

## 24. JUSTICIA Linnaeus, Sp. Pl. 1: 15. 1753.

爵床属 *jue chuang shu*

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Adatoda* Adanson; *Adhatoda* Miller; *Calophanoides* Ridley; *Ecbolium* Kuntze (1891), not Kurz (1871); *Gendarussa* Nees; *Mananthes* Bremekamp; *Rhaphidospora* Nees; *Rostellaria* Nees (1832), not C. F. Gaertner (1807); *Rostellularia* Reichenbach.

Herbs, subshrubs, or shrubs, cystoliths present. Leaves sessile or petiolate; leaf blade margin usually entire but sometimes sinuate or slightly serrate. Inflorescences dichasia (sometimes reduced to a single flower) in leaf axils or axillary or terminal spikes, racemes, or thyrses, sometimes branched and becoming panicles; bracts variable in shape, sometimes prominent and/or brightly colored; bracteoles 2, similar to or smaller than bracts. Calyx deeply 4- or 5-lobed; lobes equal or subequal. Corolla tubular or funnel-shaped; limb strongly 2-lipped; lower lip 3-lobed; upper lip entire to 2-lobed, internally rugulate (i.e., with a stylar furrow); lobes ascending cochlear in bud. Stamens 2; anthers 2-theous; thecae equally or unequally inserted, parallel to perpendicular, one or both spurred at base or sometimes lacking basal appendages; staminodes absent. Ovary with 2 ovules per locule; stigma slightly 2-lobed. Capsule with a sterile basal stalk and a fertile head (i.e., ± clavate), 2–4-seeded; retinacula present. Seeds compressed [to spheric].

About 700 species: tropical and temperate regions worldwide; 43 species (26 endemic, three introduced) in China.

*Justicia betonica* Linnaeus, *J. brandegeana* Wasshausen & L. B. Smith, and *J. carnea* Lindley are only cultivated in China so are not treated here.

- 1a. Calyx equally 4-lobed or unequally 5-lobed (i.e., with one lobe conspicuously smaller than others).
  - 2a. Leaves sessile.
    - 3a. Plants diffuse, to 8 cm tall; leaf blade lanceolate to narrowly lanceolate, glabrous ..... 1. *J. demissa*
    - 3b. Plants usually erect, to 100 cm tall; leaf blade oblong to broadly ovate, pubescent ..... 2. *J. mollissima*
  - 2b. Leaves petiolate.
    - 4a. Leaf blade linear, to 5 mm wide ..... 3. *J. neolinearifolia*
    - 4b. Leaf blade ovate to elliptic to subcircular, usually wider than 5 mm.
      - 5a. Bracts obovate-elliptic, broadest at or above middle, 2–3 mm wide ..... 6. *J. hayatae*
      - 5b. Bracts ovate to elliptic-lanceolate to oblong-lanceolate, mostly broadest near base, 0.6–1.3 mm wide.
        - 6a. Spikes dense and cylindric,  $\pm$  densely pubescent ..... 4. *J. procumbens*
        - 6b. Spikes neither dense nor cylindric, sparsely pubescent ..... 5. *J. diffusa*
- 1b. Calyx equally 5-lobed.
  - 7a. Flowers in axillary abbreviated spikes, spikes ca. 1 cm, usually solitary or several clustered.
    - 8a. Leaf blade glabrous.
      - 9a. Leaf blade linear to linear-lanceolate ..... 7. *J. neesiana*
      - 9b. Leaf blade ovate to broadly elliptic (rarely lanceolate).
        - 10a. Bracts subcircular ..... 8. *J. kwangsiensis*
        - 10b. Bracts lanceolate ..... 9. *J. albovidis*
    - 8b. Leaf blade  $\pm$  pubescent (sometimes glabrous or only pubescent along veins in *J. quadrifaria*).
      - 11a. Corolla ca. 2 cm ..... 10. *J. wardii*
      - 11b. Corolla less than 1.5 cm.
        - 12a. Bracts linear, lanceolate, or ovate, broadest at base, 1-veined.
          - 13a. Bracts 2–3 mm ..... 20. *J. siccanca*
          - 13b. Bracts 5–6 mm ..... 21. *J. xantholeuca*
        - 12b. Bracts ovate to circular to elliptic to obovate to spatulate-obovate, broadest above base, pinnately veined.
          - 14a. Leaf blade (2–)5.5–11.5 cm.
            - 15a. Bracts ovate to obovate, with 3–4 mm petiole, apex obtuse; calyx 5–6 mm ..... 17. *J. quadrifaria*
            - 15b. Bracts obovate to circular, with 1–2 mm petiole, apex retuse or rounded; calyx ca. 1 cm ..... 18. *J. kouytcheensis*
          - 14b. Leaf blade 0.8–7(–10.5) cm.
            - 16a. Leaf blade adaxially glabrous ..... 13. *J. xylopoda*
            - 16b. Leaf blade adaxially pubescent at least when young.
              - 17a. Leaf blade sparsely pubescent, soon glabrescent or abaxially pilose along midvein ..... 11. *J. championii*
              - 17b. Leaf blade hispid, or densely grayish or white or yellowish pubescent.
                - 18a. Bracts circular to subcircular ..... 16. *J. hainanensis*
                - 18b. Bracts not circular (sometimes subcircular in *J. xerobatica* and *J. xerophila*).
                  - 19a. Corolla white.
                    - 20a. Stems yellow pilose; leaf blade 3–5 mm wide ..... 12. *J. xerophila*
                    - 20b. Stems minutely white sericeous; leaf blade 5–8 mm wide ..... 19. *J. xerobatica*
                  - 19b. Corolla whitish yellow, yellow, or yellowish green.
                    - 21a. Stems villous ..... 14. *J. albovelata*
                    - 21b. Stems sericeous ..... 15. *J. yunnanensis*
      - 7b. Flowers in terminal or axillary elongated spikes (or racemes or panicles), or in axillary cymes, or in thyrses of 3-flowered cymes.
        - 22a. Flowers in terminal thyrses of 3-flowered cymes; both anther thecae spurred at base ..... 22. *J. grossa*
        - 22b. Flowers in spikes or axillary cymes; only lower anther theca spurred at base.
          - 23a. Corolla 2.5–3 cm ..... 23. *J. adhatoda*
          - 23b. Corolla 2.2 cm or less.
            - 24a. Flowers in axillary cymes ..... 24. *J. vagabunda*
            - 24b. Flowers in terminal or axillary spikes (or panicles of spikes), or sometimes in racemes.
              - 25a. Bracts (at least lower ones) longer than calyx.
                - 26a. Bracts 1–1.5 cm ..... 25. *J. ventricosa*
                - 26b. Bracts to 1 cm.
                  - 27a. Leaf blade narrowly lanceolate, to 1.5 cm wide; basal bracts longer than calyx then gradually smaller with apicalmost ones shorter than calyx ..... 26. *J. gendarussa*
                  - 27b. Leaf blade lanceolate to ovate to elliptic to subcircular, often wider than 1.5 cm; all bracts longer than calyx.

- 28a. Spikes interrupted; flowers distant on rachis; corolla yellow with purplish spots ..... 27. *J. pseudospicata*  
 28b. Spikes continuous; flowers dense on rachis; corolla pale white or yellowish green with purplish red dots or stripes.  
 29a. Leaf blade margin entire; bracts ovate to elliptic, basally pale green and purplish red above middle, apex acuminate ..... 28. *J. latiflora*  
 29b. Leaf blade margin entire or crenate; bracts broadly obovate or flabellate, green, apex acuminate to obtuse and mucronate with 1–3 teeth ..... 29. *J. austrosinensis*  
 25b. Bracts equaling or shorter than calyx.  
 30a. Leaves sessile.  
 31a. Leaf blade oblanceolate to rarely lanceolate, 8–17 × 2.5–6.5 cm, abaxially rust-colored when dry ..... 30. *J. ferruginea*  
 31b. Leaf blade obovate, 15–26 × 7.5–15 cm, abaxially dark green when dry ..... 31. *J. panduriformis*  
 30b. Leaves petiolate.  
 32a. Leaf blade base cordate to truncate.  
 33a. Flowers usually 1 per rachis node; stems 4-angled; calyx ca. 4 mm; calyx and corolla pubescent with gland-tipped trichomes outside ..... 32. *J. lianshanica*  
 33b. Flowers usually 2–5 per rachis node; stems terete; calyx ca. 2 mm; calyx and corolla pubescent with non-glandular trichomes outside ..... 33. *J. cardiophylla*  
 32b. Leaf blade base (rounded to) cuneate to attenuate.  
 34a. Stems short; leaves in a basal rosette ..... 34. *J. austroguangxiensis*  
 34b. Stems elongated; leaves cauline.  
 35a. Flowers more than 1 per rachis node.  
 36a. Shrubs to 2 m tall; leaf blade (2–)3–5.5 × 1.5–2.5 cm; inflorescences unbranched spikes ..... 36. *J. microdonta*  
 36b. Herbs to 1 m tall; leaf blade 4–12.5(–18) × 2.5–6.5(–8) cm; inflorescences unbranched or branched.  
 37a. Leaf blade 10.5–12.5(–18) × 5–6.5(–8) cm; flowers in spikes ..... 35. *J. leptostachya*  
 37b. Leaf blade 4–9 × 2.5–4.5 cm; flowers in spiciform racemes (pedicel ca. 1 mm) ..... 37. *J. damingensis*  
 35b. Flowers 1 per rachis node.  
 38a. Calyx lobes elliptic-lanceolate, apex obtuse or rounded ..... 38. *J. amblyosepala*  
 38b. Calyx lobes linear to lanceolate or narrowly triangular, apex acute.  
 39a. Stems sharply 4-angled, slightly winged along angles ..... 39. *J. acutangula*  
 39b. Stems subterete to 4-angled, wingless.  
 40a. Corolla tube 2–3 × as long as limb ..... 40. *J. patentiflora*  
 40b. Corolla tube less than 2 × as long as limb.  
 41a. Calyx puberulent on both surfaces ..... 41. *J. poilanei*  
 41b. Calyx glabrous adaxially.  
 42a. Leaf blade lanceolate, broadest below middle, 4.3–5 cm wide; bracts ca. 1.5 mm ..... 42. *J. kamptiana*  
 42b. Leaf blade elliptic to obovate-elliptic, broadest at or above middle, 1.2–4.2 cm wide; bracts 3–4 mm ..... 43. *J. caudatifolia*

**1. *Justicia demissa*** N. H. Xia & Y. F. Deng, J. Trop. Subtrop. Bot. 13: 534. 2005.

矮爵床 ai jue chuang

*Rostellaria humilis* H. S. Lo, Fl. Hainan. 3: 598. 1974, not *Justicia humilis* Michaux (1803).

Herbs 6–8 cm tall, diffuse, annual. Stems 4-angled, glabrous. Leaves sessile; leaf blade lanceolate to narrowly lanceolate, 1–2 × ca. 0.3 cm, glabrous, cystoliths inconspicuous, base cuneate, margin entire, apex obtuse. Spikes terminal, 2–4.5 cm, glabrous; bracts linear-lanceolate, ca. 3 mm, glabrous, margin membranous; bracteoles similar to bracts. Calyx ca. 5 mm, glabrous, 4-lobed to base; lobes linear, margin membranous, apex obtuse. Corolla not seen. Capsule ca. 6 mm, glabrous.

• Hainan.

**2. *Justicia mollissima*** (Nees) Y. F. Deng & T. F. Daniel, **comb. nov.**

喀西爵床 ka xi jue chuang

Basionym: *Rostellaria mollissima* Nees in Wallich, Pl. Asiat. Rar. 3: 101. 1832; *Justicia khasiana* C. B. Clarke; *J. procumbens* Linnaeus var. *latispica* C. B. Clarke; *Rostellaria khasiana* (C. B. Clarke) J. L. Ellis; *R. khasiana* var. *latispica* (C. B. Clarke) C. Y. Wu ex C. C. Hu; *R. mollissima* (Nees) Nees.

Herbs 60–100 cm tall. Stems 4-angled, erect, hispid. Leaves sessile; leaf blade oblong to broadly ovate, 3–4.5 × 0.3–0.5 cm, both surfaces hispid, secondary veins 4–6 on each side of midvein, base broadly cuneate, margin entire, apex acute to obtuse. Spikes 2.5–4 cm, hispid; bracts linear-oblong, ca. 8 × 2–3 mm, hispid; bracteoles linear, ca. 6 mm. Calyx ca. 8 mm, out-

side hispid, 4-lobed almost to base; lobes linear, margin ciliate. Corolla purplish red, 0.8–1.2 cm; lower lip spreading, 3-lobed; upper lip erect, apex emarginate. Staminal filaments ca. 6 mm, sparsely hirsute; anther thecae superposed, lower one white spurred at base. Ovary hirsute at tip; style ca. 8 mm, basal portion hirsute. Capsule ellipsoid, ca. 8 mm, pubescent. Seeds minutely reticulate.  $2n = 18$ .

Trailsides; 2100–2700 m. Yunnan [India].

"*Justicia mollissima*" was published as a nomen nudum (Wallich, Numer. List, no. 2445. 1830). The earliest name for this species is *Rostellaria mollissima*, dating from 1832. Nees' name has not been transferred previously to *Justicia*.

**3. *Justicia neolinearifolia*** N. H. Xia & Y. F. Deng, J. Trop. Subtrop. Bot. 13: 534. 2005.

线叶爵床 xian ye jue chuang

*Rostellularia linearifolia* Bremekamp, Proc. Kon. Ned. Akad. Wetensch. C 60: 5. 1957; *Justicia linearifolia* (Bremekamp) H. S. Lo (1997), not Lamarck (1785); *J. linearifolia* subsp. *liangkhwangensis* (H. S. Lo) H. S. Lo; *J. neolinearifolia* subsp. *liangkhwangensis* (H. S. Lo) N. H. Xia & Y. F. Deng; *R. linearifolia* subsp. *liangkhwangensis* H. S. Lo.

Herbs to 50 cm tall. Stems 4-angled, sulcate, pubescent. Petiole 2–4 mm, pubescent; leaf blade linear, 2–4 × 0.2–0.5 cm, sparsely pubescent, secondary veins 3–5 on each side of midvein, base rounded, margin entire, apex acute. Spikes terminal, 2–3.5 cm; rachis sparsely hirsute to subglabrous; bracts linear, ca. 6 × 1 mm, subglabrous, apex acute; bracteoles linear, ca. 5 × 1 mm, sparsely hirsute, apex acute. Calyx ca. 6 mm, outside sparsely hirsute, 4-lobed almost to base; lobes linear, apex acuminate. Corolla purplish red, ca. 8 mm; lower lip 3-lobed; upper lip 2-lobed. Staminal filaments ca. 5 mm, sparsely hirsute; anther thecae superposed, lower one spurred at base. Ovary hirsute; style ca. 8 mm, basal portion hirsute. Capsule ca. 6 mm, pubescent. Seeds ovate in outline, ca. 1 × 1 mm, verrucose.

Wetlands, trailsides. Guangdong, Guangxi, Yunnan [Thailand].

**4. *Justicia procumbens*** Linnaeus, Sp. Pl. 1: 15. 1753.

爵床 jue chuang

*Ecbolium procumbens* (Linnaeus) Kuntze; *Justicia hayatae* Yamamoto var. *decumbens* Yamamoto; *J. procumbens* var. *hirsuta* Yamamoto; *J. procumbens* var. *linearifolia* Yamamoto; *Rostellularia procumbens* (Linnaeus) Nees; *R. procumbens* var. *hirsuta* (Yamamoto) S. S. Ying; *R. procumbens* var. *linearifolia* (Yamamoto) S. S. Ying; *R. trichochila* Miquel.

Herbs 20–50 cm tall, procumbent. Stems 4-angled, sulcate, pubescent. Petiole 3–8 mm, pubescent; leaf blade elliptic, ovate-elliptic, or elliptic-oblong, 1.5–4 × 0.8–1.5 cm, subglabrous to sparsely hispid, cystoliths numerous, secondary veins 3–6 on each side of midvein and prominent, base broadly cuneate to subrounded and slightly decurrent onto petiole, margin entire or slightly undulate, apex acute to obtuse. Spikes terminal or axillary in upper leaf axils, cylindric, 1–6 cm, dense; peduncle 0.5–7 cm, densely pilose; bracts ovate to elliptic-lanceolate, 2.5–8 × 0.6–1.3 mm, abaxially pilose, margin ciliate; bracteoles

lanceolate, 2.5–5 mm, abaxially pilose, margin ciliate. Calyx 4–6 mm, 4-lobed to base; lobes linear, outside pilose along veins, 1-veined, margin yellowish white and ciliate. Corolla pink or white and red-spotted on lower lip, 5–8.5 mm; lower lip ca. 3 × 3.5 mm, 3-lobed, lobes ovate, middle lobe slightly larger and ca. 1 × 1–1.5 mm; upper lip ca. 3 mm, apex emarginate. Stamens exerted; filaments ca. 4 mm, glabrous; anther thecae superposed, lower one spurred at base, upper one muticous. Ovary pubescent; style ca. 5 mm, pubescent. Capsule 4–6 mm, 4-seeded. Seeds ovate in outline, ca. 1 × 1 mm, rugose. Fl. and fr. all year.  $2n = 18, 36$ .

Wastelands, roadsides, lawns, open fields, littoral forests; near sea level to 1500 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

**5. *Justicia diffusa*** Willdenow, Sp. Pl. 1: 87. 1797.

小叶散爵床 xiao ye san jue chuang

*Justicia diffusa* var. *prostrata* Roxburgh ex C. B. Clarke; *Rostellaria hedyotidifolia* Nees; *Rostellularia diffusa* (Willdenow) Nees; *R. diffusa* var. *hedyotidifolia* (Nees) Kumari; *R. diffusa* var. *prostrata* (Roxburgh ex C. B. Clarke) H. S. Lo; *R. hedyotidifolia* (Nees) Nees.

Herbs 10–30 cm tall. Stems 4-angled, procumbent and diffuse, sulcate, sparsely pubescent. Petiole ca. 2 mm, pubescent; leaf blade lanceolate-elliptic, subcircular, or ovate, (0.7–)2–5 × 0.7–1.5 cm, glabrous or minutely pubescent, secondary veins 2–4 on each side of midvein, base cuneate, margin entire, apex acute. Spikes (1.5–)2.5–5 cm, neither dense nor cylindric, sparsely hirsute; bracts oblong-lanceolate, 2–3 × ca. 1 mm, sparsely pubescent; bracteoles linear, ca. 2.5 × 1 mm, sparsely pubescent. Calyx 3.5–5 mm, outside sparsely pubescent, 4- or 5-lobed; lobes lanceolate, margin ciliate, apex acute. Corolla purplish red, ca. 6 mm; lower lip, 3-lobed, sparsely puberulent; upper lip emarginate. Staminal filaments ca. 4 mm, hirsute; anther thecae superposed, lower one spurred at base. Ovary pubescent; style ca. 5 mm, pubescent. Capsule oblong, ca. 5 mm, subglabrous to pubescent. Seeds subsmooth.  $2n = 18$ .

Grasslands, streamsides, sandy places. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, India, Myanmar, Sri Lanka, Thailand, Vietnam].

**6. *Justicia hayatae*** Yamamoto, Icon. Pl. Formosan. Suppl. 2: 34. 1926 ["*hayatai*"].

早田氏爵床 zao tian shi jue chuang

*Justicia ciliata* (Yamamoto) C. F. Hsieh & T. C. Huang (1974), not Jacquin (1762); *J. hayatae* var. *ciliata* Yamamoto; *J. procumbens* Linnaeus var. *hayatae* (Yamamoto) Ohwi; *Rostellularia hayatae* (Yamamoto) S. S. Ying; *R. procumbens* (Linnaeus) Nees var. *ciliata* (Yamamoto) S. S. Ying.

Herbs 30–50 cm tall. Stems 4-angled, sulcate, bifariously pubescent along sulcae. Petiole 1–9 mm, glabrous; leaf blade ovate, 1.5–3.5 × 0.8–2 cm, glabrous, abaxially pale green and without cystoliths, adaxially green and with numerous cysto-

liths, secondary veins 3 or 4 on each side of midvein, base attenuate and decurrent onto petiole, margin entire, apex acute. Spikes mostly terminal or axillary at upper leaf axils, 1–4 cm, elongate to 7 cm in fruit; peduncle (0–)0.5–2 cm, glabrous; bracts obovate-elliptic, 4–5 × 2–3 mm, glabrous, margin white, apex acute; bracteoles lanceolate-elliptic, ca. 5 × 1.2 mm. Calyx 4-lobed almost to base; lobes lanceolate, ca. 4 × 1 mm, glabrous, margin white. Corolla ca. 6 mm, glabrous, 2-lipped to half its length; lower lip oblong, ca. 3 × 3 mm, minutely 3-lobed; upper lip ovate, ca. 3 × 2 mm, apex emarginate. Stamens exserted; filaments ca. 2.5 mm, glabrous except for trichomes at base; anther thecae ovoid, ca. 1.3 mm, superposed, lower one spurred at base, upper one mucous. Ovary glabrous; style ca. 6 mm, glabrous. Capsule with a brownish yellow short stipe, oblong, ca. 4 mm, glabrous, 4-seeded. Seeds ovate in outline, ca. 1 mm, rugose, glabrous.

● Seashores, sandy places. Hong Kong, Taiwan.

**7. *Justicia neesiana*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 513. 1867.

狭叶爵床 *xia ye jue chuang*

*Gendarussa neesiana* Nees in Wallich, Pl. Asiat. Rar. 3: 105. 1832; *Adhatoda neesiana* (Nees) Nees; *Calophanoides multinodis* (Benoist) C. Y. Wu & H. S. Lo; *Justicia multinodis* Benoist.

Subshrubs to 30 cm tall. Stems basally woody, decumbent, and often rooting at nodes, then erect, apical portion much branched; branchlets blackish brown when dry, terete or ± 4-angled, pubescent at nodes. Leaves subsessile; leaf blade linear to linear-lanceolate, 1–3.5 × 0.2–0.8 cm, papery, glabrous, secondary veins 4 on each side of midvein, base attenuate, margin entire, apex obtuse to rounded. Spikes axillary, ca. 1 cm, 1–3-flowered; bracts lanceolate to spatulate-lanceolate, 4–6 mm; bracteoles subulate, ca. 1 mm, glabrous. Calyx ca. 5 mm, 5-lobed almost to base; lobes lanceolate-linear. Corolla white, 7–8 mm, pubescent; lower lip 3-lobed, lobes triangular and with an acute apex; upper lip triangular, 2-lobed. Staminal filaments pubescent on basal portion; anther thecae superposed, lower one with a white spur at base. Capsule ca. 5 mm, glabrous. Fl. Jun–Aug, fr. Aug–Oct.

On rocks, streamsides; 200–800 m. Hainan, Yunnan [Laos, Thailand, Vietnam].

Specimens misidentified as *Calophanoides loheri* (C. B. Clarke) Bremekamp by C. C. Hu (FRPS 70: 284. 2002) belong here.

**8. *Justicia kwangsiensis*** (H. S. Lo) H. S. Lo, Guihaia 17: 50. 1997.

广西爵床 *guang xi jue chuang*

*Calophanoides kwangsiensis* H. S. Lo, Acta Phytotax. Sin. 17(4): 86. 1979; *C. buxifolia* (H. S. Lo & D. Fang) C. Y. Wu & T. Y. Ding ex C. C. Hu; *Justicia buxifolia* H. S. Lo & D. Fang.

Shrubs to 50 cm tall, erect. Branches stout, 4-angled, sulcate; branchlets glabrous, densely punctate with grayish white cystoliths. Petiole 4–10 mm; leaf blade ovate to broadly elliptic, (0.5–)2–9 × 1–4 cm, leathery, glabrous, densely covered with

cystoliths, secondary veins ca. 5 on each side of midvein, base broadly cuneate, margin entire, apex acuminate and sometimes shortly caudate. Spikes axillary, ca. 1 cm, 1–3-flowered; bracts subcircular, (1.5–)4–5 mm in diam., glabrous; bracteoles subulate, ca. 2 × 1 mm, glabrous. Calyx 5–6 mm, glabrous, 5-lobed almost to base; lobes narrowly lanceolate, apex acuminate. Corolla white, 7–9 mm; lower lip 3-lobed; upper lip triangular, 2-toothed. Staminal filaments glabrous; anther thecae superposed, lower one spurred at base. Capsule fusiform, ca. 8 mm, glabrous, 4-seeded. Seeds yellowish brown, tuberculate. Fl. Sep–Nov, fr. Dec–Feb.

● Limestone hills; below 700 m. Guangdong, Guangxi, Hainan.

**9. *Justicia albobiridis*** Benoist, Notul. Syst. (Paris) 5: 115. 1936.

大叶杜根藤 *da ye du gen teng*

*Calophanoides albobiridis* (Benoist) C. Y. Wu & H. S. Lo.

Herbs to 50 cm tall, perennial. Stems basally slightly decumbent then erect; young branches 4-angled, sulcate and striate, bifariously pubescent, glabrescent. Petiole 3–8 mm; leaf blade ovate to rarely lanceolate, (1–)3–9 × (0.5–)1.5–4 cm, papery, both surfaces glabrous, secondary veins 4 or 5 on each side of midvein, base slightly oblique and cuneate to subrounded, margin subentire, apex shortly acuminate. Spikes axillary, ca. 1 cm, (1–)3–5-flowered; bracts lanceolate, 1–3 mm, glabrous; bracteoles linear, ca. 1.5 mm. Calyx ca. 4 mm, 5-lobed; lobes lanceolate, outside glabrous except pubescent along midvein. Corolla white or greenish white, 8–9 mm, outside pubescent; lower lip elliptic, 3-lobed, lobes ovate with an obtuse apex; upper lip narrowly triangular, 2-lobed. Ovary slightly hirsute at tip; style basally hirsute. Capsule ca. 7 cm, glabrous. Seed light yellow, papillate. Fl. Aug–Sep, fr. Nov–Jan.

Wet places, streamsides; 200–600 m. Hainan [Vietnam].

**10. *Justicia wardii*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 184. 1918.

高山杜根藤 *gao shan du gen teng*

*Calophanoides wardii* (W. W. Smith) C. Y. Wu ex C. C. Hu.

Shrubs to 60 cm tall, diffuse. Stems straw-colored, much branched, flexuous, densely grayish tomentose, soon glabrescent. Petiole ca. 5 mm, gray pilose; leaf blade elliptic, elliptic-lanceolate, oblanceolate, or sometimes obovate, to 4.5 × 2 cm, papery, both surfaces first white tomentose then sparsely pilose, base cuneate, margin slightly undulate, apex shortly acuminate, acute, or rarely retuse. Spikes axillary, ca. 1 cm, (1–)3–5-flowered; peduncles 0–3 mm; bracts linear-lanceolate, ca. 5 mm, densely white villous; bracteoles linear, ca. 2 mm. Calyx to 8 mm, 5-lobed almost to base; lobes oblanceolate, outside densely villous, apex acute. Corolla ca. 2 cm, outside white villous; tube longer than limb; lower lip 3-lobed to middle, lobes oblong; upper lip 7–8 mm, shallowly 2-lobed. Staminal filaments glabrous, basally whitish; anther thecae superposed, lower one spurred at base. Ovary glabrous; style white villous. Capsule not seen. Fl. May.

- On rocks, thickets; ca. 1000 m. Yunnan.

**11. *Justicia championii*** T. Anderson in Benth. Fl. Hongk. 264. 1861.

圆苞杜根藤 yuan bao du gen teng

*Adhatoda chinensis* Benth. Hooker's J. Bot. Kew Gard. Misc. 5: 134. 1853; *Calophanoides chinensis* (Benth.) C. Y. Wu & H. S. Lo; *Dicliptera cyclostegia* Handel-Mazzetti; *Justicia chinensis* (Benth.) Druce (1917), not Linnaeus (1753).

Herbs to 50 cm tall. Stems 4-angled, sulcate, retrorsely pubescent. Petiole (0–)0.5–1.5 cm, sulcate, pubescent; leaf blade elliptic, oblong-elliptic, ovate, or lanceolate, 1–7(–10.5) × 0.5–2(–3.5) cm, sparsely pubescent when young, soon glabrescent or abaxially pilose along midvein, cystoliths adaxially numerous, secondary veins 3–6 on each side of midvein, base cuneate to attenuate, margin entire, apex acute to obtuse. Spikes axillary, usually 3-flowered, several clustered; peduncle 2–4 mm, sparsely pubescent; bracts petiolate, subleaflike, circular to obovate-spatulate or sometimes elliptic, 5–11 × 2–6 mm, glabrous or adaxially sparsely pilose, veins 1–3 on each side of midvein, apex rounded to obtuse; bracteoles subulate to triangular, ca. 1 mm, glabrous or sparsely yellow puberulent, apex acute. Calyx 5-lobed almost to base; lobes yellowish white except for green along veins, linear-lanceolate, 6–7 mm, 1- or 2-veined, margin ciliate. Corolla white with 2 purplish red streaks, 7–10 mm, outside puberulent; lower lip ovate, ca. 4 × 3 mm, 3-lobed, middle lobe semicircular and ca. 0.8 × 1.3 mm, lateral lobes ovate and ca. 1.2 × 1 mm; upper lip lanceolate, ca. 3.5 × 1.5 mm, apex emarginate. Stamens exserted; filaments ca. 4 mm, glabrous; anther thecae superposed, lower one spurred at base, upper one muticous. Ovary glabrous; style ca. 6 mm, sparsely pubescent toward base; stigma capitate. Capsule 8–9 mm, glabrous, 4-seeded. Seeds oblong, ca. 2 × 1.5 mm, verrucose. Fl. and fr. Aug–Oct.

- Thickets, forests; 400–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Yunnan, Zhejiang.

Inflorescences of *Justicia championii* appear to be axillary clusters of flowers but are much-reduced spikes or racemes with a very short rachis.

**12. *Justicia xerophila*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 214. 1919.

干地杜根藤 gan di du gen teng

*Calophanoides xerophila* (W. W. Smith) C. Y. Wu ex C. C. Hu.

Herbs to 10 cm tall. Stems basally semi-woody, slender and flexuous, yellow pilose. Petiole 1–3 mm, pilose; leaf blade lanceolate to oblanceolate, 0.8–1.5 × 0.3–0.5 cm, papery, both surfaces slightly pilose along veins, secondary veins ca. 3 on each side of midvein, base cuneate, margin ciliate and entire or apically 2 or 3 repandly toothed, apex acute to obtuse. Spikes axillary, ca. 1 cm, 1–3-flowered; bracts leaflike, broadly obovate to subcircular, 3–5 mm; bracteoles linear, ca. 2 mm. Calyx green, ca. 5 mm, outside slightly pilose to subglabrous, 5-lobed almost to base; lobes linear, apex acuminate. Corolla white, 7–8

mm, outside sparsely pilose; lower lip 3-lobed; upper lip emarginate. Staminal filaments ca. 4 mm, pilose; anther thecae superposed, lower one spurred at base. Ovary glabrous; style ca. 6 mm, subglabrous. Capsule ca. 5 mm, glabrous. Seeds ovate in outline, ca. 1 × 1 mm, tuberculate.

- Thickets on dry slopes. Yunnan.

**13. *Justicia xylopoda*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 214. 1919.

木柄杜根藤 mu bing du gen teng

*Calophanoides xylopoda* (W. W. Smith) C. Y. Wu ex H. P. Tsui.

Shrubs 10–13 cm tall. Stems very short, much branched; branches basally often cylindric, erect or decumbent, apically ascending, grayish or whitish pubescent, internodes sulcate. Petiole 1–3 cm, white pubescent; leaf blade ovate to narrowly ovate, 1–2.4 × 0.7–1.2 cm, papery, abaxially minutely and sparsely pilose on veins, adaxially glabrous, secondary veins 3 on each side of midvein, base cuneate and decurrent onto petiole, margin entire, apex ± obtuse. Spikes axillary, ca. 1 cm, usually 3-flowered; bracts ovate, ca. 1 cm, pubescent like leaves; bracteoles sublinear, ca. 1.5 mm. Calyx green, ca. 6 mm, 5-lobed to base; lobes linear-lanceolate, membranous, subequal, margin white, apex acuminate. Corolla yellow with purplish spots, ca. 1 cm, outside white pilose; lower lip broad, 3-lobed with center one larger; upper lip triangular, 2-lobed. Stamens inserted at apical part of corolla tube; filaments pilose around insertion; anther thecae superposed, lower one with a white spur at base. Ovary glabrous. Capsule not seen.

- Thickets on mountain slopes; 2300–2400 m. Sichuan, Yunnan.

**14. *Justicia albovelata*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 182. 1918.

绵毛杜根藤 mian mao du gen teng

*Calophanoides albovelata* (W. W. Smith) C. Y. Wu ex H. P. Tsui.

Herbs 20–50 cm tall, perennial, much branched. Stems basally decumbent then erect and zigzag; young branchlets densely white villous. Petiole 3–5 mm, pubescent; leaf blade lanceolate, 3.5–4.5 × 0.8–1.5 cm, membranous, abaxially villous, adaxially densely white villous, secondary veins 4 or 5 on each side of midvein, base cuneate, margin entire, apex obtuse. Spikes axillary, ca. 1 cm, usually 3(or 4)-flowered; bracts spatulate-circular to obovate, 5–10 × 3–7 mm; bracteoles oblanceolate to linear. Pedicels ca. 2 mm. Calyx grayish green, 5–6 mm, 5-lobed almost to base; lobes linear-lanceolate, with dense white trichomes along veins, apex acuminate. Corolla whitish yellow to yellow, ca. 9 mm; tube slightly longer than limb, outside pilose; lower lip 3-lobed; upper lip short, 2-lobed. Staminal filaments basally hirsute; anther thecae superposed, lower one larger and with a white spur at base. Ovary glabrous. Capsule clavate, ca. 8 mm, glabrous, 4-seeded. Seeds ovate in outline, ca. 1.5 × 1.5 mm, verrucose. Fl. Sep.

- Thickets, streamsides; ca. 2700 m. Yunnan.

**15. *Justicia yunnanensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 215. 1919.

滇杜根藤 dian du gen teng

*Calophanoides yunnanensis* (W. W. Smith) C. Y. Wu ex H. P. Tsui.

Shrubs to 45 cm tall. Stems basally unbranched, suberect, apically ascending, whitish sericeous. Petiole 2–5(–7) mm, pilose; leaf blade lanceolate to oblanceolate, ca.  $2.5 \times 1$  cm, papery, both surfaces pilose, base narrowly cuneate and decurrent onto petiole, margin entire, apex  $\pm$  obtuse. Spikes axillary, ca. 1 cm, usually 3–5-flowered; bracts surrounded by leaves, circular-spatulate to obovate, 5–10 mm; bracteoles linear to oblanceolate. Pedicel short. Calyx light grayish green, ca. 5 mm, 5-lobed to base; lobes linear-lanceolate, midvein pale whitish yellow, apex acuminate. Corolla light whitish yellow, ca. 8 mm, outside minutely pilose; lower lip broad, 3-lobed with center one larger; upper lip triangular, 2-lobed. Stamens inserted at apical part of corolla tube, pilose around insertion; anther thecae superposed, lower one with a white spur at base. Capsule glabrous, 4-seeded. Seeds verrucose. Fl. Sep.

● Limestone slopes; ca. 1600 m. Yunnan.

Based on the known characters, *Justicia yunnanensis* appears remarkably similar to *J. albovelata*, if it is indeed distinct. We have refrained from making taxonomic alterations because no specimens of *J. yunnanensis* were studied.

**16. *Justicia hainanensis*** (C. Y. Wu & H. S. Lo) N. H. Xia & Y. F. Deng, J. Trop. Subtrop. Bot. 13: 533. 2005.

海南爵床 hai nan jue chuang

*Calophanoides hainanensis* C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 597. 1974.

Herbs to 1 m tall. Stems 4-angled, sulcate, pubescent. Petiole 2–5 mm; leaf blade ovate to lanceolate-ovate, (0.5–)1.5–3  $\times$  (0.3–)0.5–1.8 cm, thickly papery, both surfaces hispid, secondary veins 3–5 on each side of midvein, base broadly cuneate to subrounded, margin entire, apex acute. Spikes axillary, ca. 1 cm, (1–)3–5-flowered; bracts shortly petiolate, circular to subcircular, 2–5 mm in diam.; bracteoles small or absent. Calyx ca. 4.5 mm, hispid, 5-lobed almost to base; lobes linear-lanceolate. Corolla white, ca. 6 mm, outside densely pubescent; tube slightly enlarged; lower lip spreading, apex 3-lobed; upper lip erect, triangular and concave, apex emarginate. Staminal filaments ca. 2.5 mm; anther thecae superposed, lower one spurred at base. Ovary glabrous; style ca. 3 mm, glabrous. Capsule obovoid, ca. 6 mm, glabrous, 4-seeded. Seeds broadly ovate in outline, ca.  $0.6 \times 0.6$  mm, compressed, verrucose. Fl. Jul–Nov, fr. Oct–Jan.

● Forests; 200–1100 m. Guangdong, Hainan.

**17. *Justicia quadrifaria*** (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 514. 1867.

杜根藤 du gen teng

*Gendarussa quadrifaria* Nees in Wallich, Pl. Asiat. Rar. 3: 105. 1832; *Adhatoda quadrifaria* (Nees) Nees; *A. zollingeriana* Nees; *Calophanoides quadrifaria* (Nees) Ridley.

Herbs. Stems 4-angled, basally decumbent and usually rooting at nodes then erect, sulcate, bifariously pubescent, soon glabrescent. Petiole 0.4–2.5 cm, sparsely pubescent; leaf blade oblong, lanceolate, to rarely orbicular, (2–)6–8  $\times$  (1–)2–3.5 cm, both surfaces glabrous or only pubescent along veins, secondary veins 5–7 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin entire or slightly serrate, apex acute. Spikes axillary, ca. 1 cm, usually 3-flowered, solitary or several in a cluster; bracts with a 3–4 mm petiole, ovate to obovate, 3–8  $\times$  3–5 mm, sparsely pubescent, pinnately veined, apex obtuse; bracteoles linear, ca. 1 mm, glabrous. Calyx 5–6 mm, outside puberulent, 5-lobed almost to base; lobes linear-lanceolate. Corolla white with purple spots on lower lip, ca. 8 mm, outside pubescent; lower lip ca.  $4 \times 3$  mm, patent, apex 3-lobed; upper lip oblong, erect, apex 2-lobed. Anthers with thecae superposed, lower ones spurred at base. Ovary glabrous; style ca. 6 mm, sparsely hirsute. Capsule ca. 8 mm, glabrous. Seeds ovate in outline, ca.  $1.5 \times 1$  mm, verrucose, glabrous.

On rock in forested valleys; 800–1600 m. Chongqing, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Sichuan, Yunnan [India, Indonesia, Laos, Myanmar, Thailand, Vietnam].

**18. *Justicia kouytcheensis*** (H. Léveillé) E. Hossain, Notes Roy. Bot. Gard. Edinburgh 32: 407. 1973.

贵州杜根藤 gui zhou du gen teng

*Ruellia repens* Linnaeus var. *kouytcheensis* H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 175. 1914; *Calophanoides kouytcheensis* (H. Léveillé) H. S. Lo.

Herbs to 40 cm tall. Stems basally decumbent and rooting at nodes. Petiole 1–2.5 cm; leaf blade oblong to rhombic, 5.5–11.5  $\times$  3.5–5.5 cm, membranous, both surfaces pubescent especially along veins, secondary veins 6 or 7 on each side of midvein, base cuneate and decurrent onto petiole, margin entire or sometimes apically undulate-serrate, apex acuminate to subcaudate. Spikes axillary, ca. 1 cm, 1–3(–5)-flowered; bracts with a 1–2 mm petiole, obovate to circular, 7–8  $\times$  4–5 mm, veins ca. 3 on each side of midvein, base broadly cuneate, apex retuse or rounded; bracteoles subulate, 1–2 mm. Calyx ca. 1 cm, 5-lobed almost to base; lobes lanceolate, subequal, outside white laterally, green along midvein, and pubescent. Corolla white, ca. 1.4 cm; lower lip patently 3-lobed; upper lip erect, 2-lobed. Staminal filaments ca. 5 mm, glabrous; anther thecae oblong, superposed, lower one smaller and with a white spur at base. Ovary glabrous; style ca. 9 mm, glabrous; stigma capitate, slightly enlarged. Capsule and seeds not seen. Fl. Aug–Oct.

● Limestone hills, thickets; 800–1300 m. Guizhou, Yunnan.

*Justicia kouytcheensis* is very similar to *J. quadrifaria*, and the putative distinctions between them require additional studies.

**19. *Justicia xerobatica*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 213. 1919.

滇东杜根藤 dian dong du gen teng

*Calophanoides xerobatica* (W. W. Smith) H. P. Tsui.

Subshrubs to 30 cm tall, prostrate. Stems basally woody, slender, flexuous, and often rooting at nodes, apically as-

ending, minutely white sericeous. Petiole 2–3 cm, pilose; leaf blade subcircular, broadly obovate, or rarely narrowly lanceolate,  $1-2 \times 0.5-0.8$  cm, softly membranous, both surfaces pilose on veins, base cuneate, margin entire, apex rounded to obtuse. Spikes axillary, ca. 1 cm, 1–3-flowered; bracts surrounded by leaves, leaflike, broadly obovate to subcircular, 3–4 mm; bracteoles ovate to nearly subulate-lanceolate, small. Calyx green, ca. 5 mm, 5-lobed almost to base; lobes linear-lanceolate, midrib pilose, margins scarious, apex acuminate. Corolla white (reportedly), ca. 9 mm, outside sparsely pilose. Mature capsule not seen. Fl. Sep.

- Limestone areas; 1200–1400 m. Sichuan, Yunnan.

*Justicia xerobatica* is very similar to *J. xerophila*. Further studies of both will be necessary to determine whether they should be treated as distinct from one another.

**20. *Justicia siccanca*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 43. 1917.

旱杜根藤 han du gen teng

*Calophanoides siccanca* (W. W. Smith) C. Y. Wu ex C. C. Hu.

Shrubs to 60 cm tall, prostrate. Stems woody, flexuous, grayish tomentose, soon glabrescent. Petiole 3–8 cm, villous; leaf blade ovate to lanceolate,  $1.5-4 \times 1-2$  cm, both surfaces sparsely pilose, secondary veins ca. 4 on each side of midvein, base cuneate, margin entire, apex rounded to acute. Spikes axillary, ca. 1 cm, 1–3-flowered; peduncle ca. 3 mm, grayish pubescent; bracts linear, 2–3 mm, abaxially grayish pubescent; bracteoles similar to bracts. Calyx ca. 7 mm, outside pubescent, 5-lobed to base; lobes linear. Corolla white tinged with red, ca. 1.3 cm, outside pubescent; lower lip very short, 3-lobed, lobes circular; upper lip shorter, apex emarginate. Staminal filaments ca. 4 mm, basal portion whitish villous; anther thecae superposed, lower one spurred at base. Ovary glabrous; style ca. 8 mm, white villous. Capsule ca. 7 mm, glabrous. Seeds ovate in outline, ca.  $1 \times 1$  mm. Fl. Sep.

- On rocks by trailsides, open slopes; 2000–2200 m. Sichuan, Yunnan.

**21. *Justicia xantholeuca*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 212. 1919.

黄白杜根藤 huang bai du gen teng

*Calophanoides xantholeuca* (W. W. Smith) C. Y. Wu ex C. C. Hu.

Shrubs to 30 cm tall. Stems 4-angled, much branched, sulcate, pilose then glabrescent. Petiole 2–5 mm, pilose; leaf blade lanceolate,  $2-3 \times 0.7-1$  cm, papery, both surfaces pilose along veins, secondary veins ca. 3 on each side of midvein, base cuneate, margin entire, apex acute. Spikes axillary, 3–5-flowered; bracts lanceolate or ovate, 5–6 mm; bracteoles subulate, narrowly lanceolate, or ovate, smaller than bracts. Calyx grayish white, ca. 5 mm, white pilose along midvein, 5-lobed almost to base; lobes linear-lanceolate. Corolla white, ca. 8 mm, outside sparsely pilose; lower lip 3-lobed; upper lip emarginate. Staminal filaments ca. 5 mm, sparsely hirsute; anther thecae superposed, lower one spurred at base. Ovary glabrous; style ca. 6

mm, subglabrous. Capsule ca. 5 mm, glabrous. Seeds ovate in outline, ca.  $1 \times 1$  mm, tuberculate-verrucose. Fl. Nov–Jan.

- Thickets on dry slopes; 400–800 m. Yunnan.

**22. *Justicia grossa*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 535. 1885.

大爵床 da jue chuang

Shrubs 50–100 cm tall. Stems subterete, puberulent when young then glabrescent. Petiole 1.3–4 cm, glabrous or puberulent; leaf blade elliptic to lanceolate,  $16-30 \times 5-9.5$  cm, abaxially glabrous or puberulent along veins; adaxially glabrous, secondary veins 5–8 on each side of midvein, base broadly rounded to cuneate, margin crenulate, apex acuminate to attenuate and with an obtuse tip. Inflorescences terminal, thyrsoid of 3-flowered cymes, usually 3 or more branched,  $5-15 \times 2-3$  cm; peduncle 1–3.5 cm; rachis hirsute; bracts ovate, elliptic, or lanceolate,  $2-8 \times 1-5$  mm, abaxially puberulent; bracteoles lanceolate to rarely triangular,  $1.5-3 \times 0.5-1$  mm, abaxially puberulent. Pedicel 1–5 mm, hirsute. Calyx ca. 6 mm, both surfaces gland-tipped pubescent, 5-lobed to base; lobes linear. Corolla greenish white with pale purple dots on lower lip, 1.2–1.5 cm, outside pubescent; tube 6–7 mm; limb 6–7 mm; lower lip 3-lobed, lobes ovate and ca.  $2 \times 1.5-2$  mm; upper lip emarginate. Staminal filaments 4–6 mm, basal portion densely pubescent; anther thecae 1.5–2 mm, both spurred at base. Ovary pubescent; style pubescent. Capsule ca. 1.6 cm, densely pubescent. Seeds elliptic to circular in outline, ca.  $3.5 \times 3.5$  mm, wrinkly verrucose.

Forests; 400–800 m. Hainan [Laos, Malaysia, Myanmar, Thailand, Vietnam].

**23. *Justicia adhatoda*** Linnaeus, Sp. Pl. 1: 15. 1753.

鸭嘴花 ya zui hua

*Adhatoda vasica* Nees.

Shrubs to 4 m tall. Branches thickened,  $\pm$  4-angled, lenticellate, pubescent when young but soon glabrescent. Petiole 0.8–3 cm, puberulent; leaf blade ovate to elliptic-ovate,  $7-18 \times 2-7$  cm, abaxially puberulent, adaxially densely tomentose when young but glabrescent except tomentose along veins, secondary veins 9–12 on each side of midvein and meeting near margin, base broadly cuneate, margin entire, apex acuminate and sometimes slightly falcate. Spikes terminal or axillary, ovoid to broadly ovoid, 3–7 cm; peduncle 3–7 cm; bracts imbricate, ovate-oblong,  $1-2 \times 0.5-1.5$  cm, puberulent, 3–7-veined, margin ciliate, apex acute; bracteoles linear-lanceolate,  $1-1.4 \times$  ca. 0.4 cm, puberulent, 3–5-veined, margin ciliate, apex acute. Calyx 5-lobed; lobes linear-oblong, ca.  $10 \times 3$  mm, margin narrowly scarious and ciliate. Corolla white or pink with purplish or pinkish stripes outside, broadly tubular, 2.5–3 cm, outside pilose; tube basally cylindric and ca. 5 mm wide for ca. 5 mm and then slightly inflated and bent upward; upper lip ovate-oblong, ca. 1.8 cm, erect, shallowly 2-lobed; lower lip oblong-circular, spreading, 3-lobed, middle lobe subcircular and ca.  $9 \times 5$  mm, lateral lobes ovate and ca.  $8 \times 4.5$  mm. Stamens exserted; filaments ca. 1.5 cm, declinate, glabrous except basally sericeous; anther thecae ellipsoid, ca. 3.5 mm, equal,

superposed, lower one spurred at base. Ovary pubescent especially at tip; style ca. 2.5 cm, recurved, basal part pubescent; stigma simple. Capsule obovoid, 2.5–4 × ca. 0.5 cm. Seeds circular in outline. Fl. Jan–Mar, fr. Jun–Jul.  $2n = 34$ .

Roadsides, thickets. Naturalized or cultivated in Guangdong, Guangxi, Hainan, and Yunnan [probably native to India, Indonesia, Malaysia, Nepal, Pakistan, and Sri Lanka, but widely cultivated and naturalized in tropics, obscuring native distribution].

*Justicia adhatoda* is widely cultivated beyond its native range.

This species is used medicinally.

**24. *Justicia vagabunda*** Benoist, Notul. Syst. (Paris) 5: 114. 1936.

针子草 zhen zi cao

*Raphidospora vagabunda* (Benoist) C. Y. Wu ex C. C. Hu.

Shrubs to 1.3 m tall. Stems terete, zigzag, glabrous. Petiole 7–12 mm; leaf blade oblong-lanceolate, 6–14 × 2–5 cm, glabrous or sometimes pilose along midvein, base obliquely cuneate, margin entire or slightly undulate, apex acute to falcate. Cymes axillary, ca. 2 cm; peduncle 4–6 mm, pubescent; bracts subulate, 1–2 mm, pilose; bracteoles 2–5 mm, pilose. Calyx ca. 3.5 mm, outside pubescent; lobes 5, oblong-lanceolate. Corolla white with blue lines, 1–1.1 cm, outside pubescent; tube as long as limb; lower lip 3-lobed; upper lip triangular, apex emarginate. Staminal filaments ca. 4 mm, glabrous; anther thecae superposed, lower one spurred at base. Ovary pubescent at tip; style basal portion hirsute. Capsule not seen.

Forests, thickets, streamsides; 500–800 m. Yunnan [Cambodia, Vietnam].

**25. *Justicia ventricosa*** Wallich ex Hooker, Bot. Mag. 54: t. 2766. 1827.

黑叶小驳骨 hei ye xiao bo gu

*Adhatoda ventricosa* (Wallich ex Hooker) Nees; *Gendarussa ventricosa* (Wallich ex Hooker) Nees.

Subshrubs or perennial herbs, to 1 m tall. Stems subterete, glabrous. Winter buds ovoid, ca. 2 mm, pubescent. Petiole 0.5–1.5 cm, sulcate, glabrous; leaf blade elliptic to obovate, 6–17 × 2–6 cm, glabrous, midvein abaxially prominent and adaxially impressed, secondary veins 6–8 on each side of midvein, prominent on both surfaces, and meeting near margin, base attenuate, margin entire or slightly undulate, apex shortly acuminate to acute. Spikes terminal, 5–10 cm, densely flowered, usually with 1–3 flowers on each inflorescence node; peduncle ca. 1 cm; bracts leaflike, green to maroon, imbricate, broadly ovate to subcircular, 1–1.5 × 0.8–1 cm, abaxially pilose to subglabrous, pinnately veined, margin ciliate, apex acute; bracteoles linear, 3–5 × 1–2 mm, margin ciliate. Calyx 5-lobed; lobes linear-lanceolate, ca. 3 mm, margin ciliate. Corolla creamy white with purplish pink stripes on lips, 1.5–1.8 cm, outside pilose, inside pubescent; tube basally cylindric and ca. 1.7 mm wide for ca. 1 cm; lower lip 3-lobed, lobes ovate, ca. 2 × 1 mm, and apex rounded; upper lip oblong-ovate, 2-lobed. Stamens exserted; filaments ca. 6 mm, glabrous; anther thecae ovoid, subequal, superposed, lower one with a white appendage at base. Ovary comose; style ca. 1.6 cm, base pilose. Cap-

sule ca. 8 mm, pubescent, 4-seeded. Fl. Nov–Jan, fr. Apr–May.  $2n = 30$ .

Sparse forests, thickets. Naturalized or cultivated in Guangdong, Guangxi, Hainan, and Yunnan [native to Cambodia, Laos, Myanmar, N Thailand, and Vietnam].

This species is used medicinally.

**26. *Justicia gendarussa*** N. L. Burman, Fl. Indica, 10. 1768.

小驳骨 xiao bo gu

*Gendarussa vulgaris* Nees.

Subshrubs 0.7–1.5 cm tall, much branched. Stems subterete, swollen at nodes, glabrous. Petiole 3–10 mm; leaf blade narrowly lanceolate, 6–10 × 1–1.5 cm, glabrous, secondary veins 5–8 on each side of midvein, base cuneate to attenuate, margin subsinuate, apex acute to shortly acuminate. Spikes terminal or axillary, 3–12 cm, interrupted, usually in a leafy panicle; peduncle 0.5–1.5 cm; bracts triangular, 2–6 × 1–2.5 mm, basal ones longer than calyx then gradually smaller with apicalmost ones shorter than calyx, margin ciliate, apex acute; bracteoles elliptic to linear-lanceolate, ca. 3 × 1 mm, margin ciliate, apex acute. Calyx ca. 5 mm, 5-lobed; lobes linear-lanceolate, 3–4 × ca. 0.5 mm, subequal, apex acuminate. Corolla creamy white, 1.2–1.5 cm; tube basally cylindric and ca. 2 mm wide for 8–9 mm; lower lip violet dotted basally, cuneate-obovate, 6–10 mm broad, 3-lobed, lobes oblanceolate and 3–5 × ca. 3.5 mm; upper lip violet blotched, triangular, ca. 7 × 3.5 mm, 2-cleft. Stamens exserted; filaments 3–6 mm, glabrous; anther thecae oblong, ca. 1.2 mm, superposed, lower one spurred at base, upper one mucicous. Ovary glabrous; style ca. 1 cm, glabrous; stigma capitate, shortly 2-lobed. Capsule clavate, ca. 1.2 cm. Fl. Jan–Apr.  $2n = 28, 30$ .

Roadsides, thickets. Naturalized or cultivated in Guangdong, Guangxi, Hainan, Taiwan, and Yunnan [native to or naturalized in Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, and Vietnam; widely cultivated].

*Justicia gendarussa* is native to S and SE Asia but is widely cultivated and naturalized. Its actual native distribution is not certain because it is often not clear whether particular collections are native.

**27. *Justicia pseudospicata*** H. S. Lo & D. Fang, Guihaia 17: 52. 1997.

黄花爵床 huang hua jue chuang

*Mananthes pseudospicata* (H. S. Lo & D. Fang) C. Y. Wu & C. C. Hu.

Herbs to 30 cm tall, perennial. Stems 4-angled, basally usually rooting at nodes, sulcate, bifariously pubescent. Petiole 3–13 mm, pubescent; leaf blade ovate, (0.8–)1.5–6.5 × (0.4–)1–4 cm, thickly papery, abaxially glabrous, adaxially glabrous or pilose on veins, secondary veins 4 or 5 on each side of midvein, base cuspidate to rounded, margin subundulate, apex acute. Spikes often terminal or rarely axillary in apicalmost leaf axil, 1.5–3 cm, interrupted; peduncle 1–2.5 cm; rachis bifariously pubescent; bracts broadly obovate to sometimes circular or ovate, 3–5 × 2–4 mm, abaxially sparsely gland-tipped puberulent, apex cuspidate; bracteoles narrowly triangular, ca. 2 × 1 mm, abaxially pubescent, margin ciliate, apex acute. Calyx 2–3

mm, 5-lobed almost to base; lobes linear. Corolla yellow with purplish spots, 1.2–1.4 cm, outside pubescent; lower lip palate 3-lobed, lobes triangular and 1–2 mm; upper lip 4–5.5 mm, apex emarginate. Staminal filaments 2.5–3 mm, glabrous; anther thecae ca. 1.5 mm, lower one spurred at base. Ovary glabrous; style 5–8 mm, subglabrous. Capsule not seen. Fl. Sep–Dec.

- On rocks in forests; 1300–1700 m. Guangxi.

**28. *Justicia latiflora*** Hemsley, J. Linn. Soc., Bot. 26: 245. 1890.

紫苞爵床 *zi bao jue chuang*

*Mananthes latiflora* (Hemsley) C. Y. Wu & C. C. Hu.

Herbs or shrubs 50–100 cm tall, erect. Stems 4-angled, sulcate, sparsely pubescent. Petiole 1–3.5 cm, pubescent; leaf blade lanceolate, ovate, or subcircular, 6–10 × 2–3.5 cm, both surfaces hispid along veins, secondary veins 8–10 on each side of midvein, base cuneate to sometimes attenuate, margin entire, apex acuminate. Spikes terminal, 3.5–5.5 cm, densely flowered; bracts basally pale green and purplish red above middle, ovate to elliptic, 7–10 × 3–4 mm, abaxially puberulent, apex acuminate; bracteoles linear, 5–7 × ca. 1.5 mm, abaxially puberulent. Calyx 5–8 mm, outside puberulent, 5-lobed almost to base; lobes linear, apex acute. Corolla pale white with purplish red dots or stripes on lobes, ca. 1.5 cm, outside pubescent; tube ca. 1 cm; lower lip patent, broadly 3-lobed, lobes circular and ca. 1 mm in diam.; upper lip ca. 0.5 mm, broadly rounded and concave, apex emarginate. Staminal filaments glabrous; anther thecae superposed, lower one minutely spurred at base. Ovary glabrous; style glabrous. Capsule obovoid-clavate, 1–1.2 cm, glabrous. Seeds ovate in outline, ca. 4 × 3.5 mm, rugose. Fl. Feb–Apr, fr. May–Jun.

- Forests, streamsides; 600–1800 m. Chongqing, Guizhou, Hubei, Hunan.

**29. *Justicia austrosinensis*** H. S. Lo, Guihaia 17: 52. 1997.

华南爵床 *hua nan jue chuang*

*Mananthes austrosinensis* (H. S. Lo) C. Y. Wu & C. C. Hu.

Herbs 40–70 cm tall. Stems 4-angled, sulcate, glabrous. Petiole 0.5–3 cm, bifariously pubescent or glabrescent; leaf blade broadly ovate to ovate-elliptic, 7–15 × 2.5–7 cm, glabrous, abaxially pale green, adaxially green and with numerous cystoliths especially on veins, secondary veins 5–8 on each side of midvein, base cuneate and decurrent onto petiole, margin crenate or entire, apex shortly acuminate to acute. Spikes mostly terminal or rarely axillary, 5–7 cm; peduncle 1–3 cm, with numerous cystoliths, glabrous; bracts green, usually subtending 1 or 2 flowers, flabellate or broadly obovate, 5–8 × 7–9 mm, margin ciliate, apex acuminate to obtuse and mucronate, with 1–3 teeth; bracteoles subulate, ca. 3 mm, margin ciliate, apex acuminate. Calyx 5-lobed almost to base; lobes lanceolate, ca. 4 mm, margin ciliate, apex acuminate. Corolla yellowish green with purplish red dots on lobes, ca. 1.3 cm, outside pilose, inside glabrous except for trichomes retaining style; lip ca. 1/2

as long as corolla; lower lip 3-lobed, lobes ovate, ca. 2 × 2 mm, and apex rounded; upper lip ovate-triangular, ca. 6 × 3 mm, erect, apex emarginate. Stamens exserted; filaments ca. 4 mm, glabrous; anther thecae ca. 2 mm, unequal, superposed, lower one spurred at base, upper one mucous. Ovary glabrous; style ca. 1 mm, pilose. Capsule clavate, ca. 1.2 cm, pubescent, 4-seeded. Seeds ovate in outline, ca. 2 mm, rugose. Fl. Jul–Oct.

- Thickets in ravines. Guangdong, Guangxi, Guizhou, Jiangxi, Yunnan.

**30. *Justicia ferruginea*** H. S. Lo & D. Fang, Guihaia 17: 58. 1997.

锈背爵床 *xiu bei jue chuang*

*Mananthes ferruginea* (H. S. Lo & D. Fang) C. Y. Wu & C. C. Hu.

Herbs 20–60 cm tall, anisophyllous. Stems 4-angled, sulcate, glabrous. Leaves sessile; leaf blade oblanceolate to rarely lanceolate, 8–17 × 2.5–6.5 cm, papery, glabrous, abaxially rust-colored when dry, secondary veins 10–13 on each side of midvein, base auriculate and somewhat amplexicaul, margin entire, apex obtuse. Spikes terminal or axillary, 1.5–5 cm, interrupted, with 2–5 flowers per node; peduncle 1.5–3.5 cm, glabrous; rachis puberulent; bracts triangular, ca. 1 mm, subglabrous; bracteoles similar to bracts. Calyx ca. 2 mm, subglabrous, 5-lobed almost to base; lobes narrowly triangular. Corolla white, 6.5–7 mm, outside puberulent; lower lip 3-lobed, lobes ca. 1 mm and apex rounded; upper lip ovate-triangular, ca. 3 mm, erect, apex emarginate. Staminal filaments ca. 2 mm, glabrous; anther thecae ca. 1 mm, unequal, superposed, lower one spurred at base. Ovary glabrous; style subglabrous. Capsule not seen. Fl. May–Aug.

- Forests on limestone hills. Guangxi.

**31. *Justicia panduriformis*** Benoist, Notul. Syst. (Paris) 5: 116. 1936.

琴叶爵床 *qin ye jue chuang*

*Mananthes panduriformis* (Benoist) C. Y. Wu & C. C. Hu.

Shrubs to 2 m tall. Stems 4-angled, sulcate, glabrous. Leaves sessile; leaf blade obovate, 15–26 × 7.5–15 cm, glabrous, base attenuate to rounded, margin entire or slightly undulate, apex shortly acuminate. Spikes terminal, elongated; rachis densely pubescent, with 2 or 3 flowers clustered per node; bracts lanceolate-linear, 2–3 mm, apex acute; bracteoles similar to bracts. Calyx ca. 3 mm, outside puberulent, 5-lobed almost to base; lobes linear, apex acute. Corolla white, ca. 8 mm; tube as long as limb; lower lip 3-lobed; upper lip emarginate. Staminal filaments ca. 4 mm, glabrous; anther thecae unequal, superposed, lower one spurred at base. Ovary pubescent; style ca. 6 mm, basal portion slightly pubescent. Capsule not seen. Fl. May–Sep.

- Forests on limestone hills. Guangxi, Yunnan [Vietnam].

**32. *Justicia lianshanica*** (H. S. Lo) H. S. Lo, Guihaia 17: 50. 1997.

广东爵床 *guang dong jue chuang*

*Mananthes lianshanica* H. S. Lo, Bull. Bot. Res., Harbin 1(4): 105. 1981.

Herbs to 30 cm tall. Stems 4-angled, basally prostrate and rooting at nodes then erect, sulcate, bifariously pubescent to glabrescent. Petiole 1.5–3.5 cm, pubescent; leaf blade ovate, 3.5–14 × 2–6 cm, thinly papery, abaxially glabrous or sparsely puberulent along veins, adaxially glabrous, secondary veins 6–8 on each side of midvein and meeting near margin, base shallowly cordate to subtruncate, margin slightly undulate or subentire, apex obtuse. Spikes terminal; rachis densely pubescent, usually 1-flowered per node; bracts ovate-lanceolate, 2–3 mm, abaxially pubescent; bracteoles similar to bracts. Calyx ca. 4 mm, outside gland-tipped pubescent, 5-lobed almost to base; lobes lanceolate, ca. 3.5 × 0.7 mm. Corolla yellow with purplish spots on lower lip, ca. 8 mm, outside gland-tipped pubescent; tube slightly widened apically; lower lip ca. 3.5 mm, broader than upper lip, patent, 3-lobed, lobes ovate and apex rounded; upper lip triangular, ca. 2.2 mm, erect, apex emarginate. Staminal filaments ca. 3 mm, glabrous; anther thecae ovoid, superposed, lower one spurred at base. Ovary hirsute; style ca. 9 mm, subglabrous. Capsule (immature) clavate, hirsute. Fl. May–Jul.

● Forests on rocks; 300–800 m. Guangdong, Guangxi.

**33. *Justicia cardiophylla*** D. Fang & H. S. Lo, Guihaia 17: 57. 1997.

心叶爵床 xin ye jue chuang

*Mananthes cardiophylla* (D. Fang & H. S. Lo) C. Y. Wu & C. C. Hu.

Herbs 20–50 cm tall. Stems terete, glabrous. Petiole 3.5–11 mm, glabrous or somewhat gland-tipped puberulent; leaf blade cordate to rarely broadly ovate, 3.5–12 × 2–9 cm, papery, glabrous, secondary veins 5–7 on each side of midvein, base cordate to ± truncate, margin subentire, apex acute to rarely shortly acuminate. Spikes terminal, 3.5–11 cm, unbranched or sometimes 1-branched; peduncle 7.5–20.5 cm, somewhat bifariously pubescent; rachis densely pubescent, (1 or) 2–5-flowered per node; bracts triangular, 1.5–2 × ca. 1 mm, abaxially puberulent, margin ciliate; bracteoles subtriangular, ca. 1.5 mm, abaxially puberulent. Calyx ca. 2 mm, outside puberulent, 5-lobed almost to base; lobes linear-triangular, ca. 1.5 × 0.6 mm. Corolla greenish yellow, ca. 7 mm, outside pubescent; lower lip patent, 3-lobed, lobes ca. 1 mm and apex rounded; upper lip triangular, ca. 3.5 mm, erect, apex emarginate. Staminal filaments ca. 2 mm, glabrous; anther thecae linear, ca. 1 mm, unequal, superposed, lower one spurred at base. Ovary pubescent; style ca. 3.5 mm, basal portion sparsely puberulent. Capsule clavate, ca. 1.5 cm, pubescent, 4-seeded. Seeds ovate in outline, ca. 1.3 × 1.3 mm, verrucose. Fl. Mar–Jun.

Rocky limestone hills; 400–600 m. Guangxi [Vietnam].

**34. *Justicia austroguangxiensis*** H. S. Lo & D. Fang, Guihaia 17: 54. 1997.

桂南爵床 gui nan jue chuang

*Justicia austroguangxiensis* f. *albinervia* D. Fang & H. S. Lo; *Mananthes austroguangxiensis* (H. S. Lo & D. Fang) C. Y.

Wu & C. C. Hu; *M. austroguangxiensis* f. *albinervia* (D. Fang & H. S. Lo) C. Y. Wu & C. C. Hu.

Herbs 15–30 cm tall. Stems 0.5–5 cm, sometimes woody. Leaves in a basal rosette; petiole 1–3 cm, glabrous; leaf blade obovate, obovate-elliptic, or rarely elliptic, (6–)10–15 × (2.5–)4–7(–9) cm, papery, glabrous, secondary veins 7 or 8 on each side of midvein, base attenuate to narrowly cuneate and decurrent onto petiole, margin entire, apex acute to rarely obtuse. Spikes terminal or axillary in apical leaf axils, 5–35 cm, interrupted, usually branched; rachis puberulent, usually (1 or) 2–9-flowered per node; bracts triangular to rarely narrowly triangular, 1–2 mm, abaxially puberulent; bracteoles similar to bracts. Calyx 1.5–2 mm, outside puberulent, 5-lobed almost to base; lobes subulate. Corolla light yellowish green, 8–9 mm, outside puberulent; lower lip 3-lobed, lobes 4–4.5 mm; upper lip triangular, 3.5–4 mm, erect, apex emarginate. Staminal filaments ca. 3 mm, glabrous; anther thecae superposed, lower one spurred at base. Ovary puberulent; style 4.5–5 mm, basal portion puberulent. Capsule clavate, 1.3–1.5 cm. Seeds ovate in outline, ca. 0.8 × 0.8 mm, tuberculate. Fl. Mar–Jul, fr. Aug.

● Dense forests on rocks; 300–500 m. Guangxi.

**35. *Justicia leptostachya*** Hemsley, J. Linn. Soc., Bot. 26: 245. 1890.

南岭爵床 nan ling jue chuang

*Mananthes leptostachya* (Hemsley) H. S. Lo.

Herbs 40–60 cm tall. Stems 4-angled, sulcate, bifariously pubescent. Petiole 1–2 cm; leaf blade ovate-lanceolate, 10.5–12.5(–18) × 5–6.5(–8) cm, papery, abaxially strigose along veins, adaxially sparsely strigose, secondary veins 5–9 on each side of midvein, base broadly cuneate, margin entire or slightly undulate, apex acuminate. Spikes terminal, 3–6 cm, branched or rarely unbranched; rachis hispid, with several flowers per node; bracts linear, ca. 2 × 0.8 mm, abaxially puberulent; bracteoles similar to bracts. Calyx ca. 3 mm, outside puberulent, 5-lobed almost to base; lobes narrowly lanceolate to linear, apex acute. Corolla ca. 6 mm, outside pubescent; lower lip patent, 3-lobed, lobes ovate and apex rounded; upper lip oblong, apex emarginate. Staminal filaments ca. 3 mm, glabrous; anther thecae superposed, lower one spurred at base. Ovary glabrous; style filiform, glabrous. Capsule clavate, ca. 1.2 cm, puberulent, 4-seeded. Seeds dark brown, ovate in outline, ca. 1 × 1 mm, slightly muricate. Fl. Mar–Jun, fr. Jul–Aug.

● On rocks. Guangdong, Guangxi, Hunan.

Specimens misidentified as *Mananthes vasculosa* (Nees) Bremekamp by C. C. Hu (FRPS 70: 298. 2002) belong here.

**36. *Justicia microdonta*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 183. 1918.

小齿爵床 xiao chi jue chuang

*Mananthes microdonta* (W. W. Smith) C. Y. Wu & C. C. Hu.

Shrubs to 2 m tall, much branched. Young braches reddish when dry, 4-angled, sparsely pilose. Petiole 1–2 cm; leaf blade

ovate, (2–)3–5.5 × 1.5–2.5 cm, variable in size, papery, abaxially light green and pilose along midvein, adaxially green and pilose especially along veins, base broadly cuneate and decurrent onto petiole, margin entire, apex shortly acuminate to acute. Spikes terminal, 5–7(–10) cm, unbranched, nodes distant, with 2–4 flowers per node; peduncle short; rachis densely pilose; bracts linear-lanceolate, 3–5 cm; bracteoles similar to bracts. Calyx ca. 7 mm, 5-lobed almost to base; lobes linear-lanceolate, 5–6 mm, pilose along midvein. Corolla white, 1–1.3 cm, outside somewhat pubescent to glabrescent; tube short; limb longer than tube; lower lip 4–5 mm, 3-lobed, lobes pilose inside and ciliate on margin; upper lip 2-lobed. Staminal filaments pilose; anther thecae parallel, superposed, lower one with a white spur at base. Ovary glabrous; style densely pilose. Capsule ca. 2 cm, 4-seeded. Seeds reddish brown, circular in outline, 3–4 mm in diam., rugose-verruculose. Fl. Jun–Aug.

● Thickets; 800–1200 m. Sichuan, Yunnan.

**37. *Justicia damingensis*** (H. S. Lo) H. S. Lo, *Guihaia* 17: 51. 1997.

大明爵床 da ming jue chuang

*Mananthes damingensis* H. S. Lo, *Bull. Bot. Res.*, Harbin 1(4): 106. 1981.

Herbs 15–30 cm tall. Stems subterete, basally prostrate and rooting at nodes then erect, sulcate, bifariously pubescent. Petiole 0.5–1.5 cm, pubescent; leaf blade ovate, 4–9 × 2.5–4.5 cm, thinly papery, abaxially pubescent along veins, adaxially glabrous, secondary veins ca. 5 on each side of midvein, base narrowly cuneate, margin shallowly undulate, apex acute. Racemes terminal, spiciform, 17–18 cm, branchless or trifurcate branched, with 3 flowers per node; peduncle 5.5–10 cm, pubescent; bracts subulate, 1.5–2 mm, abaxially pubescent; bracteoles similar to bracts. Pedicel ca. 1 mm, pubescent. Calyx ca. 6 mm, 5-lobed almost to base; lobes narrowly triangular, ca. 5 × 0.6 mm, margin ciliate, apex acuminate. Corolla yellow, ca. 1 cm, outside puberulent; lower lip ca. 3.2 mm, patent, 3-lobed, lobes ovate and apex rounded; upper lip subdeltoid, ca. 2.5 mm. Staminal filaments ca. 3 mm, glabrous; anther thecae ellipsoid, superposed, lower one spurred at base. Ovary glabrous; style ca. 6 mm, glabrous. Capsule not seen. Fl. May–Jun.

● Thickets; 300–600 m. Guangxi.

**38. *Justicia amblyosepala*** D. Fang & H. S. Lo, *Guihaia* 17: 55. 1997.

钝萼爵床 dun e jue chuang

*Mananthes amblyosepala* (D. Fang & H. S. Lo) C. Y. Wu & C. C. Hu.

Shrubs 30–50 cm tall. Stems terete, glabrous. Petiole 0.8–3 cm, glabrous; leaf blade ovate to elliptic, 9–17 × 4.5–8 cm, papery, glabrous, secondary veins 5–7 on each side of midvein, base attenuate to rounded, margin subentire, apex acute. Spikes terminal or axillary, 2–23 cm, interrupted, simple or branched; peduncle 1.5–5 cm; rachis 4-angled, sulcate, bifariously puberulent, with 1 flower per node; bracts triangular to rarely narrowly triangular, 1.5–3 mm, subglabrous; bracteoles narrowly triangular, ca. 2 mm, margin ciliate. Calyx ca. 5 mm, 5-lobed;

lobes elliptic-lanceolate, both surfaces usually puberulent to subglabrous, apex obtuse to rounded. Corolla light yellow, ca. 1.3 cm, outside retrorsely puberulent; lower lip 3-lobed, lobes ca. 1.5 mm and apex rounded; upper lip ovate-triangular, ca. 5 mm, erect, apex emarginate. Staminal filaments ca. 3 mm, glabrous; anther thecae ellipsoid, ca. 1.5 mm, unequal, superposed, lower one spurred at base. Ovary pubescent at tip; style 8–11 mm, sparsely puberulent. Capsule clavate, ca. 1.5 cm, pubescent. Seeds ovate in outline, ca. 1 × 1 mm, verrucose. Fl. Mar–May, fr. Aug.

● Forests on limestone slopes. Guangxi.

**39. *Justicia acutangula*** H. S. Lo & D. Fang, *Guihaia* 17: 56. 1997.

棱茎爵床 leng jing jue chuang

*Mananthes acutangula* (H. S. Lo & D. Fang) C. Y. Wu & C. C. Hu.

Herbs 50–100 cm tall. Stems sharply 4-angled and slightly winged, sulcate, glabrous. Petiole ca. 1.3 mm, pubescent; leaf blade elliptic to rarely broadly elliptic, 8.5–28 × 5–12.5 cm, glabrous, secondary veins 13–15 on each side of midvein, base rounded to attenuate and decurrent onto petiole, margin subentire, apex acute. Spikes terminal or axillary in upper leaf axils, 3.5–14 cm, interrupted, unbranched or branched, with 1 flower per node; bracts triangular, 2–3 mm, glabrous, margin ciliate; bracteoles ca. 2.5 mm, glabrous, margin ciliate. Calyx ca. 5 mm, outside densely puberulent, 5-lobed almost to base; lobes lanceolate, apex acute. Corolla light greenish yellow with purplish dots on lower lip, 2–2.2 cm, outside pubescent; limb as long as tube; lower lip as long as upper lip, 3-lobed, lobes ovate, ca. 2 mm, and apex rounded; upper lip ca. 9 mm, apex emarginate. Staminal filaments ca. 7.5 mm, glabrous; anther thecae ca. 2.5 mm, superposed, lower one minutely spurred at base. Ovary glabrous; style ca. 2 cm, basal portion pubescent. Capsule clavate, ca. 2 cm. Seeds ovate in outline, ca. 1.2 × 1.3 mm. Fl. Nov–Jan, fr. Apr–May.

● Forests on limestone hills; 500–700 m. Guangxi, Guizhou.

**40. *Justicia patentiflora*** Hemsley, *Hooker's Icon. Pl.* 28: t. 2792. 1905.

野靛棵 ye dian ke

*Mananthes patentiflora* (Hemsley) Bremekamp.

Herbs to 2 m tall, perennial. Stems subterete, glabrous. Petiole 2–6 cm; leaf blade ovate to oblong-lanceolate, 16–26 × 7.5–9.5 cm, membranous, glabrous, secondary veins 8 or 9 each side, blade basally attenuate to a narrowly cuneate base, apex acuminate. Spikes terminal or axillary in upper leaf axils, 5–12 cm, unbranched or bifurcately branched; rachis 4-angled, bifariously yellowish pubescent, with 1 flower per node; bracts scale-like, triangular-lanceolate, ca. 3 mm, abaxially puberulent; bracteoles similar to bracts. Calyx ca. 1.2 cm, puberulent, 5-lobed almost to base; lobes linear, apex acute. Corolla purplish red with purplish spots, 1.5–2 cm; tube 1–1.5 cm, abruptly recurved above base, outside puberulent; lower lip 3-lobed, lobes circular; upper lip subcircular, shorter than lower lip, apex emarginate. Staminal filaments ca. 5 mm, glabrous; anther

thecae superposed, lower one spurred at base. Ovary glabrous; style ca. 7 mm, basal portion sparsely puberulent. Capsule narrowly obovoid, ca. 1.5 cm. Seeds light yellow, circular in outline, ca.  $1.2 \times 1.2$  mm, verrucose. Fl. Nov–Jan, fr. Apr–May.

Forests, streamsides, limestone hills; 500–1800(–2400) m. Yunnan [Vietnam].

“*Mananthes tubiflora*” (Y. M. Shui & W. H. Chen, Seed Pl. Karst Reg. China 1: 182. 2006) belongs here but was not validly published.

**41. *Justicia poilanei*** Benoist, Notul. Syst. (Paris) 5: 125. 1936.

毛萼爵床 mao e jue chuang

Shrubs to 2 m tall. Stems  $\pm$  4-angled, sulcate, glabrous. Petiole 1–6 cm, flat, sulcate, margin ciliate; leaf blade ovate to ovate-lanceolate, 10–20  $\times$  4–8 cm, glabrous, secondary veins 6–10 on each side of midvein, base attenuate and decurrent onto petiole, margin entire or undulate, apex acute. Spikes terminal or rarely axillary, 7–15 cm, usually trifurcately branched or rarely unbranched; peduncle 1–3 cm; rachis 4-angled, glabrous, with 1 flower per node; bracts triangular, 2–2.5  $\times$  ca. 2 mm, both surfaces glabrous, margin ciliate; bracteoles similar to bracts. Calyx 3–4 mm, both surfaces puberulent especially distally on inner surface, 5-lobed almost to base; lobes lanceolate, margin ciliate, apex acute. Corolla ca. 1 cm, outside pubescent; tube as long as limb; lower lip 3-lobed, lobes subequal, ovate, and apex rounded; upper lip subtriangular, erect, apex emarginate. Staminal filaments ca. 4 mm, glabrous; anther thecae unequal, superposed, lower one spurred at base. Ovary glabrous; style ca. 8 mm, glabrous. Capsule not seen. Fl. Dec–Feb.

Limestone hills; 1000–2400 m. Yunnan [Vietnam].

**42. *Justicia kampfiana*** Benoist, Notul. Syst. (Paris) 5: 118. 1936.

那坡爵床 na po jue chuang

*Mananthes kampfiana* (Benoist) C. Y. Wu & C. C. Hu.

Shrubs to 1 m tall. Stems  $\pm$  4-angled, sulcate, glabrous. Petiole 3–6 mm, glabrous; leaf blade lanceolate, 9–16  $\times$  4.3–5

cm, glabrous, secondary veins ca. 8 on each side of midvein, base cuneate, margin entire, apex shortly acuminate. Spikes axillary or terminal; rachis 4-angled, unbranched or 2-furcately branched, subglabrous, 1-flowered per node; bracts narrowly triangular, ca. 1.5 mm, abaxially pubescent; bracteoles similar to bracts. Calyx ca. 3 mm, outside pubescent, inside glabrous, 5-lobed almost to base; lobes linear, subequal, apex acute. Corolla ca. 1 cm, outside pubescent; tube slightly longer than limb; lower lip 3-lobed, lobes subequal, ovate, and apex rounded; upper lip subtriangular, erect, apex emarginate. Staminal filaments ca. 4 mm, glabrous; anther thecae unequal, superposed, lower one spurred at base. Ovary and style glabrous. Capsule glabrous. Fl. Apr–May.

On rocks in forests; 500–600 m. Guangxi [Cambodia].

**43. *Justicia caudatifolia*** (H. S. Lo & D. Fang) Z. P. Hao, Y. F. Deng & T. F. Daniel, J. Trop. Subtrop. Bot. 18: 486. 2010.

尾叶爵床 wei ye jue chuang

*Leptostachya caudatifolia* H. S. Lo & D. Fang, Guihaia 17: 45. 1997.

Herbs to 1 m tall. Stems 4-angled, basally prostrate and rooting at nodes, sulcate, glabrous. Petiole 2–15 mm, glabrous; leaf blade elliptic to obovate-elliptic, 3–10  $\times$  1.2–4.2 cm, apical half broadest, papery, glabrous, secondary veins 5 or 6 on each side of midvein, base cuneate, margin subentire, apex caudate. Spikes axillary, 1–3 cm, interrupted; peduncle 0.5–1.5 cm; rachis sulcate, puberulent, 1-flowered per node; bracts linear-triangular, 3–4 mm, abaxially puberulent, margin ciliate; bracteoles ovate, 2.5–3 mm, margin ciliate. Calyx ca. 4 mm, 5-lobed almost to base; lobes narrowly triangular, outside glabrescent, inside glabrous. Corolla white, ca. 1.1 cm, outside slightly retrorsely pubescent; tube as long as limb; lower lip 3-lobed, lobes ca. 2.5 mm and apex rounded; upper lip ca. 5 mm, apex emarginate. Staminal filaments ca. 3 mm, glabrous; anther thecae superposed, lower one minutely spurred at base. Ovary glabrous; style ca. 5 mm, glabrous. Capsule not seen. Fl. Oct.

● On rocks in forests on limestone hills. Guangxi.

## 25. RHINACANTHUS Nees in Wallich, Pl. Asiat. Rar. 3: 76, 108. 1832.

灵枝草属 ling zhi cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs, subshrubs, or herbs, with cystoliths. Leaves opposite, petiolate or subsessile; leaf blade margin entire or slightly undulate. Inflorescences axillary or terminal, spikes or racemes, sometimes branched into panicles; bracts and bracteoles shorter than calyx. Calyx deeply 5-lobed; lobes subequal. Corolla white or greenish [or purple]; tube cylindric, elongate, narrow; limb 2-lipped; lower lip 3-lobed, lobes ascending cochlear in bud; upper lip entire or 2-cleft, inside rugulose. Stamens 2, exerted from mouth of corolla; anthers 2-theous; thecae unequally inserted to superposed, lower theca with or without a basal appendage; staminodes absent. Capsule with a solid stalk, clavate, 4-seeded; retinacula present. Seeds discoid, variously ornamented, lacking trichomes.

About 25 species: tropical and subtropical regions of Africa and Asia; two species (one endemic) in China.

*Rhinacanthus calcaratus* (Wallich) Nees was reported from Yunnan by C. C. Hu (FRPS 70: 268. 2002) based on a misidentification of *Pseuderanthemum polyanthum*.

- 1a. Leaf blade narrowly obovate to oblanceolate, 20–24  $\times$  6–8 cm, abaxially glabrous, secondary veins 8–10 on each side of midvein; corolla tube ca. 4 cm, lobes of lower lip 2–2.5 cm ..... 1. *R. beesianus*  
 1b. Leaf blade elliptic, ovate-elliptic, or rarely lanceolate, 2–7(–11)  $\times$  0.8–3 cm, abaxially pubescent, secondary veins 5 or 6 on each side of midvein; corolla tube 1.5–1.8 cm, lobes of lower lip 2–4 mm ..... 2. *R. nasutus*

**1. *Rhinacanthus beesianus*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 164. 1912.

滇灵枝草 dian ling zhi cao

Shrubs to 1.5 m tall. Stems 4-angled, subglabrous. Petiole 0–4 mm; leaf blade narrowly obovate to oblanceolate, 20–24 × 6–8 cm, abaxially glabrous, adaxially slightly pubescent, secondary veins 8–10 on each side of midvein, base attenuate and decurrent onto petiole, margin slightly undulate to subentire, apex acute. Panicles terminal, 12–15 × 8–9 cm; bracts leaflike, lanceolate, 0.8–1.2 × 0.3–0.4 cm. Flowers pedicellate. Calyx lobes linear, ca. 10 × 1.5 mm, pubescent, 1-veined, apex acute. Corolla white, fragrant, outside gland-tipped pubescent; tube ca. 4 cm; lower lip lobes elliptic, 2–2.5 cm; upper lip ca. 2 cm, apex 2-cleft. Stamens ca. 1 cm. Fl. Aug–Sep.

● Open dry situations on mountain slopes; 2100–2400 m. Yunnan.

**2. *Rhinacanthus nasutus*** (Linnaeus) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 39: 79. 1870.

灵枝草 ling zhi cao

*Justicia nasuta* Linnaeus, Sp. Pl. 1: 16. 1753; *Rhinacanthus communis* Nees.

Subshrubs or perennial herbs, to 1.5 m tall. Stems stout, ± 4-angled, faintly striate, densely pubescent when young then glabrescent. Petiole 0.5–1.5 cm; leaf blade elliptic, ovate-elliptic, or rarely lanceolate, 2–7(–11) × 0.8–3 cm, abaxially densely pubescent, adaxially sparsely pubescent to subglabrous, secondary veins 5 or 6 on each side of midvein, base cuneate, margin entire or slightly undulate, apex shortly acuminate to acute. Panicles terminal or axillary, to 50 cm; rachis densely pubescent; bracts lanceolate, to 2 × 0.5 mm; bracteoles ca. 1 mm. Flowers sessile to subsessile. Calyx ca. 5 mm, both surfaces pubescent; lobes lanceolate, ca. 4 × 0.7 mm. Corolla greenish white, 2.1–2.7 cm, outside pubescent with gland-tipped and non-glandular trichomes; tube 1.5–1.8 cm; lower lip 0.75–1.2 cm, lobes 2–4 mm and subequal; upper lip linear-lanceolate, 6–7.5 mm, erect. Staminal filaments glabrous. Style sparsely pubescent. Capsule ca. 2 × 0.3 cm, pubescent with gland-tipped trichomes. Seeds ca. 2.5 × 2.2 mm, papillose. Fl. Oct–Dec. *2n* = 30.

Thickets, forests, cultivated around villages; below 700 m. Guangdong, Hainan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Madagascar].

## 26. DICLIPTERA Jussieu, Ann. Mus. Natl. Hist. Nat. 9: 267. 1807, nom. cons.

狗肝菜属 gou gan cai shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Diapedium* K. D. Koenig.

Herbs, diffuse, annual, biennial, or perennial [or sometimes shrubs], with cystoliths; young stems ± 6-angled in cross-section. Leaves petiolate; leaf blade margin entire or subsinuate. Inflorescences of cymes in leaf axils or in terminal spikelike thyrses or panicles of thyrses. Flowers subtended by an involucre of several pairs of bracteoles (= cymule); outermost pair equal or unequal in size, usually concealing inner pair(s), calyx, and base of corolla. Calyx deeply 5-lobed; lobes narrow, equal, apex acute. Corolla pink, resupinate 180° by torsion of tube; tube slender, widened apically, limb 2-lipped; lower lip (in upper position) 3-lobed, lobes ascending cochlear in bud; upper lip (in lower position) entire or emarginate. Stamens 2, exserted from mouth of corolla; anthers 2-theccous; thecae unequally inserted to superposed, base mucinous; staminodes absent. Stigma 2-cleft. Capsule substipitate or stipitate, 2–4-seeded; retinacula present; placenta with retinacula separating elastically and rising from inner capsule wall at dehiscence. Seeds lenticular, papillate, lacking trichomes.

About 100 species: tropical and temperate regions worldwide; four species (two endemic) in China.

1a. Outer bracteoles oblong-lanceolate to oblanceolate, greater than 2 × as long as wide.

2a. Outer bracteoles oblong-lanceolate, 5–7 mm, sparsely covered with white or grayish trichomes or glabrescent; corolla ca. 0.5 cm ..... 1. *D. bupleuroides*

2b. Outer bracteoles oblanceolate, 10–14 mm, densely covered with yellow trichomes; corolla ca. 1.5 cm ..... 2. *D. induta*

1b. Outer bracteoles elliptic, subcircular, or obovate, less than 2 × as long as wide.

3a. Corolla pale purple, 1–1.2 cm; outer bracteoles 0.5–1.3 × 0.3–0.8 cm ..... 3. *D. chinensis*

3b. Corolla pinkish red, ca. 1.8 cm; outer bracteoles 1.5–2 × 1–1.5 cm ..... 4. *D. elegans*

**1. *Dicliptera bupleuroides*** Nees in Wallich, Pl. Asiat. Rar. 3: 111. 1832.

印度狗肝菜 yin du gou gan cai

*Dicliptera roxburghiana* Nees var. *bupleuroides* (Nees) C. B. Clarke.

Herbs to 50 cm tall. Stems sulcate, pubescent. Petiole 5–10 mm; leaf blade ovate, 3.5–7 × 1.8–2.8 cm, glabrous or with 2-celled trichomes, secondary veins 4 or 5 on each side of midvein, base cuneate, margin subentire, apex acuminate. Inflores-

cences axillary and subsessile or sometimes terminal and shortly pedunculate, cymes, many flowered; peduncle 3–5 mm; bracts lanceolate, 2–3 mm; outer bracteoles green, oblong-lanceolate, 5–7 × ca. 2 mm, abaxially pubescent, base cuneate, margin entire and ciliate, apex mucronate; inner bracteoles green with yellowish margin, lanceolate, ca. 4 × 1.5 mm. Calyx ca. 3 mm; lobes subulate, pubescent. Corolla ca. 5 mm, outside pubescent; lip in lower position orbicular, ca. 1.5 × 1.5 mm; lip in upper position oblong, ca. 2 × 1 mm, 3-lobed, lobes ovate and ca. 0.3 × 0.3 mm. Staminal filaments ca. 2 mm; anther thecae spheri-

cal. Ovary pilose at tip; style ca. 3 mm. Capsule ca. 3 mm, pilose at tip. Seeds ovate in outline, ca. 1 mm, papillate. Fl. Nov–May, fr. Dec–Jun.  $2n = 26$ .

Roadsides, forests, shady places; 800–1900 m. Guizhou, Sichuan, Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

**2. *Dicliptera induta*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 175. 1918.

毛狗肝菜 mao gou gan cai

Herbs to 60 cm tall. Stems sulcate, densely yellow hirsute especially along sulcae. Petiole 5–12 mm, yellow tomentose; leaf blade ovate, 3–4 × 1.5–2.5 cm, both surfaces yellow tomentose especially along veins, secondary veins 3–5 on each side of midvein, base broadly cuneate to subrounded, margin entire, apex acute. Inflorescences axillary, each of 1 or 2 cymes; peduncle 2–3 mm, yellow hirsute; bracts linear-subulate, ca. 5 mm, tomentose; outer bracteoles dark green, oblanceolate, 10–14 × 2–4 mm, unequal, rigid, both surfaces tomentose especially toward base, base cuneate, apex acute and shortly mucronate; inner bracteoles linear-lanceolate, 8–10 mm, pilose, apex acuminate. Pedicel ca. 1 mm. Calyx ca. 5 mm; lobes linear, pilose, apex acute. Corolla pink, ca. 1.5 cm, pilose; tube basally slender, white pilose; lip in lower position ca. 4 mm, 2-lobed; lip in upper position ca. 3 mm, 3-lobed, lobes ovate. Staminal filaments ca. 6 mm, glabrous; anther thecae spherical, ca. 1 mm. Ovary minutely pilose; style ca. 1.2 cm, minutely pilose. Capsule ca. 4 mm, pilose. Seeds ovate in outline, ca. 2 mm, papillate. Fl. Aug–Sep, fr. Oct–Nov.

• Wastelands; 400–700 m. Yunnan.

**3. *Dicliptera chinensis*** (Linnaeus) Jussieu, Ann. Mus. Natl. Hist. Nat. 9: 268. 1807.

狗肝菜 gou gan cai

*Justicia chinensis* Linnaeus, Sp. Pl. 1: 16. 1753; *Diapedium chinense* (Linnaeus) K. D. Koenig & Sims; *Dicliptera burmanni* Nees; *D. roxburghiana* Nees.

Herbs 30–80 cm tall, annual or biennial. Stems ridged, basally diffuse, apically erect, glabrous except for pubescence on young branches and nodes. Petiole to 0.5–3 cm, puberulent; leaf blade ovate-elliptic, 2–8 × 1.5–4 cm, abaxially sparsely puberulent along veins, adaxially glabrous, secondary veins 4 or 5 on each side of midvein and abaxially slightly prominent, base cuneate to attenuate and decurrent onto petiole, margin entire or slightly sinuate, apex shortly acuminate to acute. Inflorescences each of (1–)3 or 4 pedunculate cymes from upper leaf axils, 1–4 cm; inflorescence bracts subulate to linear to oblanceolate to obovate, 3–7.5 × 0.3–1 mm; peduncle 2–5 mm; cymules usually 3 or 4 per cyme; outer bracteoles elliptic to obovate, 5–13 × 3–8 mm, unequal, abaxially puberulent, 3-veined, margin cili-

ate, apex acute and mucronate; inner bracteoles linear, ca. 5 mm, abaxially hirsute, apex acuminate. Pedicel 0.5–3 mm, puberulent. Calyx ca. 5 mm; lobes linear, equal, margin hirsute, apex acuminate. Corolla pale purple, 1–1.2 cm, outside puberulent; tube slender, ca. 6 mm, ca. 1.5 mm wide; limb 2-lipped; lip in lower position ovate, ca. 5 × 3 mm, apex entire; lip in upper position oblong, ca. 4 × 1.5 mm, shallowly 3-lobed. Stamens inserted near apex of corolla tube; filaments ca. 4 mm, glabrous; thecae spherical, ca. 1.2 mm in diam., parallel. Ovary pilose at tip; style ca. 1.4 cm. Capsule broadly ellipsoid, ca. 6 mm, puberulent, 4-seeded, apex apiculate. Seeds circular in outline, ca. 2 mm in diam., covered with apically barbed papillae. Fl. Sep–Jan, fr. Nov–Feb.  $2n = 26$ .

Streamsides, trailsides; below 1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bangladesh, India, Vietnam].

This species is used medicinally.

**4. *Dicliptera elegans*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 174. 1918.

优雅狗肝菜 you ya gou gan cai

*Dicliptera mairei* Benoist.

Herbs 60–120 cm tall. Stems erect, branched, slender, sulcate, sparsely pubescent. Petiole 0.5–1.5 cm, sulcate, pubescent; leaf blade ovate to ovate-lanceolate, 4–8 × 2–5 cm, abaxially pale gray and sparsely pubescent, adaxially green, densely covered with cystoliths, and densely brownish pilose on midveins but otherwise sparsely pubescent with few large-celled white trichomes, secondary veins 4–6 on each side of midvein, base broadly cuneate and decurrent onto petiole, margin entire or sinuate, apex acuminate. Inflorescences axillary, each of 2 or 3 cymes; peduncle to 7 cm, white tomentose; inflorescence bracts linear, 7–10 × 1–2 mm, puberulent; cymules 3–6 per cyme; outer bracteoles subcircular to obovate, 1.5–2 × 1–1.5 cm, unequal, abaxially with cystoliths and pilose, palmately 3- or 5-veined, base rounded, apex mucronate; inner bracteoles linear-lanceolate, 5–7 × ca. 1 mm, abaxially puberulent, apex acuminate. Pedicel 0.5–2 mm. Calyx 6–7 mm; lobes linear-lanceolate, outside puberulent, apex acuminate. Corolla pinkish red, ca. 1.8 cm, outside pubescent; tube slender; limb 2-lipped. Staminal filaments ca. 5 mm, glabrous; anther thecae spherical, ca. 1 mm, inserted at slightly different levels. Ovary slightly pilose. Capsule ca. 6 mm, light yellow pilose. Seeds light brown, circular in outline, ca. 1.5 × 1.5 mm, compressed, yellowish papillate. Fl. Aug–Oct, fr. Oct–Dec.

• Forest margins, thickets, roadsides; 600–2000 m. Sichuan, Yunnan.

*Dicliptera mairei* was incorrectly reduced to *D. induta* by C. C. Hu (FRPS 70: 238. 2002).

## 27. PERISTROPHE Nees in Wallich, Pl. Asiat. Rar. 3: 77, 112. 1832.

观音草属 guan yin cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs or shrubs, with cystoliths. Leaf blade margin entire or slightly toothed. Inflorescences in axillary or terminal cymes, these

sometimes aggregated into a leafy panicle-like complex; cymes consisting of (1 or) 2–4 (or more) involucre; involucre of usually 1–3 flowers enclosed by 2 (or more) pairs of bracteoles that conceal calyx and corolla tube. Outer pair of bracteoles equal to unequal in size and larger than inner pair(s). Calyx small, 5-lobed; lobes equal. Corolla white to pink or purple, usually large, resupinate 180°; tube slender, twisted, apically ± widened into throat; limb 2-lipped; upper lip (in lower position) entire to 2-cleft; lower lip (in upper position) 3-lobed; lobes ascending cochlear in bud. Stamens 2, inserted at corolla throat, exerted from corolla tube; anthers 2-theccous; thecae unequally inserted or superposed (contiguous or separated by gap), base muticous; staminodes absent. Ovary with 2 ovules per locule; stigma slightly enlarged or 2-cleft. Capsule with a solid stalk, 4-seeded; retinacula present; placenta not rising elastically from base of valves. Seeds discoid, smooth to tuberculate, lacking trichomes.

About 40 species: tropical and subtropical Africa, Asia, and Madagascar, with one species possibly extending to Australia (see R. M. Barker, J. Adelaide Bot. Gard. 9: 192. 1986); ten species (three endemic) in China.

- 1a. Outer involucre bracteoles abaxially pubescent with gland-tipped trichomes.
  - 2a. Corolla ca. 4.5 cm, pubescent with gland-tipped and non-glandular trichomes ..... 1. *P. lanceolaria*
  - 2b. Corolla ca. 1 cm, outside pubescent with non-glandular trichomes ..... 2. *P. paniculata*
- 1b. Outer involucre bracteoles abaxially glabrous or pubescent with non-glandular trichomes.
  - 3a. Anther thecae superposed (i.e., one entirely above other and with a gap between them).
    - 4a. Corolla ca. 1 cm; outer involucre bracteoles subulate to lanceolate to linear, less than 3 mm wide; capsule pubescent with non-glandular trichomes ..... 2. *P. paniculata*
    - 4b. Corolla 3–3.4 cm; outer involucre bracteoles ovate to elliptic, more than 5 mm wide; capsule pubescent with gland-tipped and non-glandular trichomes ..... 10. *P. japonica*
  - 3b. Anther thecae inserted at same level or at different levels but overlapping.
    - 5a. Anther thecae inserted at same level ..... 3. *P. yunnanensis*
    - 5b. Anther thecae inserted at different levels.
      - 6a. Outer involucre bracteoles less than 2 × as long as calyx.
        - 7a. Leaf blade subglabrous ..... 4. *P. tianmuensis*
        - 7b. Leaf blade densely pubescent ..... 5. *P. strigosa*
      - 6b. Outer involucre bracteoles more than 2 × as long as calyx.
        - 8a. Corolla and capsule glabrous ..... 6. *P. montana*
        - 8b. Corolla and capsule pubescent.
          - 9a. Leaf blade adaxially puberulent (especially along midvein) or becoming subglabrescent; corolla 3–5.7 cm ..... 7. *P. bivalvis*
          - 9b. Leaf blade adaxially sparsely pubescent; corolla 2–4 cm.
            - 10a. Outer involucre bracteoles narrowly ovate to lanceolate, more than 4 × as long as wide ..... 8. *P. floribunda*
            - 10b. Outer involucre bracteoles ovate to oblong to elliptic, less than 3 × as long as wide.
              - 11a. Outer involucre bracteoles ovate to oblong, abaxially slightly villous, base subcordate ..... 9. *P. fera*
              - 11b. Outer involucre bracteoles ovate to elliptic, abaxially subglabrous to puberulent, base cuneate to truncate ..... 10. *P. japonica*

**1. *Peristrophe lanceolaria*** (Roxburgh) Nees in Wallich, Pl. Asiat. Rar. 3: 114. 1832.

五指山蓝 wu zhi shan lan

*Justicia lanceolaria* Roxburgh, Fl. Ind. 1: 122. 1820.

Herbs to 1 m tall, erect. Branches stout, densely covered with white retrorse trichomes or sometimes glabrescent. Petiole (0.5–)1.5–3.5 cm; leaf blade lanceolate to ovate-lanceolate, (6–)10–17 × (1–)3–6 cm, abaxially sparsely pubescent or glabrescent, adaxially glabrescent except for a few trichomes along midvein toward base, secondary veins 5–7 on each side of midvein, base narrowly cuneate and slightly oblique, margin entire, apex acuminate. Inflorescences of axillary pedunculate cymes of (1–)3 involucre with cymes sometimes in axils of distal bracts and collectively forming a terminal panicle-like complex 5–7 cm; outer involucre bracteoles linear-lanceolate, 10–18 × 1.5–3 mm, gland-tipped pubescent; inner involucre bracteoles similar to outer ones except smaller. Calyx ca. 9 mm; lobes linear, ca. 1 mm broad. Corolla pink, ca. 4.5 cm, outside pubes-

cent with gland-tipped and non-glandular trichomes; tube base ca. 1.5 mm wide for ca. 2.5 cm; lip in lower position obovate, ca. 2 × 0.8 cm, slightly 2-lobed; lip in upper position oblong, ca. 2 × 0.6 cm, 3-lobed, lobes ovate and ca. 1 × 1 mm. Staminal filaments ca. 1.8 cm, glabrous; anther thecae oblong, ca. 3 × 0.6 mm, superposed. Capsule 1.4–1.8 cm, pubescent with gland-tipped trichomes. Seeds ca. 3 × 2 mm, smooth. Fl. Dec–Mar, fr. Mar–Jun.

Wet places; 500–700 m. Hainan, Yunnan [India, Laos, Myanmar, Thailand, Vietnam].

**2. *Peristrophe paniculata*** (Forsskål) Brummitt, Kew Bull. 38: 451. 1983.

双萼观音草 shuang e guan yin cao

*Dianthera paniculata* Forsskål, Fl. Aegypt.-Arab. 7. 1775; *D. bicalyculata* Retzius; *Dicliptera paniculata* (Forsskål) I. Darbyshire; *Justicia bicalyculata* (Retzius) Vahl; *Peristrophe bicalyculata* (Retzius) Nees.

Herbs to 1.2 m tall, erect, perennial. Stems hirsute, usually 4- or 6-angled. Petiole 3–12 mm; leaf blade ovate to lanceolate, (1–)3–4.5 × (0.5–)1.5–2 cm, abaxially scabrid, adaxially slightly scabrid, base attenuate to broadly cuneate, margin remotely serrulate and slightly ciliate, apex acuminate, acute, or sometimes rounded. Inflorescences of axillary pedunculate cymes with (1–)4(or more) involucre (cymes sometimes branching internally) in axils of leaves or bracts and collectively often forming a terminal leafy panicle-like complex; rachis and inflorescence branches pubescent; outer involucre bracteoles unequal, abaxially pubescent with gland-tipped (sometimes absent) and non-glandular trichomes, larger outer involucre bracteole ± linear, ca. 10 × 2 mm, 1-veined, and apex acute and mucronate, shorter outer involucre bracteole subulate to lanceolate, ca. 6 × 0.1 mm; inner involucre bracteoles narrowly linear to subulate, unequal in length. Calyx lobes lanceolate, ca. 3 mm, outside sparsely pubescent with non-glandular trichomes, inside sparsely pubescent with sessile gland-tipped trichomes, margin membranous at base, apex long acuminate. Corolla light to dark purple, ca. 1 cm, outside pubescent with non-glandular trichomes; tube basally cylindric for ca. 5 mm; lip in lower position narrowly elliptic, 5–7 × 1–2 mm, apex emarginate; lip in upper position elliptic, 3–7 × 2–3 mm, 3-lobed. Staminal filaments ca. 5 mm, white hairy; anther thecae ovoid, superposed, not touching. Ovary ovoid, pubescent and glandular; style glabrous; stigma 2-lobed. Capsule 0.9–1.3 cm, pubescent with non-glandular trichomes. Seeds 2.2–2.5 mm, rough and tuberculate. Fl. Aug–Dec, fr. Oct–Feb.

Weedy areas, roadsides; 600–2200 m. Guangxi, Sichuan, Yunnan [Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam; tropical Africa, Australia].

**3. *Peristrophe yunnanensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 187. 1918.

滇观音草 dian guan yin cao

Herbs 1–2 m tall. Stems sulcate, densely grayish pubescent when young, later glabrescent. Petiole 1–10 mm; leaf blade lanceolate to ovate, 2.5–3 × ca. 1 cm, abaxially pubescent, adaxially sparsely puberulent especially on veins or glabrescent, base cuneate, margin entire, apex acuminate. Outer involucre bracteoles linear, ca. 3 mm; inner involucre bracteoles 2.5–6 mm. Calyx 5–7 mm; lobes linear, glabrous or subglabrous, apex acute. Corolla pink to violet, ca. 1.8 cm, outside slightly pubescent. Staminal filaments basally pubescent; anther thecae oblong, ca. 2 mm, parallel, inserted at same level, touching each other. Capsule not seen. Fl. Apr, Aug.

• Thickets; 1900–2200 m. Sichuan, Yunnan.

**4. *Peristrophe tianmuensis*** H. S. Lo, Bull. Bot. Res., Harbin 8(1): 4. 1988.

天目山蓝 tian mu shan lan

Herbs 30–35 cm tall. Stems 6-angled, pubescent. Petiole 3–10 mm; leaf blade broadly ovate, 1.5–6 × 1–4 cm, both surfaces subglabrous, secondary veins 3–6 on each side of midvein, base broadly cuneate to subrounded, margin entire, apex cuspidate to acute. Cymes terminal or pseudo-axillary; outer involucre bracteoles narrowly lanceolate, 3.5–6 mm, pubes-

cent; inner involucre bracteoles similar to outer involucre bracteoles. Calyx ca. 3 mm; lobes linear, pubescent. Corolla light purple, ca. 2 cm; tube slender; lip in lower position oblong-elliptic, ca. 1 cm, apex emarginate; lip in upper position oblong-spatulate, minutely 3-lobed. Staminal filaments 7.5–8 cm, pubescent; anther thecae linear, parallel, inserted at different levels, touching each other for 2/3 of length. Ovary pubescent; style ca. 2 cm, glabrous. Capsule 8–9 mm, pubescent. Seeds ca. 1.2 × 1.2 mm. Fl. Aug, fr. Oct.

• Thickets. Zhejiang (Tianmu Shan).

**5. *Peristrophe strigosa*** C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 596. 1974.

糙叶山蓝 cao ye shan lan

Herbs 40–100 cm tall, annual. Stems 6-angled, pubescent. Petiole 1.5–2.5 cm; leaf blade ovate to lanceolate-ovate, 7–13 × 3–5.5 cm, both surfaces densely pubescent, secondary veins 6–8 on each side of midvein, base broadly cuneate, margin entire, apex acuminate to shortly caudate. Cymes terminal or axillary, 3(or 5)-branched, with 3–5 involucre; peduncle ca. 4 mm; outer involucre bracteoles ovate, ca. 5 × 2 mm, concave, apex aristate; inner involucre bracteoles subulate, ca. 2.5 mm. Calyx ca. 5 mm; lobes linear-lanceolate, apex acuminate. Corolla purple, ca. 4.2 cm, outside pubescent; tube basally cylindric for ca. 2.4 cm; lip in lower position elliptic-obovate, ca. 1.6 × 0.6 cm, apex obtuse to retuse; lip in upper position oblong, ca. 1.6 × 0.5 cm, slightly narrowed at tip, 3-lobed, lobes suboblong and ca. 1 × 1 mm. Staminal filaments ca. 1 cm, pubescent; anther thecae linear, parallel, inserted at different levels. Ovary oblong, ca. 2 mm, pubescent; style ca. 3.5 cm, glabrous. Capsule clavate, ca. 1.7 cm, densely strigose-pubescent. Seeds ca. 2.5 × 2 mm, tuberculate-punctate. Fl. Nov–Jan, fr. Jan–Mar.

• Dense forests. Hainan.

**6. *Peristrophe montana*** Nees in Wallich, Pl. Asiat. Rar. 3: 113. 1832.

岩观音草 yan guan yin cao

Herbs to 1 m tall, erect, glabrous. Petiole 1.5–4.5 cm; leaf blade narrowly oblong, lanceolate, or rarely ovate, 4–9(–20) × 3–5 cm, both surfaces glabrous, secondary veins 6–8 on each side of midvein, base rounded, margin entire, apex acute. Cymes terminal or axillary; peduncle 1.5–1.7 cm; outer involucre bracteoles various, broadly ovate to linear-lanceolate, 1–1.8 × 0.2–1 cm, pinnately veined, base rounded to truncate, margin entire, apex obtuse; inner cymule bracteoles linear, 3–4 mm. Calyx ca. 5 mm; lobes linear. Corolla pink, 4.5–6 cm, outside glabrous; lip in lower position elliptic, apex emarginate; lip in upper position oblong, 3-lobed. Filaments pubescent; anther thecae linear. Ovary glabrous; style glabrous. Capsule ca. 2 cm, shiny, glabrous. Seeds ca. 3 × 2.6 mm. Fl. Oct–Dec, fr. Dec–Feb.

Wet shady cliffs. Hainan [India, Sri Lanka].

**7. *Peristrophe bivalvis*** (Linnaeus) Merrill, Interpr. Herb. Amboin. 476. 1917.

观音草 guan yin cao

*Justicia bivalvis* Linnaeus, Syst. Nat., ed. 10, 2: 850. 1759; *Hypoestes bodinieri* H. Léveillé; *J. baphica* Sprengel; *J. roxburghiana* Roemer & Schultes; *J. tinctoria* Roxburgh; *Peristrophe baphica* (Sprengel) Bremekamp; *P. roxburghiana* (Roemer & Schultes) Bremekamp; *P. tinctoria* (Roxburgh) Nees.

Herbs to 1 m tall, perennial. Stems 5- or 6-angled, much branched, sulcate, pubescent. Petiole to 3.5 cm; leaf blade ovate to lanceolate-ovate, 3–14.5 × 1.5–5.3 cm, both surfaces puberulent (especially along midvein) or becoming subglabrescent, secondary veins 5 or 6 on each side of midvein, base broadly cuneate to subrounded, margin entire to sinuate, apex acuminate to acute. Cymes axillary or terminal, pedunculate, often consisting of 1–3 (or more) pedunculate involucre terminating branches; peduncle 0.3–2.3 cm; outer involucral bracteoles broadly ovate, ovate, or elliptic, unequal in size, puberulent to subglabrous, base rounded to cuneate, apex acute; larger outer involucral bracteole (1.8–)2.3–3.3 × 0.8–1.5 cm; smaller outer involucral bracteole 0.71–0.85 × as long as larger one; inner cymule bracteoles triangular-subulate, 1–2 mm. Calyx 4.5–5 mm, pubescent; lobes lanceolate. Corolla pink, 3.5–5.7 cm, outside pubescent with non-glandular trichomes; tube ca. 1.5 mm in diam.; lip in lower position broadly ovate-elliptic, 2.2–2.6 × ca. 1.8 cm, apex emarginate; lip in upper position oblong, 2–2.5 × ca. 0.9 cm, 3-lobed. Staminal filaments ca. 1.3 cm, puberulent; anther thecae linear, subequally to unequally inserted (overlapping for most of their length), 3.2–4 mm. Ovary pubescent; style glabrous; stigma 2-cleft. Capsule ca. 1.5 cm, pubescent. Seeds ca. 1.5 × 1.5 mm. Fl. Aug–Mar.

Forests; 500–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Taiwan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Thailand, Vietnam].

**8. *Peristrophe floribunda*** (Hemsley) C. Y. Wu & H. S. Lo, Fl. Hainan. 3: 561. 1974.

海南山蓝 hai nan shan lan

*Dicliptera crinita* (Thunberg) Nees var. *floribunda* Hemsley, J. Linn. Soc., Bot. 26: 248. 1890.

Herbs, erect, perennial. Stems stout, 4-angled, sulcate, pubescent. Petiole 0.5–2 cm; leaf blade ovate to lanceolate, 2–9 × 1.5–3.5 cm, both surfaces pubescent along veins, secondary veins 4–6 on each side of midvein, base broadly cuneate to subrounded, margin entire, apex acuminate to acute-acuminate. Cymes terminal or axillary; outer involucral bracteoles narrowly ovate to lanceolate, unequal in size, both surfaces pubescent, base cuneate, rounded, or sometimes cordate, margin entire and ciliate, apex acuminate; larger outer involucral bracteoles 1.5–2 × 0.3–0.5 cm; smaller outer involucral bracteoles 4/5–5/6 size of larger ones; inner involucral bracteoles shorter than calyx. Calyx ca. 4.5 mm, pubescent; lobes ca. 3.5 mm. Corolla light purple to pink, outside pubescent; tube slender, ca. 1 mm in diam.; lip in lower position ovate-elliptic, apex slightly emarginate; lip in upper position oblong, 3-lobed. Staminal filaments ca. 1 cm, pubescent; anther thecae linear, parallel, slightly unequally inserted. Ovary hirsute; style basally hirsute. Capsule 1.2–1.3 mm, densely pubescent. Seeds ca. 2.5 mm in diam. Fl. Jun–Sep.

Valleys, forests. Fujian, Guangdong, Guizhou, Hainan, Hunan, Sichuan, Yunnan [India].

**9. *Peristrophe fera*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 556. 1885.

野山蓝 ye shan lan

*Peristrophe fera* var. *intermedia* C. B. Clarke; *P. jalapifolia* Nees.

Herbs to 1 m tall, erect. Stems 4-angled, sulcate, pubescent. Petiole 5–10(–20) mm; leaf blade ovate to ovate-lanceolate, 5–10 × 2–4.3 cm, both surfaces pubescent, secondary veins 3–5 on each side of midvein, base broadly cuneate, margin subentire or apically obscurely dentate, apex acuminate. Cymes terminal or axillary in apical leaf axils, densely pubescent; outer involucral bracteoles ovate to oblong, unequal in size, slightly villous, base subcordate, margin ciliate, apex acuminate; larger outer involucral bracteoles ca. 1.5 × 0.8–1 cm; smaller outer involucral bracteoles 4/5–5/6 size of larger ones; inner involucral bracteoles 2.2–2.5 mm. Calyx 4–5 mm, pubescent; lobes linear, apex acuminate. Corolla 3–4 cm, outside pubescent; tube ca. 1.5 mm in diam.; lip in lower position broadly elliptic, apex emarginate; lip in upper position narrowly oblong, apex 3-lobed. Staminal filaments ca. 1.5 cm, villous; anther thecae linear, parallel, slightly unequally inserted. Ovary pubescent; style basally hirsute. Capsule ca. 1.4 cm, pubescent. Seeds ca. 1.5 × 1.5 mm. Fl. Jul–Aug.

Dense forests. Guizhou, Hainan, Yunnan [India].

**10. *Peristrophe japonica*** (Thunberg) Bremekamp, Boissiera 7: 194. 1943.

九头狮子草 jiu tou shi zi cao

*Dianthera japonica* Thunberg in Murray, Syst. Veg., ed. 14, 64. 1784; *Dicliptera buergeriana* Miquel; *D. crinita* (Thunberg) Nees; *D. japonica* (Thunberg) Makino; *D. uraiensis* Hayata; *Justicia crinita* Thunberg; *Peristrophe chinensis* Nees; *P. guangxiensis* H. S. Lo & D. Fang.

Herbs 20–80 cm, perennial. Stems 4-angled, basally prostrate and rooting at nodes, bifariously pubescent. Petiole 0.5–1.5 cm; leaf blade lanceolate to ovate-oblong, (3–)5–13 × (1–)2.5–4.5 cm, both surfaces sparsely pubescent (especially along midvein), secondary veins 3–5 on each side of midvein, base obtuse to cuneate, margin entire or slightly sinuate, apex acuminate to caudate. Inflorescences terminal or axillary pedunculate cymes from axils of distal leaves, cymes consisting of 1–4 (or more) pedunculate involucre; involucre bearing 1–3 flowers; peduncle 0.7–5.5 cm; outer involucral bracteoles ovate to elliptic, subequal to unequal in size, abaxially subglabrous to puberulent, base cuneate to truncate, margin entire, apex acute to obtuse; larger outer involucral bracteoles 1.1–2.5 × 0.5–1.8 cm; smaller outer involucral bracteoles 8–17 × 3–9 mm; inner involucral bracteoles linear, 2–3 mm, abaxially puberulent, apex acuminate. Calyx ca. 4 mm; lobes subulate, pubescent. Corolla white to pale pink to light purple and with pink specks or dark lines on limb, 2–3.4 cm, outside pubescent with non-glandular trichomes; tube basally ca. 1 mm wide for ca. 1.5 cm; lip in lower position elliptic to subcircular, 8–15 × 3–11 mm, entire or slightly emarginate; lip in upper position oblong, 9–15 × 4–7

mm, 3-lobed. Staminal filaments ca. 7 mm, pubescent; anther thecae linear, ca. 1.2 mm, parallel, unequally inserted to superposed. Ovary pilose; style ca. 2 cm; stigma 2-cleft. Capsule 0.8–1.2 cm, pubescent with gland-tipped and non-glandular trichomes. Seeds ca. 2 mm in diam., tuberculate. Fl. Jul–Feb, fr. Jul–Oct.  $2n = 48$ .

Roadsides, grasslands, streamsides, montane slopes, trailsides, evergreen broad-leaved forests, *Machilus-Castanopsis* forests; below 1500 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

This species is used medicinally.

## 28. *HYPOESTES* Solander ex R. Brown, Prodr. 474. 1810.

枪刀药属 qiang dao yao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs or perennial herbs, decumbent to erect, with cystoliths. Leaves opposite, petiolate; leaf blade margin entire or dentate. Inflorescences of axillary or terminal bracteate spikes to panicles of spikes or of variously disposed cymes (these sometimes clustered in leaf axils); bracteoles usually 4, in 2 to rarely more pairs, distinct or connate, inner pair sometimes partially adnate to outer pair, forming an involucre enclosing 1 or sometimes more flowers. Calyx small, usually obscured by bracteoles, scarious or membranous, 5-lobed; lobes equal or subequal in length. Corolla rose-pink, purplish, or whitish, resupinate 180° by torsion of tube; tube subcylindric to expanded distally into a narrow throat; limb 2-lipped; lower lip (in upper position) shallowly 3-lobed; upper lip (in lower position) subentire or shallowly 2-lobed; lobes ascending cochlear in bud. Stamens 2, inserted near apex of corolla tube, exerted from mouth of corolla; anthers 1-theous; theca muticous. Ovary with 2 ovules per locule; style exerted from mouth of corolla; stigma 2-lobed, lobes equal or unequal. Capsule stalked, 2–4-seeded; retinacula present. Seeds smooth or ornamented.

About 150 species: Old World; three species in China.

- 1a. Outer bracteoles connate for more than half their length, forming a conspicuous tube; capsule glabrous ..... 1. *H. purpurea*
- 1b. Outer bracteoles inconspicuously connate only at base if at all, not forming a conspicuous tube; capsule pubescent.
- 2a. Outer bracteoles 2.5–4 mm, lanceolate-subulate to linear ..... 2. *H. cumingiana*
- 2b. Outer bracteoles 7–17 mm, elliptic to obovate to oblanceolate ..... 3. *H. triflora*

### 1. *Hypoestes purpurea* (Linnaeus) R. Brown, Prodr. 474. 1810.

红丝线 hong si xian

*Justicia purpurea* Linnaeus, Sp. Pl. 1: 16. 1753; *Hypoestes sinica* Miquel; *Peristrophe purpurea* (Linnaeus) Hochreutiner.

Shrubs or perennial herbs, to 1.5 m tall, spreading to erect. Stems  $\pm$  4-angled when young, sulcate, slightly puberulent. Petiole 1–3.5 cm, sparsely pubescent; leaf blade ovate to ovate-elliptic, 5–13  $\times$  1.5–7 cm, abaxially pale green and glabrous, adaxially green and sparsely pubescent or glabrous except for pubescent along veins and on margin, secondary veins 5–8 on each side of midvein, base narrowed and cuneate, margin entire, subundulate, or sinuate-crenate, apex acuminate to acute. Inflorescences of terminal or axillary spikes, 1–3 cm, often arranged in large panicles forming a many-flowered thyse to 7 cm or of dense cymose clusters in axils of leaves or subleaflike bracts; outer bracteoles connate for more than half their length, forming a 5–8 mm obconic involucre, abaxially glabrous or pubescent; inner bracteoles smaller than and partially adnate to outer pair. Calyx ca. 5 mm, 5-lobed  $\pm$  halfway to base; lobes equal, margin ciliate. Corolla reddish purple to purple, 2–2.7 cm, outside puberulent; lip in lower position lanceolate, subentire; lip in upper position triangularly obovate. Staminal filaments to 1.2 cm, glabrous. Style glabrous; stigma equally 2-lobed. Capsule oblong-ovoid, 0.7–1 cm, glabrous. Seeds elliptic-ovate in outline, tuberculate. Fl. Sep–Oct, fr. Oct.

Thickets, along trails and roads, evergreen broad-leaved forests, rocky shores; near sea level to 1200 m. Guangdong, Guangxi, Hainan, Taiwan [Laos, Philippines].

*Hypoestes purpurea* is a medicinal and ornamental plant.

### 2. *Hypoestes cumingiana* (Nees) Benth & J. D. Hooker, Gen. Pl. 2: 1122. 1876.

枪刀菜 qiang dao cai

*Peristrophe cumingiana* Nees in A. Candolle, Prodr. 11: 498. 1847.

Herbs to 1 m tall, suffrutescent. Stems subterete, ascending to decumbent, distally minutely pubescent. Petiole to 2 cm; leaf blade ovate-oblong to linear-lanceolate, 4–14  $\times$  1–4 cm, both surfaces glabrous, secondary veins 3–6 on each side of midvein, base truncate to cuneate, margin slightly undulate, apex acuminate to acute. Panicles terminal or axillary, to 40 cm, lax; branches of panicle usually subtended by subleaflike inflorescence bracts; floral bracts lanceolate, ca. 4.5  $\times$  1 mm; bracteoles lanceolate-subulate to linear, outer pair 2.5–4 mm, puberulent, inner pair smaller. Flowers single or paired, crowded at tips of branches. Calyx 5-lobed nearly to base, lobes subulate, outside puberulent with non-glandular and gland-tipped trichomes. Corolla white to light purple with darker purple markings, 1.6–2 cm, outside puberulent; tube basally cylindrical and ca. 1 mm wide for 5–8 mm; lip in lower position elliptic, 8–1.2  $\times$  7–8 mm, apex rounded; lip in upper position ca. 10  $\times$  4 mm. Staminal filaments ca. 8 mm. Style 1.4–2 cm, sparsely strigose; stigma 2-lobed. Capsule oblong-ovoid, ca. 1.3 cm, densely puberulent. Seeds blackish brown, ovate in outline, ca. 3  $\times$  3 mm, verrucose. Fl. Nov–Mar, fr. Mar–Jun.

Trailside slopes, along streams; 100–500 m. Taiwan [Philippines].

**3. *Hypoestes triflora*** (Forsskål) Roemer & Schultes, Syst. Veg. 1: 141. 1817.

三花枪刀药 san hua qiang dao yao

*Justicia triflora* Forsskål, Fl. Aegypt.-Arab. 4. 1775; *Dicliptera riparia* Nees var. *yunnanensis* Handel-Mazzetti.

Herbs to 1 m tall, decumbent, much branched. Stems 4-angled, sulcate, strigose. Petiole 1–3 cm, pubescent; leaf blade ovate, ovate-elliptic, or oblong, (1.3–)3–10 × (1–)2–4 cm, both surfaces sparsely pubescent, secondary veins 4–7 on each side of midvein, base cuneate and decurrent onto petiole, margin minutely crenate to denticulate, apex acuminate. Cymes pedunculate in leaf axils and/or in axils of subleaflike bracts distally or in a terminal cluster, (1–)3(–5)-flowered; outer pair of bracte-

oles elliptic to obovate to oblanceolate, 0.7–1.7 × 0.4–0.6 cm, green toward apex, abaxially pilose, base cuneate, apex rounded to acute; inner pair of bracteoles linear-lanceolate to oblanceolate, smaller, basally connate, apex acute. Calyx ca. 6 mm, 5-lobed almost to base; lobes linear-lanceolate, ca. 5 mm. Corolla white to pink with maroon markings, ca. 1.5 cm, outside pubescent; tube basally cylindric and ca. 1 mm wide for ca. 1 cm; lip in lower position lanceolate, ca. 5 × 1.5 mm, apex slightly 2-lobed; lip in upper position oblong, ca. 5 × 3 mm. Ovary pubescent; style ca. 1.4 cm, glabrous; stigma unequally 2-lobed. Capsule ca. 9 mm, pubescent (at least distally). Seeds black, ovate in outline, ca. 2 × 2 mm, verrucose. Fl. Jul–Sep, fr. Sep–Jan.  $2n = 30$ .

Trailsides, forests; 300–2400 m. Yunnan [Bhutan, India, Myanmar, Nepal; Africa].

## 29. *BARLERIA* Linnaeus, Sp. Pl. 2: 636. 1753.

假杜鹃属 jia du juan shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs, subshrubs, or perennial herbs, with cystoliths, usually spiny. Leaves opposite, petiolate. Inflorescences axillary cymes (sometimes secund or reduced to dense clusters), terminal spikes, or flowers solitary; bracts present or absent; bracteoles 2, sometimes becoming spinose. Calyx deeply 4-lobed; outer 2 lobes larger [anterior lobe sometimes 2-cleft]; inner 2 lobes smaller. Corolla funnel-shaped, usually large; limb 5-lobed (usually with upper lip appearing 4-lobed); lobes subequal, quincuncial in bud. Stamens [2 or] 4 and didynamous, one pair usually greatly reduced and/or sterile; anthers 2-theous; thecae ± equal in size, equally inserted, lacking basal appendages; staminodes 1 or 3, sometimes bearing very small anthers. Ovary with 2 ovules per locule; stigma 2-cleft or entire. Capsule substipitate or lacking a distinct basal stalk, subellipsoid to ovoid, 2–4-seeded; retinacula present. Seeds discoid, pubescent with appressed hygroscopic trichomes.

About 80–120 species: tropical regions of Africa and Asia, one species in tropical America; four species (one endemic) in China.

*Barleria procumbens* Loureiro (Fl. Cochinch. 2: 377. 1790) is not treated here because no material was available for study. *Barleria lupulina* Lindley is cultivated only in China and not treated here.

1a. Margin of calyx lobes (at least outer lobes) serrate or spiny.

2a. Flowers in dense, shortly pedunculate cymes from leaf axils; bracteoles linear to linear-lanceolate, 2.4–6.5 cm ..... 1. *B. cristata*

2b. Flowers in axillary and terminal dense spikes; bracteoles elliptic, ca. 1.2 cm ..... 3. *B. strigosa*

1b. Margin of calyx lobes entire (apex spine-tipped in *B. prionitis*).

3a. Plants with spines in at least some leaf axils; calyx lobes apically spinose; corolla yellowish to orange ..... 2. *B. prionitis*

3b. Plants without spines; calyx lobes not apically spinose; corolla not yellowish to orange.

4a. Flowers in dense spikes; calyx purple; narrow basal portion of corolla tube ca. 3 × as long as throat; bracteoles ca. 1/2 as long as calyx; seeds 4 per capsule ..... 3. *B. strigosa*

4b. Flowers solitary in leaf axils; calyx green; narrow basal portion of corolla tube shorter than throat; bracteoles equaling or longer than calyx; seeds 2 per capsule ..... 4. *B. integrisepala*

**1. *Barleria cristata*** Linnaeus, Sp. Pl. 2: 636. 1753.

假杜鹃 jia du juan

*Barleria cavaleriei* H. Léveillé; *B. ciliata* Roxburgh; *B. cristata* var. *mairei* H. Léveillé; *B. dichotoma* Roxburgh; *B. laciniata* Nees; *B. napalensis* Nees.

Subshrubs to 2 m tall. Stems terete, branched, covered with soft trichomes. Petiole (0–)0.3–1 cm; leaf blade elliptic to oblong to ovate, 2–10 × 1–4 cm, both surfaces villous especially along veins, secondary veins 4–7 on each side of midvein, base cuneate and decurrent onto petiole, apex acute to sometimes acuminate. Inflorescences axillary short and dense cymes, shortly pedunculate; bracts absent; bracteoles variable,

linear to linear-lanceolate, 2.4–6.5 × 0.5–1.5 cm, 3–7-veined, base cuneate, margin usually spiny but sometimes bristly pilose and becoming spinescent with age, apex acuminate. Outer calyx lobes ovate to narrowly elliptic to lanceolate, 1.2–2.5 × 0.5–1.3 cm, pilose, reticulately veined, margin spiny, apex mucronate; inner calyx lobes linear to lanceolate, 6–12 mm, 1-veined, margin scarious. Corolla purplish blue, 4.5–6.5 cm, outside pilose; tube basally narrowly cylindric then gradually widened; lobes oblong-elliptic, ca. 1.5 cm, equal. Stamens 4, didynamous; filaments pilose especially toward base; staminode 1, filament sparsely pilose. Ovary oblong-ellipsoid, glabrous; style linear, ca. 2.5 cm, glabrous; stigma slightly inflated. Capsule 1.2–1.8 cm, glabrous, 4-seeded. Seeds subglobose to ovoid, 4–5 × ca. 4 mm. Fl. May, Aug–Dec, fr. May, Oct.  $2n = 40$ .

Roadsides, slopes, along streams, in xeric vegetation; below 100–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, ?Xizang, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam].

*Barleria cristata* is a medicinal and ornamental plant.

**2. *Barleria prionitis* Linnaeus, Sp. Pl. 2: 636. 1753.**

黄花假杜鹃 huang hua jia du juan

Shrubs to 1.8 m tall with spines in lower leaf axils, branched. Stems and branches terete, smooth, lenticellate, glabrous. Petiole 1–2.5 cm; leaf blade elliptic to ovate, 4–10.5 × 1.8–5.5 cm, both surfaces pubescent when young but soon glabrescent, sparsely strigose along midvein, base attenuate and decurrent onto petiole, margin entire, apex acute. Flowers clustered in axils of upper leaves and/or bracts; bracts linear-oblong, 1.2–2.2 × 0.2–0.8 cm, margin ciliate, apex abruptly acuminate; bracteoles linear-lanceolate, to 1.4 × 0.2 cm, spine-tipped. Outer calyx lobes ovate-oblong, ca. 1.5 × 0.4 cm, apex mucronate; inner calyx lobes linear-lanceolate, ca. 1.3 × 0.2 cm, apex mucronate. Corolla yellow to orange, 2.4–4 cm, outside pilose; tube with narrow basal portion slightly shorter than throat; lobes ovate-oblong to orbicular, 8–10 × 6–7 mm, recurved. Stamens 4, longer pair ca. 1.1 cm with anthers ca. 3.2 mm, shorter pair ca. 1.5 mm with anthers ca. 1 mm. Ovary ovoid; stigma slightly enlarged, 2-cleft, exserted. Capsule ovoid, ca. 1.8 cm, contracted gradually at tip forming a beak, 2-seeded. Seeds ovate in outline, ca. 7 × 5 mm. Fl. Oct–Dec, fr. Dec–Feb.  $2n = 40$ .

Roadsides, thickets, dry places in evergreen broad-leaved forests; ca. 600 m. Yunnan [India, Laos, Myanmar, Sri Lanka, Thailand, Vietnam; Africa, Madagascar].

This species is used medicinally.

The distribution of *Barleria prionitis* is commonly given as throughout tropical Africa and Asia, where it is often introduced; its native distribution is not known with certainty.

**3. *Barleria strigosa* Willdenow, Sp. Pl. 3: 379. 1800.**

紫萼假杜鹃 zi e jia du juan

*Barleria purpureosepala* H. P. Tsui.

Subshrubs to 80 cm tall, branched. Stems subterete, coarsely fulvous strigose. Petiole 0.7–2.5 cm, brownish yellowish strigose; leaf blade elliptic to ovate, 5.5–15 × 2.2–5.5 cm, both surfaces fulvous strigose especially along veins, secondary veins ca. 7 on each side of midvein, base cuneate and decurrent onto petiole, apex acute. Flowers in axillary and terminal dense spikes to 5 cm; bracts oblong to elliptic-oblong, abaxially shortly strigose along veins, apex sharply acute; bracteoles elliptic, ca. 1.2 cm, 1-veined, margin ciliate, apex acute. Outer calyx lobes purple, ovate, ca. 3.2 × 1.8 cm, base rounded, margin subentire to dentate, apex acute; inner calyx lobes yellowish brown, lanceolate, ca. 1.5 × 0.2 cm, both surfaces strigose, apex acute. Corolla purplish red, 5–6 cm; tube basally cylindric for ca. 3.7 cm, throat ca. 1.2 cm; lobes ovate-oblong, ca. 2 × 1–1.5 cm, subequal. Stamens 4; filaments basally pilose, longer pair ca. 1.3 cm with anthers ca. 5 mm, shorter pair ca. 3 mm with anthers ca. 1.5 mm; staminode 1. Ovary ovoid, ca. 3 mm; style ca. 2.5 cm. Capsule ellipsoid, 1.4–1.8 × ca. 0.5 cm, glabrous, shining, 4-seeded. Fl. Nov, fr. Feb.  $2n = 40$ .

Dense forests; ca. 900 m. Yunnan [Bhutan, Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

**4. *Barleria integriseppala* H. P. Tsui, Acta Bot. Yunnan. 12: 269. 1990.**

全缘萼假杜鹃 quan yuan e jia du juan

Shrubs to 1 m tall, evergreen. Stems sparsely lenticellate, strigose, soon glabrescent. Leaves clustered at shoot apices; petiole 3–5 cm, strigose; leaf blade ovate, narrowly ovate, or lanceolate, 3–4.5 × 0.7–1.8 cm, both surfaces pilose and strigose along veins, secondary veins 4–6 on each side of midvein, base cuneate and decurrent onto petiole, apex acute. Flowers axillary, solitary; bracteoles linear, ca. 14 × 1 mm, sparsely pilose. Pedicel short. Outer calyx lobes elliptic, ca. 1.3 × 0.7 cm, outside sparsely strigose, inside pilose, base cuneate, margin ciliate, apex acute; inner calyx lobes lanceolate, ca. 5 × 1 mm, margin ciliate, apex acuminate. Corolla bluish purple, funnel-shaped, ca. 3.5 cm; tube basally cylindric for ca. 7 mm, throat ca. 1.5 cm; lobes suborbicular, ca. 1.4 × 1.4 cm, subequal. Stamens 4; filaments basally pilose, longer pair ca. 1.7 cm with anthers ca. 4 mm, shorter pair ca. 4 mm with anthers ca. 1.5 mm; staminode 1, filament ca. 4 mm. Ovary subellipsoid, ca. 4 mm, glabrous; stigma enlarged. Capsule ellipsoid, ca. 1.7 cm, contracted at tip forming a beak, 4-seeded. Seeds ovate in outline, ca. 5 × 5 mm. Fl. Aug–Sep, fr. Nov–Dec.

• Thickets along streams; 1900–2000 m. Sichuan (Muli).

**30. LEPIDAGATHIS Willdenow, Sp. Pl. 3: 400. 1800.**

鳞花草属 lin hua cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs [or shrubs], perennial, with cystoliths, often anisophyllous. Leaves opposite; leaf blade margin entire or crenate-serrate. Inflorescences dense spikes or cymes condensed into globose heads, sometimes clustered; bracts and bracteoles present. Calyx 5-lobed; lobes heteromorphic; posterior lobe usually largest; lateral 2 lobes smallest; anterior 2 lobes usually connate to a greater degree than other lobes. Corolla small; tube usually expanded into a distinct throat near middle; limb 2-lipped; lower lip 3-lobed, patent, usually spotted, lobes subequal or middle one slightly larger; upper lip erect or slightly patent, entire to 2-lobed; lobes quincuncial in bud. Stamens 4, didynamous [or with one pair reduced or absent], usually included in corolla tube; filaments short; anthers 2-theous [or with one pair of anthers sometimes 1-theous]; thecae oblong, parallel or one lower and somewhat divergent,

base muticous or spurred. Ovary with 2 ovules per locule; stigma subcapitate, entire or slightly 2-cleft. Capsule subellipsoid to oblong to linear-conical, lacking a stalk, to 4-seeded; retinacula present. Seeds discoid, pubescent with hygroscopic trichomes.

About 100 species: tropical to subtropical regions worldwide (mostly paleotropical); seven species (three endemic) in China.

- 1a. Inflorescences globose or ovoid heads to 1 cm; leaves sessile to subsessile; leaf blade usually less than 2 cm, base truncate to subcordate ..... 6. *L. secunda*
- 1b. Inflorescences  $\pm$  elongate and secund spikes to 5.5 cm; leaves usually petiolate; leaf blade to 14.5 cm, base cuneate to attenuate and usually decurrent onto petiole (in *L. inaequalis* abruptly truncate to rounded and decurrent onto petiole).
  - 2a. Leaf blade linear to linear-lanceolate, (4.6–)6.5–16  $\times$  as long as wide ..... 7. *L. stenophylla*
  - 2b. Leaf blade ovate to elliptic to subcircular to obovate, 1.6–4.5(–5.6)  $\times$  as long as wide (in *L. fasciculata*, sometimes only distalmost 1 or 2 nodes with leaf blade linear to linear-lanceolate and 6–9.5  $\times$  as long as wide and others ovate to elliptic and 1.7–3  $\times$  as long as wide).
    - 3a. Anterior calyx lobes connate at base for 10%–25% of their length; bracts (1 or)3(or 5)-veined.
      - 4a. Corolla pinkish; bracts broadly ovate to ovate-oblong, 2.5–4.4 mm wide; posterior calyx lobe 3-veined; distinct segments of anterior calyx lobe oblanceolate to linear, 6–6.5 mm; capsule 4.5–5 mm, pubescent distally ..... 1. *L. fasciculata*
      - 4b. Corolla white; bracts narrowly lanceolate, 1–1.5 mm wide; posterior calyx lobe 5-veined; distinct segments of anterior calyx lobe narrowly lanceolate, 9–10 mm; capsule 6–6.5 mm, pubescent throughout ..... 3. *L. hainanensis*
    - 3b. Anterior calyx lobes connate at base for 30%–60% of their length; bracts 1(or 3)-veined.
      - 5a. Leaf blade 1–4(–6) cm, 1.6–2  $\times$  as long as wide, base abruptly rounded to truncate and decurrent onto petiole; plants decumbent, not conspicuously woody at base ..... 4. *L. inaequalis*
      - 5b. Leaf blade to 14.5 cm, usually more than 2  $\times$  as long as wide, base cuneate to long attenuate and decurrent onto petiole; plants not decumbent, conspicuously woody at base.
        - 6a. Calyx 5–6 mm ..... 2. *L. formosensis*
        - 6b. Calyx 8–10 mm ..... 5. *L. incurva*

**1. *Lepidagathis fasciculata*** (Retzius) Nees in Wallich, Pl. Asiat. Rar. 3: 95. 1832.

齿叶鳞花草 chi ye lin hua cao

*Ruellia fasciculata* Retzius, Observ. Bot. 4: 28. 1786.

Herbs to 40 cm tall, erect to spreading, isophyllous to anisophyllous. Stems 4-angled to 4-angled and sulcate, pubescent or glabrate. Petiole 1.5–3.5 cm; leaf blade ovate to elliptic (distalmost 1 or 2 nodes with leaves sometimes linear to linear-lanceolate), 1.3–12.5  $\times$  0.7–5(–7) cm, 1.7–3 (6–9.5 in distalmost linear leaves when present)  $\times$  as long as wide, both surfaces pubescent but trichomes sometimes sparse or restricted to midvein, secondary veins 4 or 8 or more on each side of midvein, base attenuate and decurrent onto petiole, margin entire to crenate-serrate, apex acuminate. Spikes elongate, 2–4 cm; bracts broadly ovate to ovate-oblong, 7–10  $\times$  2.5–4.4 mm, abaxially pubescent, 1- or 3-veined, veins prominent, margin ciliate with gland-tipped and non-glandular trichomes, apex aristate; bracteoles ovate-elliptic, abaxially pubescent, margin ciliate with glandular and non-glandular trichomes. Calyx ca. 8 mm, pubescent with gland-tipped and non-glandular trichomes; posterior lobe narrowly elliptic to oblong-lanceolate, ca. 8  $\times$  1.5–1.7 mm, 3-veined; lateral lobes lanceolate, ca. 6.5 mm; anterior lobes connate at base for 17%–25% of their length, distinct segments oblanceolate to linear and 6–6.5 mm. Corolla pinkish, 0.8–1.5 cm, outside pubescent; lower lip 2.5–4 mm, lobes ca. 1  $\times$  0.7–1 mm. Capsule 4.5–5 mm, distally pubescent. Seeds subcircular in outline, 0.8–1.2 mm in diam. Fl. Nov–Mar, fr. Jan–May. *2n* = 20.

Thickets, roadsides, streamsides. Hainan, Yunnan [Bangladesh, Laos, Malaysia, Myanmar, N Thailand].

**2. *Lepidagathis formosensis*** C. B. Clarke ex Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 213. 1911.

台湾鳞花草 tai wan lin hua cao

Herbs to 45(–90) cm tall, suffrutescent, erect, isophyllous to conspicuously anisophyllous. Stems 4-angled to 4-angled and sulcate, glabrous or slightly pubescent. Petiole 0.5–2 cm; leaf blade ovate to narrowly elliptic to broadly elliptic to obovate, 2.5–14.5  $\times$  (0.8–)1–6 cm, 2–3.8(–5.6)  $\times$  as long as wide, abaxially sparsely pubescent along veins, adaxially glabrous, secondary veins 4–7 on each side of midvein, base long attenuate and decurrent onto petiole, margin entire to sinuate, apex acuminate. Spikes elongate, 1–5.5 cm, secund; bracts ovate to lanceolate, 3.5–5  $\times$  1–2 mm, 1(or 3)-veined, abaxially and marginally pubescent with non-glandular and sometimes gland-tipped trichomes, apex aristate; bracteoles similar to bracts or narrower. Calyx 5–6 mm, pubescent with non-glandular and sometimes gland-tipped trichomes; posterior lobe ovate to oblong-lanceolate, 5–5.9  $\times$  1.2–1.8 mm, 3-veined; lateral lobes lanceolate to oblong-lanceolate, 4.5–5.8  $\times$  0.7–0.9 mm; anterior lobes connate at base for 50%–60% of their length, distinct segments lanceolate-subulate and 2.5–3 mm. Corolla white with purple markings on limb, 6.5–9 mm, outside pubescent; lower lip 2.3–3.1 mm, lobes 1–2  $\times$  1–2 mm. Capsule 5–7 mm, distally pubescent. Seeds subcircular to broadly ovate in outline, 1.3–1.8 mm in diam. Fl. Sep–May, fr. Jan–Apr.

• Secondary evergreen broad-leaved forests, along streams, ditches, slopes; 100–2300 m. Guangdong, Taiwan.

*Lepidagathis formosensis* is similar to *L. incurva*, if it is indeed distinct. On most plants from Taiwan the bracts and calyx are pubescent with only non-glandular trichomes. On some, however (e.g., *B. Bar-*

*tholomew & D. E. Boufford 6193* at CAS), conspicuous gland-tipped trichomes are present on these structures. In other respects, such plants agree with non-glandular specimens of *L. formosensis*.

**3. *Lepidagathis hainanensis*** H. S. Lo, Fl. Hainan. 3: 598. 1974.

海南鳞花草 hai nan lin hua cao

Herbs to 30 cm tall, erect, anisophyllous. Stems 4-angled, subglabrous to slightly pubescent. Petiole (0–)0.5–1.5 cm; leaf blade ovate to elliptic, 1–12 × 0.5–3.5 cm, 1.8–3.5 × as long as wide, abaxial surface sparsely and inconspicuously puberulent especially along midvein, adaxial surface glabrous, secondary veins 4–6 on each side of midvein, base narrowly cuneate and decurrent onto petiole, margin entire to irregularly subsinuate, apex obtuse to rounded to acute. Spikes elongate, 2–6 cm, secund; bracts narrowly lanceolate, 8–10 × 1–1.5 mm, abaxially and marginally pubescent with gland-tipped and non-glandular trichomes, 3(or 5)-veined, apex aristate; bracteoles similar to bracts. Calyx 0.9–1.2 cm, pubescent with gland-tipped and non-glandular trichomes; posterior lobe lanceolate, 8.5–11 × 1.5–2 mm, 5-veined; lateral lobes lanceolate-subulate, ca. 7 × 1 mm; anterior lobes connate at base for ca. 10% of their length, distinct segments narrowly lanceolate and 9–10 mm. Corolla white, 9–10 mm, outside pubescent; lower lip not seen. Capsule 6–6.5 mm, pubescent throughout. Seeds not seen. Fl. Feb–Apr, fr. Feb–Apr.

• Forests. Guangxi, Hainan.

**4. *Lepidagathis inaequalis*** C. B. Clarke ex Elmer, Leaflet. Philipp. Bot. 5: 1695. 1913.

卵叶鳞花草 luan ye lin hua cao

Herbs 10–20 cm tall, decumbent, not conspicuously woody, isophyllous. Stems 4-angled, sulcate, glabrous or 2-fariously pubescent. Petiole 3–15 mm; leaf blade broadly ovate to subcircular, 1–4(–6) × 0.65–2.5(–3) cm, 1.6–2 × as long as wide, sparsely pubescent especially along midvein, secondary veins 3–5 on each side of midvein, base abruptly rounded to truncate and decurrent onto petiole, margin entire or shallowly sinuate, apex acute to acuminate. Spikes elongate, 1.2–2 cm, secund; bracts lanceolate, 3–5 × 1–1.4 mm, abaxially and marginally pubescent with gland-tipped trichomes (glands sometimes restricted to distal portion of margin), 1(or 3)-veined, apex aristate; bracteoles similar to bracts or smaller. Calyx ca. 6 mm, pubescent with gland-tipped and non-glandular trichomes; posterior lobe oblong-lanceolate, ca. 6.2 × 1.1 mm, 3-veined; lateral lobes lanceolate, ca. 5.8 × 0.7 mm; anterior lobes connate at base for ca. 50% of their length, distinct segments lanceolate and ca. 3.2 mm. Corolla white, ca. 8 mm, outside pubescent; lower lip ca. 3 mm, lobes ca. 2 × 2 mm. Capsule ca. 5 mm, distally pubescent. Seeds not seen. Fl. and fr. Sep.

Evergreen broad-leaved forests, shaded roadsides; below 100 m. Taiwan [Japan, Philippines].

Corollas of *Lepidagathis inaequalis* have been reported as 4–5 mm and glabrous outside (e.g., C. F. Hsieh & T. C. Huang, Fl. Taiwan, ed. 2, 4: 671. 1998). Those of *Kao 704* (CAS) are ca. 8 mm and pubescent outside.

*Lepidagathis inaequalis* is similar to *L. formosensis*, if they are indeed distinct. Some plants from Taiwan with glandular bracts and calyces (e.g., *Hsieh 787* at CAS) appear somewhat intermediate between them in leaf shape. Plants treated as *L. inaequalis* have glandular bracts and calyces, decumbent stems, and usually smaller leaf blades that are broadly ovate to subcircular and abruptly constricted basally (truncate to rounded). In *L. formosensis*, bracts and calyces are often non-glandular, stems are erect, and leaf blades are usually larger, ovate to elliptic to obovate, and gradually attenuate-tapered at the base. Among the limited specimens studied, those of *L. inaequalis* are isophyllous, whereas most of those of *L. formosensis* are anisophyllous.

**5. *Lepidagathis incurva*** Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 119. 1825.

鳞花草 lin hua cao

*Lepidagathis hyalina* Nees.

Herbs 30–100 cm tall, base often conspicuously woody, often ± anisophyllous. Stems 4-angled, sulcate, pubescent or soon glabrescent. Petiole 0.5–3.5 cm; leaf blade ovate to elliptic to narrowly elliptic, 2.5–11 × 1–4.5 cm, 1.7–4.5 × as long as wide, both surfaces pubescent but soon glabrescent with few trichomes or sparsely pubescent along veins, secondary veins (4–)7–9 on each side of midvein, base cuneate and conspicuously decurrent onto petiole, margin entire and slightly sinuate, apex acute to shortly acuminate. Spikes elongate, (0.5–)1–3.8 cm, secund; bracts oblong-lanceolate, 6–10 × 1.5–2 mm, abaxially and marginally pubescent with gland-tipped (sometimes absent) and non-glandular trichomes, 1-veined, apex long acuminate; bracteoles similar to bracts except usually smaller. Calyx 8–10 mm, pubescent with gland-tipped (sometimes absent) and non-glandular trichomes or glabrescent; posterior lobe oblong-lanceolate, 8–9 × 1.5–1.7 mm, 3-veined; lateral lobes lanceolate, 6–7.5 × 0.7–0.8 mm; anterior lobes connate at base for 30%–55% of their length, distinct segments lanceolate and 4.8–6 mm. Corolla white streaked with purple, 8–10 mm, outside sparsely pubescent; lower lip 2.5–3 mm, lobes 1.5–3 × 1.3–1.8 mm. Stamens not seen. Ovary not seen; style not seen; stigma not seen. Capsule 5–6 mm, distally pubescent. Seeds subcircular in outline, 1.5–1.8 mm in diam. Fl. and fr. Oct–Mar.  $2n = 20, 44, 84$ .

Grasslands, thickets, roadsides, hedgerows, streamsides; 100–2200 m. Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, India, Myanmar, Thailand, Vietnam].

This species is used medicinally.

**6. *Lepidagathis secunda*** Nees in A. Candolle, Prodr. 11: 259. 1847.

小琉球鳞花草 xiao liu qiu lin hua cao

*Ruellia secunda* Blanco, Fl. Filip. 495. 1837, not Vahl (1794).

Herbs to 30 cm tall, erect or spreading. Stems 4-angled, subglabrous. Leaves sessile to subsessile; leaf blade ovate to ovate-lanceolate, 1.5–2 × 0.7–1 cm, both surfaces pubescent, base truncate to subcordate, margin entire, apex acute to shortly acuminate. Spikes globose to ovoid, to 1 cm; bracts oblong-lanceolate. Corolla to 6 mm, outside pubescent. Stamens included

in corolla tube; thecae ca. 1 mm, pilose at tip. Ovary oblong; style sparingly hirsute. Capsule ca. 4 mm. Seeds subcircular in outline.

Taiwan [Philippines].

No specimens of *Lepidagathis secunda* have been seen, and published descriptions are inadequate to evaluate the status of either this species or its occurrence in Taiwan. Information above is based entirely on that provided by C. F. Hsieh and T. C. Huang (Fl. Taiwan, ed. 2, 4: 673. 1998).

**7. *Lepidagathis stenophylla*** C. B. Clarke ex Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 214. 1911.

柳叶鳞花草 liu ye lin hua cao

Herbs to 40 cm tall, suffrutescent, often  $\pm$  anisophyllous. Stems 4-angled to 4-angled and sulcate, subglabrous or evenly to  $\pm$  bifariously pubescent. Petiole (1–)5–12 mm; leaf blade

linear to linear-lanceolate, 3.5–11  $\times$  0.3–1.9 cm, (4.6–)6.5–16  $\times$  as long as wide, both surfaces subglabrous or pubescent, secondary veins 4 or 5 on each side of midvein, base narrowed and decurrent onto petiole, margin shallowly sinuate, apex acute to acuminate. Spikes elongate, 1.3–3.8 cm, secund; bracts lanceolate to lanceolate-ovate, ca. 5  $\times$  1–1.5 mm, abaxially and marginally pubescent with non-glandular trichomes, 1-veined, apex aristate; bracteoles similar to bracts except usually smaller and narrower. Calyx 5.5–8.2 mm, pubescent with non-glandular trichomes; posterior lobe ovate to oblong-lanceolate, 5–7.5  $\times$  1.1–1.3 mm, 3-veined; lateral lobes lanceolate, 4.5–5.7  $\times$  0.7–0.8 mm; anterior lobes connate at base for 20%–55% of their length, distinct segments narrowly lanceolate and 3–6 mm. Corolla white, ca. 5 mm, outside pubescent; lower lip 2–2.3 mm, lobes 1.5–1.6  $\times$  0.6–0.8 mm. Capsule 4.5–5.5 mm, pubescent  $\pm$  throughout or only distally. Seeds subcircular in outline, 1–1.8 mm in diam. Fl. and fr. Dec.

• Forest trails; 200–400 m. Hong Kong, Taiwan.

### 31. *CHROESTHES* Benoist, Bull. Mus. Natl. Hist. Nat. 33: 107. 1927.

色萼花属 se e hua shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs, subisophyllous or anisophyllous. Leaves opposite, petiolate; leaf blade margin entire. Inflorescences terminal thyrses; bracts and bracteoles greenish. Calyx unequally 5-lobed; posterior lobe largest, 2 lateral lobes smaller than 2 anterior lobes. Corolla tube basally cylindric and expanded distally into a throat; limb 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes quincuncial in bud. Stamens 4, not connate, posterior pair shorter than anterior pair, inserted at base of throat; anthers 2-theccous; thecae parallel, inserted at different heights, dorsally pubescent, base spurred. Ovary with 2 ovules per locule; style basally sparsely pubescent. Capsule stipe absent or barely present; retinacula present. Seeds compressed, brownish pubescent.

Three species: China, Laos, Malaysia, Myanmar, Thailand, Vietnam; one species in China.

**1. *Chroesthes lanceolata*** (T. Anderson) B. Hansen, Nordic J. Bot. 3: 209. 1983.

色萼花 se e hua

*Asystasia lanceolata* T. Anderson, J. Linn. Soc., Bot. 9: 524. 1867; *A. kerrii* Craib; *A. silvicola* W. W. Smith; *Chroesthes pubiflora* Benoist; *C. racemiflora* Bremekamp; *C. racemiflora* var. *glabrior* Bremekamp; *C. silvicola* (W. W. Smith) E. Hossain.

Shrubs 0.5–3 m tall, anisophyllous. Stems terete, slender, rarely branched, glabrous. Petiole 1–2.5 cm; leaf blade elliptic to oblanceolate to lanceolate, 10–16  $\times$  3–7 cm, both surfaces glabrous, secondary veins 6–9 on each side of midvein, base cuneate, margin entire or subsinuate, apex acuminate. Thyrses 3–7 cm; cymes sessile, 1–3-flowered; bracts elliptic to broadly

lanceolate, 3–9  $\times$  1–3 mm, gland-tipped pubescent, apex acute; bracteoles narrowly elliptic to broadly lanceolate, 4–9  $\times$  0.7–1.2 mm. Pedicel 1–5 mm. Calyx 1–1.6 cm, outside gland-tipped pubescent; posterior lobe lanceolate, ovate, or subelliptic; lateral lobes linear-lanceolate; anterior lobes connate to 2/3 their length. Corolla white with pink or purple spots, ca. 2.5 cm, outside pubescent; tube basal portion ca. 9 mm, throat ca. 1.5 cm; lower lip 3-lobed; upper lip 2-lobed. Stamens included in throat; filaments 1–1.2 cm, glabrous; anther thecae 2.1–2.3 mm, pubescent at apex and along sides, basal spur pointed. Ovary apex pubescent; style ca. 2.5 cm. Capsule subellipsoid to obovoid, 1.2–1.6 cm, glabrous or only at apex pubescent, 4-seeded. Seeds subcircular in outline. Fl. Feb–Mar, fr. May–Jul.

Forests; (200–)800–1400 m. Guangxi, S Yunnan [Laos, Myanmar, Thailand, Vietnam].

### 32. *GYMNOSTACHYUM* Nees in Wallich, Pl. Asiat. Rar. 3: 76, 106. 1832.

裸柱草属 luo zhu cao shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Cryptophragmium* Nees; *Sarcanthera* Rafinesque.

Herbs, perennial [or shrubs], with cystoliths. Leaves cauline or subradical, opposite; leaf blade margin usually entire. Inflorescences axillary or terminal, spikes, racemes, or panicles, often secund; bracts and bracteoles shorter than calyx. Calyx 5-lobed nearly to base; lobes subequal. Corolla tube longer than limb, basal portion narrowly cylindric,  $\pm$  expanded distally into a throat; limb 2-lipped, lower lip 3-lobed, upper lip emarginate to 2-lobed; lobes ascending cochlear in bud. Stamens 2, included in or slightly

exserted from corolla tube; anther thecae 2, equal or subequal in size, parallel, one or both mucronate at base; staminodes absent. Ovary with 3 to many ovules per locule; stigma 2-lobed, lobes compressed. Capsule without a stipe, linear, 4-angled, many seeded; retinacula present. Seeds compressed, covered with hygroscopic trichomes.

About 30 species: tropical Asia; three species (two endemic) in China.

- 1a. Stems very short; leaves in a basal rosette ..... 1. *G. subrosulatum*  
 1b. Stems elongate; leaves cauline.  
     2a. Inflorescences axillary ..... 2. *G. listeri*  
     2b. Inflorescences terminal ..... 3. *G. sinense*

**1. *Gymnostachyum subrosulatum*** H. S. Lo, Acta Phytotax. Sin. 17(4): 86. 1979.

矮裸柱草 ai luo zhu cao

*Gymnostachyum kwangsiense* H. S. Lo.

Herbs 20–40 cm tall. Stems short, hirsute. Leaves in a basal rosette; petiole 2–9(–14) cm; leaf blade suborbicular to broadly ovate, 5–16 × 3.5–11 cm, papery, abaxially subglabrous but midvein and secondary veins hirsute, adaxially slightly scabrous, secondary veins 7–9 on each side of midvein, base slightly cordate to rounded, margin entire or slightly sinuate, apex rounded to acute. Thyrses 10–35 cm, with 1–4 flowers per cyme; peduncle 8–19 cm; bracts subulate, ca. 2.5 mm, pilose, apex acute; bracteoles similar to bracts. Calyx 2.5–3 mm; lobes subulate, pilose. Corolla ca. 1.5 cm; lower lip patent, 3-lobed, lobes oblong-ovate and ca. 3 × 2 mm; upper lip triangular, ca. 5 mm, erect, 2-dentate. Stamens exserted; filaments 7–8 mm; anther thecae linear, parallel. Ovary 2-locular, with 4 ovules per locule; style 1.3–1.9 cm. Capsule linear, 1.3–1.6 cm, 8-seeded. Seeds ovate in outline, ca. 1 × 0.8 mm. Fl. Apr–May, fr. Jun–Sep.

• Limestone hills; 200–600 m. Guangxi.

**2. *Gymnostachyum listeri*** Prain, J. Asiatic Soc. Bengal, Pt. 2, Nat. Hist. 69: 171. 1900.

云南裸柱草 yun nan luo zhu cao

*Cryptophragmium tonkinense* Benoist; *Parajusticia petelotii* Benoist.

Herbs to 50 cm tall, caulescent, isophyllous. Stems branched, 4-angled, pubescent. Leaves cauline; petiole 5–12 mm, pubescent; leaf blade elliptic to obovate-elliptic, (4.5–)6–13(–17) × 2.1–5.5 cm, abaxially white pubescent, adaxially glabrous except for trichomes along midvein, secondary veins 11–14 on each side of midvein and abaxially prominently curved, tertiary veins inconspicuous, base asymmetric or symmetric and ± decurrent onto petiole, margin entire or obscurely sinuate, apex acute to acuminate. Spikes 2–6 cm, secund; peduncle 0.5–

1.5 cm; rachis pubescent and gland-tipped pilose; bracts linear, ca. 3 × 0.3 mm, pubescent; bracteoles linear-triangular, ca. 1.5 × 0.5 mm, pubescent. Calyx 0.1–1.1 cm; lobes linear, 8–10 × ca. 0.5 mm, outside pubescent, inside glabrous, margin gland-tipped pilose. Corolla purple, 1.6–2 cm, pubescent; tube basally cylindric and ca. 2.5 cm wide for ca. 8 mm, throat abruptly bending and widening to 5 mm; lower lip 4–5 mm, 3-lobed, lobes oblong and ca. 3 × 1.5 mm; upper lip 3–4 mm, 2-lobed, lobes broadly ovate and ca. 2 × 2 mm. Staminal filaments ca. 4 mm, glabrous; anther thecae oblong, ca. 5 × 1 mm, pilose, spurred at base. Ovary ca. 3 × 1 mm, glabrous; style ca. 1.5 cm, villous. Capsule not seen. Fl. Apr–May.

Limestone hills; 200–600 m. Guangxi, Yunnan [Bangladesh, Vietnam].

**3. *Gymnostachyum sinense*** (H. S. Lo) H. Chu, Bull. Bot. Res., Harbin 11(1): 48. 1991.

华裸柱草 hua luo zhu cao

*Andrographis sinensis* H. S. Lo, Bull. Bot. Res., Harbin 1(4): 103. 1981.

Herbs to 1 m tall. Stems purplish black, terete, glabrous; young shoots 4-angled, pubescent at nodes. Petiole 2–4 mm; leaf blade ovate to broadly ovate, 1.5–4 × 1–1.8 cm, thickly paper, both surfaces glabrous, secondary veins ca. 6 on each side of midvein, base cuneate, margin entire or subentire, apex acute to sometimes caudate. Spikes terminal, few flowered; peduncle ca. 1 cm, subglabrous; bracts linear to linear-lanceolate, 1.5–2 mm; bracteoles similar to bracts. Calyx ca. 7 mm, glabrous; lobes lanceolate-linear, apex acuminate. Corolla white, ca. 1 cm; lower lip ca. 4 mm, 3-lobed, lobes ovate and ca. 0.5 × 0.5 mm; upper lip subtriangular, ca. 3.5 mm, 2-lobed. Staminal filaments ca. 2.5 mm, glabrous; anther thecae linear, ca. 3 mm, spurred at base. Ovary ellipsoid, ca. 3 mm, glabrous, ovules 5 or 6 per locule; style ca. 7 mm. Capsule narrowly cylindric, 1–1.5 mm, glabrous. Seeds subglobose, ca. 1 × 1 mm, pubescent. Fl. Aug.

• Limestone hills. Guangxi.

### 33. *ANDROGRAPHIS* Wallich ex Nees in Wallich, Pl. Asiat. Rar. 3: 77, 116. 1832.

穿心莲属 chuan xin lian shu

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

*Haplanthoides* H. W. Li; *Haplanthus* Nees.

Herbs or subshrubs, with cystoliths. Leaf blade margin entire. Inflorescences terminal or axillary, panicles, racemes, or sometimes spikes or dense clusters; bracts present; bracteoles small [or absent]. Calyx deeply 5-lobed; lobes narrow, equal or subequal. Corolla tubular to funnelform at base; limb 2-lipped; lower lip 3-lobed; upper lip entire or 2-lobed; lobes ascending cochlear in bud.

Stamens 2, exserted from or included in corolla tube; filaments sometimes pubescent; anthers 2-theous; thecae parallel, equal or subequal, base mucous and conspicuously pubescent. Capsule linear-oblong or ellipsoid, compressed perpendicular to septum, [6–]12–20-seeded; retinacula present. Seeds subglobose,  $\pm$  blocky, or  $\pm$  compressed, surfaces smooth or ornamented, lacking trichomes.

About 20 species: tropical and subtropical Asia; two species (one introduced) in China.

- 1a. Leaf blade lanceolate to oblong-lanceolate; corolla deeply and prominently 2-lipped, lips divergent (i.e., upper lip  $\pm$  perpendicular or oblique to tube and lower lip); stamens exserted from corolla tube ..... 1. *A. paniculata*  
 1b. Leaf blade ovate; corolla shallowly and inconspicuously 2-lipped, lips not divergent (i.e., lips  $\pm$  parallel to one another); stamens included in corolla tube ..... 2. *A. laxiflora*

**1. *Andrographis paniculata*** (N. L. Burman) Wallich ex Nees in Wallich, Pl. Asiat. Rar. 3: 116. 1832.

穿心莲 chuan xin lian

*Justicia paniculata* N. L. Burman, Fl. Indica, 9. 1768.

Herbs to 50 cm tall, annual, much branched. Stems 4-angled, glabrous. Petiole 0.3–1 cm; leaf blade ovate-lanceolate, lanceolate, or narrowly elliptic, 1.5–7  $\times$  1–2.5 cm, both surfaces glabrous, abaxially pale green, adaxially green, secondary veins 3–5 on each side of midvein, base attenuate and decurrent onto petiole, margin entire, apex acute to shortly acuminate. Inflorescences terminal, leafy panicles of secund racemes; rachis glabrous to sparsely pubescent; bracts triangular to subulate, 1–1.5 mm; bracteoles linear to subulate, 1–1.5 mm. Pedicel 2–9 mm, sparsely pubescent with gland-tipped and non-glandular trichomes (gland-tipped pubescent). Calyx 2.5–3 mm, outside glabrous or gland-tipped pubescent, lobes subulate. Corolla white, 0.9–1.5 cm, outside gland-tipped pubescent; tube basally funnelform for 4–8 mm; lower lip with purple dots, 5–7 mm, erect, lobes ca. 3 mm; upper lip 5–7 mm, reflexed, 2-lobed, lobes ca. 1 mm. Stamens exserted from corolla tube. Style 6–10 mm, sparsely pilose toward base. Capsule ellipsoid-compressed, 1.5–2  $\times$  0.3–0.4 cm, glabrous or sparsely pubescent with gland-tipped trichomes, ca. 12-seeded. Seeds ca. 2  $\times$  1.5 mm, rugose. Fl. and fr. throughout year.  $2n = 50$ .

Cultivated or naturalized in Anhui, Fujian, Guangdong, Guangxi, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Yunnan, and Zhejiang [native to India and Sri Lanka; cultivated or naturalized in Cambodia, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam, and Caribbean].

This species is used medicinally.

**2. *Andrographis laxiflora*** (Blume) Lindau in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 323. 1895.

疏花穿心莲 shu hua chuan xin lian

*Justicia laxiflora* Blume, Bijdr. 789. 1826; *Andrographis glomeruliflora* Bremekamp; *A. laxiflora* var. *glomeruliflora* (Bremekamp) H. Zhu; *A. monglunensis* Hung T. Chang & H. Zhu; *A. tenera* (Nees) Kuntze; *A. tenuiflora* T. Anderson, nom. illeg. superfl.; *Haplanthoides yunnanensis* H. W. Li; *Haplanthus tener* Nees.

Herbs to 50 cm tall, isophyllous or anisophyllous. Stems erect or procumbent, 4-angled, glabrous or pubescent. Petiole 3–10 mm; leaf blade ovate, 1.5–9  $\times$  1.5–3(–5.5) cm, both surfaces glabrous, secondary veins 5 or 6 pairs on each side of midvein, base slightly attenuate and decurrent onto petiole, margin entire, apex acuminate to shortly acuminate. Inflorescences axillary or terminal, racemes or panicles of racemes, these sometimes reduced and flowers appearing as clusters in leaf axils or at ends of long peduncles; rachis glabrous or pubescent (trichomes non-gland-tipped or gland-tipped); bracts linear, subulate, or lanceolate, 1–3 mm, glabrous or pubescent; bracteoles subulate, glabrous or pubescent. Pedicel 0.5–2 mm, glabrous or pubescent. Calyx 2–4 mm, outside glabrous or pubescent, lobes subulate. Corolla white with purplish or pinkish coloration on lips, 0.8–1.2 cm, outside pubescent with gland-tipped trichomes; tube 6–9 mm, base curved, dorsally  $\pm$  gibbous; lower lip 1.5–4 mm, lobes 0.5–2 mm; upper lip 1.5–4 mm, erect ( $\pm$  parallel to lower lip), entire to 2-lobed. Stamens included in corolla tube. Capsule linear-cylindric, 10–20  $\times$  ca. 2 mm, glabrous or pubescent with gland-tipped trichomes, 16–20-seeded. Seeds ca. 1  $\times$  0.7 mm, rugose. Fl. Aug–Nov, fr. Nov–Mar.

Thickets, bamboo forests; 200–1500 m. Guangxi, Guizhou, Hainan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

Specimens misidentified as *Gymnostachyum sanguinolentum* (Vahl) T. Anderson (C. Y. Wu, Index Fl. Yunnan. 2: 1676. 1984; C. C. Hu, FRPS 70: 75. 2002) belong here.

Variation is evident in the pubescence of rachises, pedicels, bracts, bracteoles, and calyces among plants of *Andrographis laxiflora*. These structures may be glabrous, have non-glandular trichomes only, have gland-tipped trichomes only, or have a mixture of gland-tipped and non-glandular trichomes. Capsule may be glabrous or pubescent with gland-tipped trichomes only. Plants with gland-tipped trichomes on the calyces and capsules have been treated as *A. laxiflora* var. *glomeruliflora* (C. C. Hu, FRPS 70: 205. 2002). Because varying degrees of pubescence are evident on calyces and capsules among specimens from within and outside of China, and because these same differences are not taxonomically recognized for plants of *A. paniculata* that show the very same variations, var. *glomeruliflora* is not recognized here (in keeping with B. Hansen, Nordic J. Bot. 5: 353–356. 1985, who did not recognize it as distinct).

### 34. PHLOGACANTHUS Nees in Wallich, Pl. Asiat. Rar. 3: 76, 99. 1832.

火焰花属 huó yán huā shù

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Herbs, shrubs, or small trees, with cystoliths. Leaves opposite; leaf blade large, margin entire or obscurely crenate. Inflores-

cences in terminal thyrses or axillary cymes, pedunculate; bracts small; bracteoles small or absent. Calyx deeply 5-lobed; lobes equal to unequal. Corolla tubular, slightly curved (arched); limb subequally 5-lobed or 2-lipped; lower lip 3-lobed, lobes ascending cochlear in bud; upper lip 2-cleft. Stamens 2, inserted at middle or basal portion of tube, included or sometimes slightly exerted beyond corolla lip; anthers 2-theous; thecae equal, base divaricate and mucous; staminodes 2, small. Ovary usually glabrous; stigma subentire. Capsule linear, 4-angled, basal portion solid but lacking a conspicuous basal stalk; retinacula present, 8–16-seeded. Seeds lenticular, glabrous or pubescent.

About 15 species: mainland Asia; two species in China.

- 1a. Inflorescences terminal thyrses, 14–18 cm; corolla purplish red, 4.5–5 cm; anthers not extending beyond corolla lips; capsule 3.5–5 cm ..... 1. *P. curviflorus*  
 1b. Inflorescences axillary cymes, ca. 4 cm; corolla orange, ca. 1.8 cm; anthers extending beyond corolla lips; capsule 2.5–3 cm ..... 2. *P. pubinervius*

**1. *Phlogacanthus curviflorus*** (Wallich) Nees in Wallich, Pl. Asiat. Rar. 3: 99. 1832.

火焰花 huó yān huā

*Justicia curviflora* Wallich, Pl. Asiat. Rar. 2: 9. 1831.

Shrubs 3–6 m tall. Petiole 1.5–5 cm; leaf blade elliptic to oblong, 12–35 × 9–18 cm, abaxially puberulent along veins, adaxially glabrous, secondary veins 12–17 on each side of midvein, base broadly cuneate and decurrent onto petiole, margin entire to subcrenate, apex acute to acuminate. Thyrses terminal, 14–18 × 6–8 cm; cymes (1–)3–5-flowered. Pedicel 5–12 mm, densely tomentose; bracts subulate to lanceolate, 3–7 mm; bracteoles subulate 2–3 mm. Calyx 6–11 mm; lobes subulate to lanceolate, subequal, outside sparsely pubescent, inside densely brown tomentose. Corolla purplish red, 4.5–5 cm, outside densely brownish pubescent and sometimes including gland-tipped trichomes; tube ca. 4.2 cm; lower lip 3-lobed, lobes oblong and ca. 2 × 1.5 mm; upper lip 2-cleft. Stamens slightly exerted; filaments glabrous; anther thecae ellipsoid, 5–5.5 mm, not extending beyond corolla lips; staminodes 2, small. Ovary and style glabrous. Capsule 3.5–5 cm, 8–10-seeded. Seeds 5.5–6.3 × 4.2–4.5 mm, pubescent. Fl. Oct–Feb, fr. Feb–May.

Thickets, forest margins, ravines; 400–1600 m. Xizang, Yunnan [Bhutan, India, Laos, Myanmar, Thailand, Vietnam].

**2. *Phlogacanthus pubinervius*** T. Anderson, J. Linn. Soc., Bot. 9: 508. 1867.

毛脉火焰花 mǎo mài huó yān huā

*Aeschynanthus dunnii* H. Léveillé; *Lonicera menelii* H. Léveillé.

Shrubs or small trees, to 5 m tall, much branched. Petiole 0.5–2 cm; leaf blade elliptic-oblong to oblong, (5–)8–18 × (1–)3.5–5 cm, abaxially puberulent along veins, adaxially scabrous, secondary veins 5–7 on each side of midvein, base attenuate, margin undulate, apex acuminate to long acuminate. Cymes axillary, 1–4-flowered; peduncle 0.8–1.6 cm, 4-angled, pubescent; bracts small, caducous; bracteoles subulate, ca. 3 × 1 mm, caducous. Pedicel 0.8–1.5 cm. Calyx 7–8 mm; lobes linear-lanceolate, unequal, outside pubescent, inside gray tomentose. Corolla orange, ca. 1.8 cm, outside pubescent; tube ca. 1.3 cm, slightly curved; lower lip deeply 3-lobed, lobes ovate; upper lip 2-cleft. Stamens much exerted; filaments ca. 2.5 cm, glabrous; anther thecae oblong, parallel, extending beyond corolla lips; staminodes 2, small. Ovary glabrous; style ca. 2 cm, glabrous. Capsule 2.5–3 cm, glabrous, 8-seeded.

Forests, thickets; 700–1500 m. Guangxi, Guizhou, Yunnan [Bhutan, India, Myanmar].

### 35. CYSTACANTHUS T. Anderson, J. Linn. Soc., Bot. 9: 457. 1867.

鳔冠花属 biāo guān huā shù

Hu Jiaqi (胡嘉琪 Hu Chia-chi), Deng Yunfei (邓云飞); Thomas F. Daniel

Shrubs or perennial herbs, with cystoliths. Leaf blade margin entire or obscurely crenate. Inflorescences thyrses or rarely axillary cymes or racemes; bracteoles 2, small. Calyx deeply 5-lobed; lobes usually covered with gland-tipped trichomes. Corolla orange or pink, funnel-shaped, usually bent ca. 90° and abruptly inflated near middle; limb 2-lipped; lower lip 3-lobed, lobes orbicular or ovate and equal; upper lip 2-lobed; lobes ascending cochlear in bud. Stamens 2, included; anthers 2-theous; thecae parallel, equal, hirsute, mucous at base; staminodes 2. Ovary ovoid, long hirsute; style filiform; stigma 2-cleft. Capsule cylindric, 8–12-seeded; retinacula present. Seeds ovate in outline, compressed, tomentose.

About 15 species: mainland Asia; eight species (three endemic) in China.

Five of the Chinese species treated here in *Cystacanthus* have also been treated in *Phlogacanthus*. In addition to the macromorphological characteristics (geniculate corolla with an inflated throat in *Cystacanthus*) distinguishing *Cystacanthus* and *Phlogacanthus*, R. W. Scotland (Rev. Palaeobot. Palynol. 72: 229–243. 1992) discussed palynological differences between them in ornamentation of the aperture margins (i.e., aperture margins with spines ± restricted to a single row in *Phlogacanthus* and with the spines throughout the aperture margin in *Cystacanthus*). A thorough reevaluation of taxa treated in these two genera will be necessary to determine whether both genera are worthy of recognition and if so, to which genus each species pertains.

- 1a. Corolla outside pubescent with gland-tipped trichomes.  
 2a. Thyrses to 2.5 cm, 3- or 4-flowered ..... 1. *C. affinis*  
 2b. Thyrses longer than 5 cm, many flowered.  
 3a. Corolla purple; leaf blade oblong to oblong-lanceolate ..... 2. *C. paniculatus*  
 3b. Corolla blue, red, white, or purplish blue; leaf blade ovate to ovate-lanceolate.  
 4a. Young stems pubescent but not densely whitish or yellowish brown villous ..... 3. *C. yangtsekiangensis*  
 4b. Young stems densely whitish to yellowish brown villous ..... 4. *C. yunnanensis*  
 1b. Corolla outside glabrous or non-glandular pubescent.  
 5a. Bracts leaflike, much longer than calyx; corolla glabrous outside ..... 5. *C. pyramidalis*  
 5b. Bracts small and not leaflike, subequal to calyx; corolla pubescent outside.  
 6a. Leaf blade secondary veins ca. 6 on each side of midvein ..... 6. *C. abbreviatus*  
 6b. Leaf blade secondary veins 9–17 on each side of midvein.  
 7a. Leaf blade secondary veins 9–11 on each side of midvein; inflorescences spikelike thyrses; rachis with 1 flower per node; calyx ca. 6 mm; corolla densely pubescent outside ..... 7. *C. vitellinus*  
 7b. Leaf blade secondary veins 12–17 on each side of midvein; inflorescences paniculate thyrses; rachis with several flowers per node; calyx ca. 3 mm; corolla sparsely pubescent outside ..... 8. *C. colaniae*

**1. *Cystacanthus affinis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 103. 1916.

丽江鳔冠花 *li jiang biao guan hua*

Shrubs to 2 m tall. Stems terete. Petiole 5–10 mm; leaf blade oblong to ovate, 2.5–6 × 1.5–3 cm, both surfaces pubescent, secondary veins 5 or 6 on each side of midvein, base cuneate, margin entire, apex acuminate. Thyrses terminal, to 2.5 cm, 3- or 4-flowered; bracts oblong-lanceolate, shorter than calyx, gland-tipped pubescent, caducous; bracteoles similar to bracts. Pedicel ca. 3 mm, gland-tipped pubescent. Calyx 1.5–2 cm, outside pubescent with gland-tipped trichomes; lobes linear, ca. 1 mm wide, apex acute. Corolla yellow outside and light yellow inside with purplish striae, 3.5–4 cm; lobes ovate, to 1.5 cm. Stamens slightly exerted; filaments barbate; anther thecae to 1 mm, connective barbate; staminodes ca. 2 mm. Ovary ca. 5 mm; style ca. 2 cm, glabrous; stigma slightly 2-cleft. Capsule light yellow, ca. 2 cm, glabrous, 6-seeded. Seeds ovate in outline, ca. 3 × 3 mm.

• Thickets, streamsides, trailsides; 1700–2200 m. Sichuan, Xizang, Yunnan.

**2. *Cystacanthus paniculatus*** T. Anderson, J. Linn. Soc., Bot. 9: 458. 1867.

鳔冠花 *biao guan hua*

*Phlogacanthus paniculatus* (T. Anderson) J. B. Imlay.

Shrubs to 2 m tall. Stems 4-angled, glabrous; young branches winged. Petiole 1–1.5 cm; leaf blade oblong to oblong-lanceolate, 10–12 × 2.5–4 cm, abaxially pubescent along veins, adaxially glabrous, base attenuate and decurrent onto petiole, margin undulate to crenulate, apex acuminate. Thyrses terminal, to 18 cm, many flowered; rachis densely villous with gland-tipped trichomes; bracts oblong-lanceolate, shorter than calyx, gland-tipped pubescent, caducous; bracteoles similar to bracts. Pedicel 2–4 mm, gland-tipped pubescent. Calyx 1.2–1.4 cm, gland-tipped pubescent; lobes lanceolate. Corolla light purple, 2–2.4 cm, ventricose, outside gland-tipped pubescent, inside glabrous; lower lip with lobes orbicular, subequal, patent. Stamens included; filaments barbate; anther thecae ca. 1 mm,

connective barbate; staminodes very small. Ovary pubescent, with 4 ovules per locule; style 1.6–2 cm, glabrous; stigma slightly 2-cleft. Capsule grayish brown, clavate, ca. 2.3 cm, pubescent, 8-seeded. Seeds ovate in outline, ca. 3.5 × 3.5 mm.

Forests; 300–2100 m. Yunnan [Myanmar].

**3. *Cystacanthus yangtsekiangensis*** (H. Léveillé) Rehder, J. Arnold Arbor. 16: 315. 1935.

金江鳔冠花 *jin jiang biao guan hua*

*Strobilanthes yangtsekiangensis* H. Léveillé, Cat. Pl. Yunnan, 6. 1915.

Shrubs to 1 m tall. Stems subterete, striate, pubescent. Petiole 3–7 mm, pubescent; leaf blade ovate, ca. 3.5 × 1.5 cm, both surfaces pubescent and glaucous, secondary veins 10–12 on each side of midvein, base cuneate, margin entire, apex acute. Thyrses terminal or axillary, racemose, secund, to 7 cm; bracts linear-lanceolate, 5–8 mm, densely gland-tipped villous; bracteoles similar to bracts. Pedicel 2–4 mm, gland-tipped pubescent. Calyx 7–10 mm; lobes linear, densely yellowish pubescent. Corolla blue or red, campanulate, ca. 2.5 × 1.2–1.3 cm, ventricose and curved; tube basally ca. 5 mm wide and short; lobes broadly triangular, apex obtuse. Stamens included; filaments barbate; anther thecae ovoid, connective barbate with yellowish brown trichomes; staminodes ca. 2 mm. Ovary pubescent; style ca. 2 cm, glabrous; stigma slightly 2-cleft. Capsule and seeds not seen.

• 400–500 m. Yunnan.

**4. *Cystacanthus yunnanensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 104. 1916.

滇鳔冠花 *dian biao guan hua*

Shrubs 1–1.5 m tall, erect. Stems subterete or slightly 4-angled, densely whitish or yellowish brown villous. Petiole 0.5–1.5 cm; leaf blade ovate to ovate-lanceolate, 5–10 × 3–4 cm, abaxially white villous, adaxially densely yellowish villous, secondary veins ca. 6 on each side of midvein, base attenuate, margin entire, apex acuminate to acute. Thyrses paniculate, to 15 cm; bracts linear-lanceolate, 5–10 mm, densely gland-tipped

villous; bracteoles similar to bracts. Pedicel 1–2 mm, gland-tipped villous. Calyx ca. 1.5 cm, outside densely gland-tipped villous, inside slightly villous; lobes linear, ca.  $13 \times 2$  mm, subequal, apex acute. Corolla white or purplish blue and with a whitish base, 3–3.5 cm, ventricose, incurved, outside gland-tipped pubescent; tube basally ca. 1.5 mm wide and very short then wide at middle; lobes orbicular, ca.  $10 \times 7$  mm, unequal with anterior one longer. Stamens 2; filaments ca. 1.5 cm, basally pilose; anther thecae oblong, ca. 6 mm, connective barbate; staminodes filiform, ca. 2 mm. Ovary ca. 4 mm, villous, with 6 ovules per locule; style ca. 2 mm, sparsely villous; stigma minutely 2-dentate. Capsule ca. 3.5 cm, ca. 5 mm wide, gland-tipped villous. Seeds disciform,  $2-3 \times 2-3$  mm, puberulent.

• Forests; 800–1600 m. Yunnan.

**5. *Cystacanthus pyramidalis*** Benoist, Bull. Soc. Bot. France 74: 907. 1928.

金塔火焰花 jin ta huo yan hua

*Phlogacanthus pyramidalis* (Benoist) Benoist.

Herbs to 1 m tall, perennial. Stems 4-angled, glabrous. Petiole ca. 2.5 cm; leaf blade elliptic to elliptic-ovate,  $9-23 \times 5.5-10$  cm, abaxially glabrous or pubescent along veins, adaxially glabrous, secondary veins 8–10 on each side of midvein, base cuneate and decurrent onto petiole, margin entire, apex acute to shortly acuminate. Thyrses terminal, to 26 cm; cymes 3-flowered; peduncle 1–3 mm, pubescent; bracts leaflike, ovate to lanceolate,  $0.6-3 \times 0.3-1.2$  cm, diminished in size apically on inflorescence, pubescent; bracteoles subulate, ca. 1 mm. Pedicel 3–5 mm. Calyx ca. 3.5 mm, glabrous or sparsely pubescent; lobes equal, linear, apex acuminate to acute. Corolla light purplish red, ca. 1 cm, bent to  $90^\circ$  and abruptly inflated at middle, glabrous; lobes ovate, ca.  $2 \times 1.5$  mm. Stamens 2; filaments ca. 0.8 cm, glabrous; anther thecae ovoid, ca. 1.5 mm, connective hirsute; staminodes ca. 2 mm. Ovary glabrous; style ca. 1 cm, glabrous; stigma slightly 2-cleft. Capsule clavate, ca. 2.2 cm, 4-angled, 8-seeded. Seeds ca.  $2 \times 2$  mm, compressed.

Forests. Hainan [Vietnam].

**6. *Cystacanthus abbreviatus*** Craib, Bull. Misc. Inform. Kew 1911: 438. 1911.

缩序火焰花 suo xu huo yan hua

*Phlogacanthus abbreviatus* (Craib) Benoist.

Shrubs to 1 m tall. Stems green, terete or 4-angled, slightly pubescent. Petiole 1.5–3.5 cm; leaf blade oblanceolate to ovate-lanceolate, ca.  $15 \times 5$  cm, abaxially slightly pubescent along veins, adaxially glabrous, secondary veins ca. 6 on each side of midvein, base narrowly attenuate, margin entire, apex shortly acuminate. Thyrses terminal, 8–12 cm; bracts minute, caducous; bracteoles subulate. Pedicel ca. 3 mm. Calyx ca. 8 mm; lobes linear-lanceolate, outside appressed strigose, margin sparsely gland-tipped ciliate, apex obtuse. Corolla purple, ca. 1.5 cm, bent to  $90^\circ$  and abruptly inflated at middle. Stamens included; filaments ca. 1.2 cm, hirsute at base; anther thecae ob-

long, connective gland-tipped hirsute; staminodes 2. Ovary ca. 2 mm, glabrous; style ca. 1 cm, glabrous; stigma slightly 2-cleft. Capsule and seeds not seen.

Yunnan [Vietnam].

**7. *Cystacanthus vitellinus*** (Roxburgh) Y. F. Deng, **comb. nov.**

糙叶火焰花 cao ye huo yan hua

Basionym: *Justicia vitellina* Roxburgh, Fl. Ind. 1: 117. 1820; *Endopogon vitellinus* (Roxburgh) Nees; *J. asperula* (Nees) G. Loddiges; *Phlogacanthus asperulus* Nees; *P. vitellinus* (Roxburgh) T. Anderson; *Sphinctacanthus siamensis* C. B. Clarke.

Shrubs to 1.5 m tall. Stems terete, glabrous. Petiole 1–5 cm; leaf blade broadly ovate to oblong-lanceolate,  $10-30 \times 6-11$  cm, abaxially slightly pubescent or glabrescent, adaxially glabrous or slightly pubescent, secondary veins 9–11 on each side of midvein, base attenuate and decurrent onto petiole, margin slightly undulate, apex acute to acuminate. Thyrses 10–20 cm; bracts minute; bracteoles linear, ca.  $1.5 \times 0.5$  mm, pubescent. Pedicel 1–3 mm. Calyx ca. 6 mm, pubescent; lobes linear-lanceolate. Corolla purplish red or white, 1.2–1.8 cm, bent to  $90^\circ$  and abruptly inflated at middle, outside pubescent. Stamens ca. 1 cm; filaments hirsute at base; anther thecae oblong, ca. 2 mm, connective glabrous; staminodes very small. Ovary glabrous; style 1–1.5 cm, glabrous; stigma slightly 2-cleft. Capsule clavate, ca. 2 cm, 8-seeded. Seeds ovate in outline, ca.  $2.5 \times 2$  mm.

Forests; 200–1100 m. Yunnan [Bhutan, India, Myanmar].

**8. *Cystacanthus colaniae*** (Benoist) Y. F. Deng, **comb. nov.**

广西火焰花 guang xi huo yan hua

Basionym: *Phlogacanthus colaniae* Benoist, Notul. Syst. (Paris) 5: 109. 1936.

Shrubs to 1 m tall. Stems terete, pubescent, soon glabrescent. Petiole 1–5 cm, puberulent; leaf blade ovate to ovate-lanceolate,  $(5-12-30 \times (2-5)-12$  cm, abaxially slightly pubescent, adaxially glabrous or puberulent along veins, secondary veins 8–17 on each side of midvein, base shortly attenuate, margin entire or slightly crenate, apex shortly acuminate. Thyrses 10–20 cm; cymes few flowered; bracts triangular,  $1.5-2 \times 0.7-1$  mm, pubescent; bracteoles linear, ca.  $1 \times 0.5$  mm, pubescent. Pedicel 1–2 mm, pubescent. Calyx ca. 3 mm, pubescent; lobes linear. Corolla ca. 1.2 cm, ventricose, bent to  $90^\circ$  and abruptly inflated at middle, outside slightly grayish white pubescent, inside pubescent on lobes; lobes oblong-ovate, ca.  $5 \times 3$  mm, unequal, apex acute. Stamens 2; filaments hirsute at base, ca. 6 mm; anther thecae oblong, ca. 2 mm, connective black and glabrous; staminodes filiform, very short, hirsute. Ovary oblong, ca. 2 mm, glabrous; style ca. 8 mm, glabrous; stigma slightly 2-cleft. Capsule 1.8–2 cm, glabrous. Seeds ovate in outline, ca.  $2.5 \times 2$  mm.

Limestone hills; 200–500 m. Guangxi, Hainan, Yunnan [Vietnam].

## CARLEMANNIACEAE

香茜科 xiang qian ke

Chen Tao (陈涛)<sup>1</sup>; Anthony R. Brach<sup>2</sup>

Perennial herbs, shrubs, or subshrubs, often somewhat fleshy; stems with interpetiolar line. Leaves opposite, petiolate, simple, estipulate, ± asymmetric, dentate or crenate-serrate. Flowers bisexual, slightly zygomorphic, in terminal or axillary cymes or corymbs, sometimes heterostylous. Calyx tube adnate to ovary, 4- or 5-lobed; lobes ± unequal. Corolla 4- or 5-lobed; lobes imbricate or induplicate-valvate. Stamens 2, inserted at middle of corolla tube; filaments short; anthers linear-oblong, opening laterally by slits, connivent around style. Disk well developed, conical or cylindrical. Ovary inferior, 2-loculed, each locule with ovules many (30–100) in axile to basal placentation. Fruit a 2-loculed, dry or fleshy capsule, 2- or 5-valvate; calyx lobes persistent. Seeds many (30–100), ovoid, smooth, with endosperm ± fleshy.

Two genera and five species: tropical Asia; two genera and three species in China.

Although previously treated in FRPS within the Rubiaceae, the Carlemanniaceae is treated separately here (see APG, Ann. Missouri Bot. Gard. 85: 531–553. 1998; M. Thiv in Kubitzki, Fam. Gen. Vasc. Pl. 7: 57–59. 2004). It has also been included by various authors in the Caprifoliaceae.

Herein, the term “calyx tube” refers to the ovary plus the tubular free portion of the calyx limb, but not including the calyx lobes when these are present.

Lo Hsienshui. 1999. *Carlemannia* and *Silvianthus*. In: Lo Hsienshui, ed., Fl. Reipubl. Popularis Sin. 71(1): 175–179.

- 1a. Herbs; leaves distinctly crenate-serrate; flowers 4-merous, arranged in loose corymbose inflorescences; calyx lobes imbricate; fruit a 2-valved dry capsule ..... 1. *Carlemannia*  
1b. Shrubs; leaves often slightly irregular and shallowly dentate; flowers 4- or 5-merous, congested in dense subglobose inflorescence; calyx lobes induplicate-valvate; fruit a 5-valved fleshy capsule ..... 2. *Silvianthus*

### 1. CARLEMANNIA Benthams, Hooker's J. Bot. Kew Gard. Misc. 5: 308. 1853.

香茜属 xiang qian shu

Herbs perennial. Leaf margin crenate-serrate. Inflorescence corymbose, lax, terminal, long pedunculate. Flowers 4-merous, minute. Calyx tube subglobose; lobes spreading, small. Corolla narrowly funnelform; lobes imbricate. Anthers linear-oblong; pollen grains 5- or 6-colpate. Ovary with placentas ascending from inner base of each locule; style prolonged; stigma clavate or fusiform, 2-lobed. Fruit a 2-valved dry capsule.

Three species: China, E Himalaya, NE India, Indonesia (Sumatra), Myanmar, N Thailand, Vietnam; one species in China.

1. *Carlemannia tetragona* J. D. Hooker, Fl. Brit. India 3: 85. 1880.

香茜 xiang qian

*Carlemannia henryi* H. Léveillé.

Plants 0.5–1.5 m tall, fragrant when dry. Stems often with lower part prostrate and rooting at nodes; young branches quadrangular, sulcate, pubescent or subglabrous; old branches terete, glabrous. Petiole 2–4 cm or slightly longer, puberulent; leaf blade elliptic or ovate, often inequilateral, 3–10(–15) × 2–5(–8) cm, drying thinly papery or membranous, lateral veins 4–

7 pairs, slender, both surfaces sparsely pilose, base shortly decurrent, margin distinctly serrate, apex often caudate. Cymes corymbose, 2–4 cm, pubescent; peduncles and branches slender; bracts linear, 2–2.5 mm, apex obtuse. Pedicel 1–2.5 mm. Calyx lobes linear, 1–2 mm. Corolla white except yellow speckled in throat, shorter than 1 cm, outside pilose, inside villous. Capsule broadly pyramidal, 3.5–4.5 mm in diam., wider than long, base truncate, apex contracted, stellate-dehiscent into 4 valves; valves with linear persistent calyx lobes. Seeds reticular striate. Fl. Jun–Sep, fr. Oct–Dec.

Dense forests especially in moist ravines; 600–1500 m. Xizang, Yunnan [NE India, Indonesia (Sumatra), Myanmar, N Thailand].

### 2. SILVIANTHUS J. D. Hooker, Hooker's Icon. Pl. 11: 36. 1868.

蜘蛛花属 zhi zhu hua shu

*Quiducia* Gagnepain.

Shrubs or subshrubs; stems hollow. Leaf margin shallowly dentate. Inflorescence a cyme, usually axillary, many flowered, dense, compact, headlike, shortly pedunculate or sessile. Flowers heterostylous. Corolla broadly funnelform, (4 or) 5-lobed; lobes

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induplicate-valvate. Anthers dorsifixed near base, oblong; pollen grains 3-colpate. Disk ridged. Ovary with placentas at middle of septum; style prolonged; stigma oblong-fusiform. Fruit a 5-valved, slightly fleshy capsule. Seeds ovoid-oblong, slightly curved; testa spongy, longitudinally striate.

Two species: China, NE India, Laos, Myanmar, N Thailand, N Vietnam; two species in China.

- 1a. Calyx lobes relatively large, oblong to spatulate; corolla white; leaf blade drying membranous ..... 1. *S. bracteatus*  
 1b. Calyx lobes relatively smaller, linear; corolla yellow or red; leaf blade drying papery ..... 2. *S. tonkinensis*

**1. *Silvianthus bracteatus*** J. D. Hooker, Hooker's Icon. Pl. 11: 36. 1868.

蜘蛛花 zhi zhu hua

Shrubs, 0.5–1 m tall. Stems brown, subterete, slightly stout, ca. 3 mm in diam., herbaceous, glabrous. Petiole 2–7 cm, slender, flattened, glabrous; leaf blade abaxially pale green, adaxially green, elliptic, 17–25 × 7.5–10.5 cm, drying membranous, midvein slender, prominent on both surfaces, lateral veins ca. 10 pairs, arcuate-ascending, distinct on both surfaces, both surfaces glabrous, base cuneate, decurrent to petiole, margin irregular, shallowly wavy-dentate, apex shortly acuminate. Cymes axillary or terminal, shortly pedunculate or sessile, glabrous or papillose-puberulent; bracts oblong, ca. 5 × 3 cm, apex obtuse. Pedicel ca. 2 mm, puberulent. Calyx tube obconical, 2–3 mm in length and width; lobes subequal, oblong to spatulate, 7–10 × (2.5–)3(–6) mm, apex acute. Corolla white, funnelform-campanulate, ca. 1.2 cm, throat slightly expanded; lobes suborbicular, valvate. Stamens included. Style long, included. Capsule pinkish, subglobose, 6–7 × 6–7 mm, subfleshy, dehiscing down from calyx lobes into 5 valves. Seeds many. Fl. spring, fr. autumn.

Forests; 700–900 m. Yunnan [NE India, Myanmar].

**2. *Silvianthus tonkinensis*** (Gagnepain) Ridsdale, Blumea 24: 42. 1978.

线萼蜘蛛花 xian e zhi zhu hua

*Quiducia tonkinensis* Gagnepain, Bull. Soc. Bot. France

95: 33. 1948; *Silvianthus bracteatus* J. D. Hooker subsp. *clerodendroides* (Airy Shaw) H. W. Li; *S. bracteatus* subsp. *tonkinensis* (Gagnepain) H. W. Li; *S. clerodendroides* Airy Shaw.

Subshrubs, 1–2(–4) m tall, glabrous. Stems terete. Petiole 1–4(–7) mm, rugose when dry; leaf blade elliptic, ovate-elliptic, or sometimes broadly elliptic, large, (10–)15–25(–30) × 5–20 cm, drying papery, lateral veins (9 or)10(–16) pairs, joining in an intramarginal vein, slightly prominent on both surfaces when dry, base usually broadly cuneate, rarely slightly obtuse, or slightly decurrent, margin often shallowly dentate-incised, apex acute to shortly acuminate. Cymes 1–4 cm in diam.; peduncles usually shorter than 1 cm, sometimes to 5 cm; bracts linear, 4–6 mm. Flowers heterostylous. Pedicel ca. 3 mm. Calyx tube obconical, 2–3 mm; lobes linear, 9–11 × 1–1.5 mm, longitudinally veined, often obtuse. Corolla usually yellow or pale red, occasionally purplish red (based on literature); tube 1.2–1.3 cm, throat slightly expanded, outside glabrous, inside with soft hairs; lobes orbicular, 5–6 mm, inside papillose. Stamens inserted near middle of corolla tube; anthers ca. 4.5 mm. Style ca. 1.1 cm. Capsule purple at maturity, obconical, 6–9 mm in diam. Seeds black, 3–3.5 mm, white aciculate striate-rugose. Fl. Mar–Jul, fr. Oct–Dec.

Forests in valleys, stream-sides in evergreen hillside forests; 900–1500 m. Yunnan [Laos, N Thailand, N Vietnam].

This species was confused with *Silvianthus bracteatus* by some authors.

## LENTIBULARIACEAE

狸藻科 li zao ke

Li Zhenyu (李振宇)<sup>1</sup>; Martin R. Cheek<sup>2</sup>

Herbs, perennial or annual, carnivorous, terrestrial, epiphytic, or aquatic. Roots present or absent. Stems often (*Utricularia*) modified into rhizoids, stolons, or rhizomes, rarely developed. Traps (bladders) on rhizoids, stolons, or leaves present in *Utricularia* but absent in *Pinguicula*. Stipules absent. Leaves alternate or in a basal rosette, simple or variously divided. Inflorescences usually racemes or reduced to a solitary flower; peduncle erect to twining. Flowers  $\pm$  zygomorphic. Calyx 2–5-lobed or -parted; lobes imbricate, persistent. Corolla gamopetalous, tube short, limb 2-lipped or equally 5-lobed; lower lip entire or 2- or 3(–6)-lobed, lobes imbricate; upper lip entire or 2- or 3-lobed; spur subulate, cylindric, conic, or saccate. Stamens 2, inserted at base of corolla tube, included; filaments linear, short, curved or straight; anthers dorsifixed, ellipsoid; thecae 2, divaricate, confluent or (in *Utricularia*) sometimes distinct and  $\pm$  separated by a connective; staminodes absent. Disk absent. Carpels 2, connate; ovary superior, 1-locular; placenta free-central or basal; ovules 2 to numerous, anatropous, somewhat sunken into placenta; style 1 or absent; stigma 2-lipped, upper lip reduced or obsolete. Fruit usually a capsule, loculicidal, circumscissile, or rarely indehiscent. Seeds few, numerous, or rarely 1 per capsule, minute, without endosperm.

Three genera and ca. 290 species: cosmopolitan but mostly in tropical regions; two genera and 27 species (four endemic) in China.

Li Zhenyu. 1990. Lentibulariaceae. In: Wang Wentsai, ed., Fl. Reipubl. Popularis Sin. 69: 582–605.

- 1a. Leaves with margin usually involute, adaxially with viscid glands; traps absent; calyx 5-parted; corolla open at throat ..... 1. *Pinguicula*  
1b. Leaves with margin not involute, adaxially without viscid glands; traps present; calyx 2(–4)-parted; corolla with variously raised palate at throat ..... 2. *Utricularia*

### 1. PINGUICULA Linnaeus, Sp. Pl. 1: 17. 1753.

捕虫堇属 bu chong jin shu

Herbs, perennial [or annual], terrestrial [epilithic or epiphytic], rhizomatous, without rhizoids, stolons, or traps. Roots fibrous. Leaves in a basal rosette, simple, petiolate or sessile, soft and fleshy; leaf blade adaxially usually with numerous viscid glands, veins pinnate, margin entire and usually involute. Inflorescences with a solitary flower, rarely a 2- or 3-flowered raceme, without scales, bracts, or bracteoles. Calyx 2-lipped; lower lip 2-lobed; upper lip 3-lobed. Corolla open at throat, palate of lower lip not raised; lower lip larger than upper lip, spurred, 3-lobed, middle lobe larger; upper lip 2-lobed. Capsule loculicidal, opening by 2 valves. Seeds many per capsule.

About 55 species; N temperate regions, most diverse in Central America, extending S to Patagonia; two species in China.

- 1a. Roots 0.4–1 mm thick; leaf blade 1–4 cm; pedicel and calyx glabrous; corolla 9–20 mm, white but spur yellowish .... 1. *P. alpina*  
1b. Roots 0.1–0.2 mm thick; leaf blade 0.5–1 cm; pedicel and calyx glandular pilose; corolla 6–9 mm, pale violet including spur ..... 2. *P. villosa*

#### 1. *Pinguicula alpina* Linnaeus, Sp. Pl. 1: 17. 1753.

高山捕虫堇 gao shan bu chong jin

Herbs, perennial, overwintering by a resting bud; bud ovoid, ca. 1 cm. Roots numerous, 0.4–1 mm thick. Leaves shortly petiolate; leaf blade pale green, elliptic-oblong to lanceolate-oblong, 1–4.5  $\times$  0.5–1.7 cm, abaxially glabrous, secondary veins 5–7 on each side of midvein, base broadly cuneate, margin involute, apex obtuse to rounded. Flowers 1–5, from generative (spring) rosette. Pedicel 2.5–13 cm  $\times$  0.4–1.2 mm, glabrous, apical part enlarged in fruit. Calyx parted from base into 2 lips, glabrous; lower lip 1–2.5 mm, 2-lobed, lobes obovate; upper lip 2–4 mm, 3-lobed, lobes triangular-ovate. Corolla mostly white with 1 or more yellow spots on palate, 0.9–2 cm; tube shortly funnelform-tubular, 3–7 mm, outside glabrous, inside puberulent; spur yellowish, cylindric, straight,

$\pm$  as long as corolla tube, apex rounded; lobes of lower lip circular to broadly ovate, apex rounded to obtuse; lobes of upper lip broadly ovate to suborbicular, apex obtuse. Filaments curved, 1.4–1.6 mm; anther thecae confluent. Ovary globose, ca. 1.5 mm in diam.; style short but distinct; stigma lower lip circular and ciliate, upper lip deltoid. Capsule ovoid-oblong, 5–7 mm, glabrous. Seeds narrowly ellipsoid, 0.6–0.8 mm; seed coat with small prominent elongate reticulations. Fl. May–Jul, fr. Jul–Sep.  $2n = 32$ .

Bogs and wet places on mountains; 1800–4500 m. Chongqing, Gansu, NE Guizhou, W Hubei, E Qinghai, S Shaanxi, Sichuan, S and SE Xizang, NW Yunnan [Bhutan, N India, Kashmir, Mongolia, N Myanmar, Nepal, Russia; Europe].

The report of *Pinguicula vulgaris* Linnaeus from Shaanxi (Iconogr. Cormophyt. Sin. 4: 148. 1975) is in fact *P. alpina*.

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**2. *Pinguicula villosa* Linnaeus, Sp. Pl. 1: 17. 1753.**北捕虫堇 *bei bu chong jin*

Herbs, perennial, overwintering by a resting bud. Roots numerous, 0.1–0.2 mm thick. Leaves shortly petiolate; leaf blade pale green, elliptic to broadly elliptic, 5–10(–15) × 4–8 mm, abaxially glabrous, secondary veins 4 or 5 on each side of midvein, base broadly cuneate, margin strongly involute, apex rounded. Flowers 1 or 2, from generative rosette. Pedicel 2.5–8 × 0.4–1 mm, glandular pilose. Calyx parted from base into 2 lips, outside glandular pilose, inside glabrous; lower lip 2-lobed, 0.5–1 mm, lobes ovate-lanceolate; upper lip 3-lobed, 1–2 mm, lobes ovate-lanceolate. Corolla pale violet with yellow

stripes in throat, 6–9 mm; tube shortly funnellform-tubular, 2.5–3 mm, outside glabrous, inside sparsely puberulent; spur cylindrical-conic, straight, longer than corolla tube, apex rounded; lobes of lower lip oblong, apex obtuse to truncate; lobes of upper lip oblong, apex obtuse. Filaments curved, 1–1.2 mm; anther thecae confluent. Ovary globose, 1.2–1.5 mm in diam.; style short; stigma lower lip semicircular and ciliate, upper lip obtuse. Capsule obovoid, 5–6 mm, glabrous. Seeds narrowly ellipsoid; seed coat with small prominent elongate reticulations. Fl. Jun–Aug, fr. Aug–Oct.  $2n = 16$ .

Sphagnum bogs. NE Nei Mongol [Japan, Russia (Far East, Siberia); N Europe, North America].

**2. *UTRICULARIA* Linnaeus, Sp. Pl. 1: 18. 1753.**狸藻属 *li zao shu*

*Calpidisca* Barnhart; *Diurospermum* Edgeworth; *Lentibularia* Séguier; *Megozipa* Rafinesque; *Meloneura* Rafinesque; *Nelipus* Rafinesque; *Vesiculina* Rafinesque; *Xananthes* Rafinesque.

Herbs, perennial or annual, terrestrial, epiphytic, or aquatic, without true roots. Stems modified into rhizoids and stolons, rarely developed. Traps on rhizoids, stolons, and/or leaves, small, bladderlike. Leaves alternate or in a basal rosette, simple to many × divided, veins 1–3, unbranched, dichotomously branched, or pinnately branched. Inflorescences racemose or flowers solitary, pedunculate, usually simple, seldom branched, erect to twining, bracteate; bracts and bracteole often present, scalelike, sometimes basiolute (with base extending below point of insertion). Calyx parted from base into 2 equal or unequal lobes, lobes sometimes apically 2-parted. Corolla lower lip larger than upper lip; lower lip entire or 2- or 3(–6)-lobed, spurred, palate variously raised; upper lip entire or 2- or 3-lobed. Anther thecae confluent or distinct. Capsule adaxially loculicidal, both abaxially and adaxially loculicidal, or circumscissile, rarely indehiscent. Seeds few, many, or rarely 1 per capsule, variously appendaged.

About 220 species: cosmopolitan but mostly in tropical regions, a few in N temperate regions; 25 species (four endemic) in China.

This account is based largely on the work of P. Taylor (Kew Bull., Addit. Ser. 14: [i]–xi, 1–724. 1989), which should be consulted for a complete synonymy.

- 1a. Leaves divided into narrowly linear to capillary segments, ultimate segments (except *U. limosa*) bearing apical and often lateral solitary or fasciculate setulae; bracteoles absent; capsule globose or ellipsoid, not dorsiventrally compressed; seeds globose, lenticular, or prismatic.
- 2a. Scales not present on peduncle; persistent style often equaling or exceeding capsule ..... 25. *U. aurea*
- 2b. Scales present on peduncle; persistent style much less than 1/2 as long as capsule.
- 3a. Scales and bracts basiolute; corolla lilac, violet, or white.
- 4a. Lower corolla lip 2-lobed to ca. 1/2 its length; seeds globose, not winged; rhizoids present and capillary ..... 18. *U. limosa*
- 4b. Lower corolla lip rounded to retuse; seeds lenticular, with a broad dentate wing; rhizoids apparently absent ..... 19. *U. punctata*
- 3b. Scales and bracts basifixed; corolla yellow.
- 5a. Turions (overwintering buds) absent; corolla with a few short stipitate glands; capsule laterally 2-valvate; seeds lenticular, with a broadly irregular wing ..... 20. *U. gibba*
- 5b. Turions usually present; corolla without external stipitate glands; capsule circumscissile; seeds prismatic, (4 or) 5- or 6-angled (unknown for *U. intermedia*).
- 6a. Stolons all with green, many × divided leaves with traps, leaf segment capillary or slightly flattened.
- 7a. Margins of lower corolla lip deflexed; palate hairy; bracts ovate ..... 21. *U. vulgaris*
- 7b. Margins of lower corolla lip spreading; palate glabrous; bracts orbicular ..... 22. *U. australis*
- 6b. Stolons dimorphic, bearing either green leaves with narrowly linear segments with few or no traps or bearing colorless much reduced leaves with traps.
- 8a. Palate of lower corolla lip with a prominent rounded basal swelling; spur subulate, slightly shorter than lower corolla lip; rhizoids present and filiform ..... 23. *U. intermedia*
- 8b. Palate of lower corolla lip without a prominent rounded swelling but much elongate with a raised marginal rim; spur saccate to obtusely broadly conic, ca. 1/2 as long as lower corolla lip; rhizoids absent ..... 24. *U. minor*

- 1b. Leaves simple, orbicular to linear, glabrous, margin entire or rarely divided into broader lobes; bracteoles present; capsule globose, ovoid, or ellipsoid, often dorsiventrally compressed; seeds ovoid, obovoid, or ellipsoid, rarely globose.
- 9a. Bracts and bracteoles basifixed, attached just above to below middle.
- 10a. Leaves linear to narrowly obovate, vein 1; scales numerous; calyx lobes  $\pm$  equal in size, upper lobe shorter than upper corolla lip.
- 11a. Corolla violet, pink, or white, marked with yellow at throat, palate without hooked processes ..... 3. *U. caerulea*
- 11b. Corolla pale bluish purple, palate with hooked processes ..... 4. *U. warburgii*
- 10b. Leaves reniform, orbicular, or obovate, veins dichotomously branched; scales absent (seldom few in *U. striatula*); calyx lobes very unequal in size, upper lobe much longer than upper corolla lip.
- 12a. Plant with a basal tuber.
- 13a. Spur of corolla  $\pm$  as long as or shorter than lower corolla lip; leaf blade 1–3 cm ..... 12. *U. brachiata*
- 13b. Spur of corolla much longer than lower corolla lip; leaf blade 0.4–0.8 cm ..... 13. *U. forrestii*
- 12b. Plant without a basal tuber.
- 14a. Trap mouth with a dorsal deeply 2-cleft appendage; corolla spur subulate,  $\pm$  as long as lower corolla lip, apex acute ..... 17. *U. striatula*
- 14b. Trap mouth with a dorsal flabellate appendage; corolla spur cylindric, much shorter than lower corolla lip, apex obtuse.
- 15a. Middle lobe of lower corolla lip rounded; spur ca. 2  $\times$  as long as upper calyx lobe ..... 16. *U. salwinensis*
- 15b. Middle lobe of lower corolla lip emarginate; spur as long as or slightly longer than upper calyx lobe.
- 16a. Lower corolla lip 5-lobed; seed papillae short, obtuse, tufts of sometimes long bristles at both ends; leaf blade membranous ..... 14. *U. kumaonensis*
- 16b. Lower corolla lip 3-lobed; seed papillae relatively long, acute, a tuft of short bristles at distal end only; leaf blade fleshy ..... 15. *U. multicaulis*
- 9b. Bracts and bracteoles basifixed.
- 17a. Bracteoles similar to or slightly narrower than bracts.
- 18a. Scales present.
- 19a. Inflorescences and calyx glabrous; plants annual ..... 1. *U. minutissima*
- 19b. Inflorescences and calyx  $\pm$  densely covered with multicellular hairs; plants perennial ..... 2. *U. hirta*
- 18b. Scales absent.
- 20a. Leaves entire; bracts and bracteoles shortly connate to base; corolla yellowish, spur apex obtuse ..... 10. *U. peranomala*
- 20b. Larger leaves pinnately divided or lobed, smaller leaves entire; bracts and bracteoles not connate; corolla white, with a yellow dot at throat, spur apex 2-lobed ..... 11. *U. mangshanensis*
- 17b. Bracteoles much less than 1/4 as wide as bracts.
- 21a. Corolla yellow.
- 22a. Peduncle erect; pedicel strongly recurved in fruit; upper calyx lobe shorter than upper corolla lip, apex obtuse ..... 5. *U. bifida*
- 22b. Peduncle twining to erect; pedicel erect in fruit; upper calyx lobe longer than upper corolla lip, apex shortly acuminate ..... 8. *U. scandens*
- 21b. Corolla violet, mauve, lilac, or white.
- 23a. Peduncle twining; pedicel strongly deflexed in fruit ..... 9. *U. foveolata*
- 23b. Peduncle erect; pedicel erect to spreading in fruit.
- 24a. Fruiting pedicel as long as or shorter than fruiting calyx; calyx lobes suborbicular in fruit; seeds globose, with isodiametric reticulations; leaf blade 2.5–4.5 cm  $\times$  1.5–6 mm ..... 6. *U. uliginosa*
- 24b. Fruiting pedicel much longer than fruiting calyx; calyx lobes ovate in fruit; seeds ovoid to ellipsoid, with elongate reticulations; leaf blade 0.4–2 cm  $\times$  0.8–3 mm ..... 7. *U. graminifolia*

**1. *Utricularia minutissima* Vahl, Enum. Pl. 1: 204. 1804.**

斜果挖耳草 xie guo wa er cao

*Utricularia brevilabris* Lace; *U. brevilabris* var. *parviflora* Pellegrin; *U. evardii* Pellegrin; *U. lilliput* Pellegrin; *U. nigri-caulis* Ridley; *U. nipponica* Makino; *U. siamensis* Ostenfeld.

Annuals, terrestrial. Rhizoids capillary, simple. Stolons

capillary, sparsely branched. Traps on rhizoids, stolons, and leaves, stalked, ovoid, ca. 0.2 mm, mouth lateral; appendage 1, dorsal, subulate, with 1 or 2 ventral pairs of trichome rows. Leaves few, from peduncle base and stolons, glabrous; leaf blade narrowly obovate to linear, 0.3–2 cm  $\times$  0.4–0.8 mm, membranous, vein 1, base attenuate onto petiole, margin entire, apex slightly obtuse. Inflorescences erect, 3–12 cm, 1–10-flowered, glabrous; peduncle terete, 0.2–0.4 mm thick; scales few,

similar to bracts; bracts basifixed, narrowly ovate, 0.5–1 mm, apex acute. Pedicel erect,  $\pm$  as long as bracts, filiform; bracteoles similar to bracts but sometimes narrower or less acute. Calyx lobes convex, 1.5–2 mm, subequal, glabrous; lower lobe apex emarginate; upper lobe ovate, apex obtuse. Corolla violet or white, 3–7 mm; lower lip suborbicular, base with a rounded 4-lobed swelling, margin distinctly 3-lobed; spur subulate, much longer than lower corolla lip, apex acute; upper lip oblong to obovate, apex emarginate to rounded. Filaments ca. 0.8 mm, slightly curved; anther thecae distinct. Ovary ovoid; style short; stigma lower lip transversely elliptic, upper lip deltoid. Capsule obliquely ellipsoid, 1.5–2 mm, dehiscing by a single longitudinal ventral slit. Seeds globose to broadly ellipsoid, 2–3 mm; seed coat with prominent reticulations. Fl. Sep–Nov, fr. Nov–Dec.  $2n = 16$ .

Sandy soil in open areas, grassy places, wet rocks; near sea level. Fujian, S Guangdong, Guangxi, S Jiangsu, Jiangxi [Cambodia, India, Indonesia, S Japan, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia].

**2. *Utricularia hirta*** Klein ex Link, Jahrb. Gewächsk. 1(3): 55. 1820.

毛挖耳草 mao wa er cao

*Utricularia hirta* var. *elongata* Pellegrin; *U. tayloriana* J. Joseph & Mani.

Probably perennials, terrestrial. Rhizoids capillary; stolons capillary, sparsely branched. Traps on rhizoids, stolons, and leaves, ovoid, ca. 0.2 mm, long stalked, with 1 or 2 ventral pairs of rows of gland-tipped hairs, mouth lateral; appendage 1, dorsal, subulate. Leaves few from stolons, 0.8–1.5 cm  $\times$  0.3–0.5 mm, glabrous; leaf blade narrowly obovate, membranous, 1-veined, base attenuate onto long petiole, margin entire, apex rounded. Inflorescences erect, 5–15 cm, 1–6-flowered,  $\pm$  densely covered with multicellular hairs; peduncle terete, 0.2–0.5 mm thick; scales few, similar to bracts; bracts basifixed, narrowly ovate-deltoid, 0.5–1 mm. Pedicel erect, filiform, longer than bracts; bracteoles subulate, as long as or longer than bracts. Calyx lobes subequal, 1.5–2 mm, with dense hairs; lower lobe slightly larger, apex truncate to emarginate; upper lobe ovate, apex obtuse. Corolla violet or white, 4–8 mm; lower lip subcircular, base with a rounded 4-lobed swelling, apex 3-lobed; upper lip oblong from a deltoid base, apex  $\pm$  emarginate; palate inside shortly pubescent; spur subulate, much longer than lower lip, apex subacute. Filaments 0.5–0.6 mm, curved; anther thecae subdistinct. Ovary ovoid; style short; stigma lower lip subcircular, upper lip much smaller and deltoid. Capsule obliquely ovoid, 1.5–2 mm, dehiscing by a single longitudinal ventral slit. Seeds ovoid, ca. 0.2 mm; testa with prominent reticulations. Fl. Sep–Nov, fr. Nov–Dec.

Wet open grassy places, wet rocks; near sea level. S Guangxi (Nanning) [Bangladesh, Cambodia, India, Laos, Malaysia, Sri Lanka, Thailand, Vietnam].

**3. *Utricularia caerulea*** Linnaeus, Sp. Pl. 1: 18. 1753.

短梗挖耳草 duan geng wa er cao

*Calpidisca tatenakae* Nakai; *Utricularia albiflora* Griffith (1854), not R. Brown (1810); *U. albina* Ridley; *U. caerulea* var.

*filicaulis* (Wallich ex A. Candolle) Haines; *U. capillaris* D. Don; *U. cavaleriei* Stapf; *U. filicaulis* Wallich ex A. Candolle; *U. filicaulis* var. *papillosa* Pellegrin; *U. kerrii* Craib; *U. nivea* Vahl; *U. obtusiloba* Benjamin; *U. ophirensis* Ridley; *U. racemosa* Wallich ex Walpers; *U. racemosa* var. *filicaulis* (Wallich ex A. Candolle) C. B. Clarke; *U. rosea* Edgeworth; *U. roseo-purpurea* Stapf ex Gamble; *U. sampathii* Subramanyam & Yoganarasimhan; *U. sootepensis* Craib; *U. squamosa* Benjamin.

Annuals, terrestrial. Rhizoids and stolons capillary, branched. Traps on stolons and leaves, stalked, ovoid, 0.2–1 mm, with stipitate glands on appendage and mouth margin, mouth lateral; appendage 1, dorsal, subulate, beaklike. Leaves numerous, from peduncle base and stolon nodes, glabrous; leaf blade linear to linear-obovate, 0.3–2 cm  $\times$  0.5–2 mm, membranous, veins 3, base attenuate onto petiole, margin entire, apex rounded. Inflorescences erect, 5–44 cm, 1–15-flowered, glabrous; peduncle terete, 0.3–1.2 mm thick; scales 1–12, similar to bracts; bracts basisolate, oblanceolate, 1.5–3 mm, base cuneate, apex acute. Pedicel erect at anthesis but spreading to deflexed in fruit, 0.2–1 mm, minutely papillose; bracteoles basisolate, ovate-lanceolate, 1–2 mm. Calyx lobes minutely papillose, glabrous; lower lobe suborbicular, smaller than upper lobe, apex retuse; upper lobe ovate-oblong, 2–3 mm, apex rounded. Corolla violet, pink, or white, marked with yellow at throat, 4–10 mm; lower lip broadly ovate, with a basal 4-ridged swelling, apex rounded to emarginate; spur narrowly conic, usually longer than lower corolla lip, apex subacute; upper lip oblong to ovate-oblong, apex retuse. Filaments 1–2 mm, straight; anther thecae  $\pm$  distinct. Ovary globose; style short; stigma lower lip semicircular, upper lip deltoid. Capsule globose to ellipsoid, 1.5–2 mm, dehiscing by a short longitudinal ventral slit. Seeds obovoid to oblong-ellipsoid, 0.2–0.3 mm; seed coat with prominent elongate reticulations and conic to clavate papillae. Fl. Jun–Jan, fr. Jul–Feb.  $2n = 36, 40$ .

Wet rocks, beside streams, wet grassland, swamps, damp places; near sea level to 2000 m. S Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Shandong, Taiwan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Madagascar, Pacific islands (Guam, Palau)].

Reports of *Utricularia caerulea* from Anhui, Jiangsu, Jiangxi, Sichuan, and Zhejiang (Z. Yu Li, FRPS 69: 594. 1990; S. R. Chen, Higher Pl. China 10: 440. 2004) are in fact *U. warburgii*.

**4. *Utricularia warburgii*** K. I. Goebel, Ann. Jard. Bot. Buitenzorg 9: 64. 1890.

钩突耳草 gou tu er cao

Annuals, terrestrial. Rhizoids capillary, simple. Stolons capillary, branched. Traps on stolons and leaves, stalked, ovoid, 0.5–1 mm, with numerous stipitate glands on appendage and mouth margin, mouth lateral; appendage 1, dorsal, narrowly oblong-obovate, beaklike, apex obtuse. Leaves numerous, from peduncle base and stolon nodes, glabrous; leaf blade narrowly obovate-cuneate, 1–1.5 cm  $\times$  1.2–1.5 mm, membranous, vein 1, base attenuate onto petiole, margin entire, apex rounded. Inflorescences erect, 5–17 cm, (1 or) 2–6-flowered, glabrous; peduncle terete, 0.3–0.4 mm thick; scales few, similar to bracts;

bracts basisolate, ovate, ca. 1.3 mm, base truncate, margin denticulate, apex obtuse. Pedicel erect at anthesis and in fruit, 0.7–1 mm, minutely papillose; bracteoles basisolate, oblong, slightly shorter than bracts, base rounded to obliquely truncate, apex acute. Calyx lobes slightly convex, 2–3 mm, subequal, minutely papillose, glabrous; lower lobe oblong, apex emarginate; upper lobe broadly ovate, apex rounded. Corolla pale bluish purple, 6–8 mm; lower lip transversely elliptic, base with a conspicuous swelling, apex rounded; spur subulate, somewhat longer than lower corolla lip; palate with 2 curved hornlike processes; upper lip obovate-cuneate, apex emarginate. Filaments ca. 1 mm, straight; anther thecae  $\pm$  distinct. Ovary ovoid; style short; stigma lower lip semicircular, upper lip deltoid. Capsule globose to ellipsoid, 1.8–2.2 mm, dehiscent by a short longitudinal ventral slit. Seeds obovoid, 0.2–0.3 mm; seed coat with prominent elongate reticulations and clavate papillae. Fl. May–Sep, fr. Jul–Oct.

• Wet grasslands, wet rocks; 800–2000 m. Anhui, Chongqing, Fujian, S Jiangsu, Jiangxi, Zhejiang.

##### 5. *Utricularia bifida* Linnaeus, Sp. Pl. 1: 18. 1753.

挖耳草 wa er cao

*Philydrum cavaleriei* H. Léveillé; *Utricularia alata* Benjamin; *U. biflora* Hayata (1911), not Lamarck (1791); *U. humilis* Vahl; *U. recurva* Loureiro; *U. wallichiana* Benjamin.

Annuals, terrestrial. Rhizoids and stolons capillary, branched. Traps on stolons and leaves, shortly stalked, globose, 0.5–1 mm, mouth basal; appendages 2, dorsal, subulate, curved. Leaves arising from stolon nodes, few to numerous, petiolate; leaf blade narrowly linear to linear-oblongate, 0.7–2(–3) cm  $\times$  1–4 mm, membranous, glabrous, vein 1, base attenuate, margin entire, apex rounded to subacute. Inflorescences erect, 2–40 cm, 1–16-flowered, glabrous; peduncle terete, 0.3–1.2 mm thick; scales few, similar to bracts; bracts basifixed, ovate, 1–2 mm, apex obtuse to acute. Pedicel spreading at anthesis but decurved in fruit, 2–5 mm, capillary, broadly winged; bracteoles subulate, much shorter than bracts, apex acute. Calyx lobes 3–4 mm at anthesis but 5–6 mm in fruit, glabrous; lower lobe ovate, slightly smaller than upper lobes, apex rounded to emarginate; upper lobe broadly ovate, apex obtuse. Corolla yellow, 6–10 mm; lower lip suborbicular, base with a prominent rounded swelling, apex rounded; spur subulate,  $\pm$  as long as lower corolla lip, widely divergent, curved, apex acute; palate margin ciliate; upper lip oblong to oblong-obovate, apex rounded. Filaments ca. 1 mm, straight; anther thecae distinct. Ovary ovoid, dorsiventrally compressed; style evident; stigma lower lip semicircular, upper lip obtuse. Capsule broadly ellipsoid, 2.5–3 mm, dorsiventrally compressed, dehiscent by longitudinal dorsal and ventral slits. Seeds obliquely obovoid, 0.4–0.6 mm; seed coat with prominent elongate reticulations. Fl. Jun–Dec, fr. Jul–Jan.

Wet soil and rocks, rice fields; near sea level to 1400 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Taiwan, Yunnan, Zhejiang [Bangladesh, Cambodia, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands (Guam, Palau)].

##### 6. *Utricularia uliginosa* Vahl, Enum. Pl. 1: 203. 1804.

齿萼挖耳草 chi e wa er cao

*Utricularia affinis* Wight; *U. brachypoda* Wight; *U. caerulea* Linnaeus var. *affinis* (Wight) Thwaites; *U. decipiens* Dalzell; *U. elachista* K. I. Goebel; *U. griffithii* Wight; *U. lilacina* Griffith; *U. macrophylla* Masamune & Syozi; *U. nayarii* Janarthanam & A. N. Henry; *U. reticulata* Smith var. *uliginosa* (Vahl) C. B. Clarke; *U. yakusimensis* Masumune.

Annuals, terrestrial. Rhizoids and stolons capillary, branched. Traps on rhizoids, stolons, and leaves, stalked, globose, 1–1.5 mm, glandular, mouth basal; appendages 2, dorsal, subulate, stipitate. Leaves few to numerous, at stolon nodes, glabrous; leaf blade linear to narrowly obovate, 2.5–4.5 cm  $\times$  1.5–6 mm, membranous, veins 3, base attenuate onto petiole, margin entire, apex rounded to acute. Inflorescences erect, 3–12 cm, 1–10-flowered, glabrous; peduncle slightly angular, 0.2–0.5 mm thick; scales few, similar to bracts; bracts basifixed, narrowly ovate, 0.8–1 mm, apex acute. Pedicel suberect, 1–1.5 mm at anthesis but to 5 mm in fruit, filiform, narrowly winged; bracteoles narrowly linear to subulate, slightly shorter than bract, apex acute. Calyx lobes broadly ovate to suborbicular, 2.5–5 mm, margin minutely denticulate; lower lobe slightly smaller than upper lobe, apex emarginate; upper lobe apex obtuse to subacute. Corolla lilac, violet, or white, 3–7 mm; lower lip suborbicular, base much swollen, apex rounded to emarginate; spur subulate,  $\pm$  as long as lower corolla lip, widely divergent, apex acute; palate with a ciliate marginal rim; upper lip oblong, scarcely longer than upper calyx lobe, apex rounded to emarginate. Filaments ca. 1 mm, straight; anther thecae distinct. Ovary ovoid, dorsiventrally compressed; style short but evident; stigma lower lip semicircular, upper lip obsolete. Capsule ovoid, 2–4 mm, dorsiventrally compressed, dehiscent by dorsal and ventral longitudinal slits. Seeds subglobose, 0.3–0.4 mm in diam.; seed coat with prominent isodiametric reticulations. Fl. Jun–Oct, fr. Jul–Nov.

Swamps, streamsides, rice fields; near sea level to 400 m. S Guangdong, Hainan, Taiwan [India, Indonesia, S Japan, Korea, Malaysia, Myanmar, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Guam, New Caledonia, Palau)].

The report of *Utricularia uliginosa* from Yunnan (C. Y. Wu, Index Fl. Yunnan. 2: 1636. 1984; H. Li, Fl. Yunnan. 4: 740. 1986) is in fact *U. graminifolia*.

##### 7. *Utricularia graminifolia* Vahl, Enum. Pl. 1: 195. 1804.

禾叶挖耳草 he ye wa er cao

*Utricularia caerulea* Linnaeus var. *graminifolia* (Vahl) P. K. Bhattacharyya; *U. conferta* Wight; *U. equiseticaulis* Blatter & McCann; *U. parviflora* Buchanan-Hamilton ex Smith; *U. pedicellata* Wight; *U. purpurascens* Graham; *U. subrecta* Lace; *U. uliginoides* Wight.

Perennials or perhaps sometimes annuals, terrestrial. Rhizoids and stolons capillary, branched. Traps on rhizoids, stolons, and leaves, stalked, globose, 0.5–1.3 mm, mouth basal; appendages 2, dorsal, simple, subulate. Leaves numerous, from stolon nodes, glabrous; leaf blade linear to narrowly obovate, 0.4–2 cm  $\times$  0.8–3 mm, membranous, veins 3, base attenuate

onto petiole, margin entire, apex rounded to subacute. Inflorescences erect, 2.5–30 cm, 1–6-flowered, glabrous; peduncle terete, 0.4–1 mm thick; scales few to many, similar to bracts; bracts basifixed, ovate, 2–2.5 mm, apex acuminate. Pedicel ascending, 3–13 mm, filiform, narrowly winged; bracteoles basifixed, subulate, slightly shorter than bracts. Calyx lobes ovate, 3.5–6 mm; lower lobe slightly smaller than upper lobe, apex shortly 2-dentate; upper lobe apex acute to acuminate. Corolla mauve to violet, 0.7–1.3 cm; lower lip suborbicular, base with a conspicuous swelling, apex rounded; spur subulate,  $\pm$  as long as lower corolla lip and widely diverging from it, straight or slightly curved; palate with a raised ciliate margin; upper lip oblong, apex rounded. Filaments ca. 1.5 mm, straight; anther thecae distinct. Ovary ovoid; style evident; stigma lower and upper lips semicircular. Capsule ellipsoid, 2–3 mm, slightly dorsiventrally compressed, dehiscing by a longitudinal ventral slit. Seed ovoid to ellipsoid, 0.3–0.4 mm; seed coat with prominent elongate reticulations. Fl. May–Dec, fr. Jun–Jan.

Marshes, swamps, streamsides, wet soil among rocks; 100–2100 m. S Fujian, Guangdong, Yunnan [India, Myanmar, Sri Lanka, Thailand].

**8. *Utricularia scandens* Benjamin, Linnaea 20: 309. 1847.**

缠绕挖耳草 chan rao wa er cao

Annuals, terrestrial. Rhizoids and stolons capillary, branched. Traps on rhizoids, stolons, and leaves, stalked, globose, 0.5–1 mm, mouth basal; appendages 2, dorsal, simple, subulate, glandular. Leaves few to many, glabrous; leaf blade narrowly linear, 5–10  $\times$  0.4–1 mm, membranous, vein 1, base attenuate onto petiole, margin entire, apex rounded to subacute. Inflorescences erect or twining, 1.5–35 cm, (1–)3–8-flowered, glabrous; peduncle terete but somewhat angular, 0.2–0.6 mm thick; scales few to numerous, similar to bracts; bracts basifixed, broadly ovate-deltoid, 0.5–1.5 mm, apex acute to acuminate. Pedicel suberect, 2.5–3 mm, filiform, winged; bracteoles basifixed, narrowly linear to subulate, as long as or slightly shorter than bracts, apex acute. Calyx lobes ovate to elliptic, 2–3 mm at anthesis, to 5 mm in fruit; lower lobe subequal to or slightly smaller than upper lobe, apex shortly 2-cleft; upper lobe apex acute to acuminate. Corolla yellow, 5–11 mm; lower lip suborbicular, base distinctly swollen, apex rounded to obscurely crenate; spur subulate, longer than lower corolla lip, widely divergent, curved or straight, apex acute; palate papillose; upper lip oblong, apex rounded to emarginate. Filaments ca. 1 mm, straight; anther thecae distinct. Ovary ovoid, dorsiventrally compressed; style short; stigma lower and upper lips semicircular. Capsule ovoid, 2–2.5 mm, dorsiventrally compressed, dehiscing by a longitudinal ventral slit. Seeds obliquely obovoid, 0.2–0.3 mm; seed coat with prominent elongate reticulations. Fl. Jun–Sep, fr. Jul–Oct.

Bogs, marshes, meadows, swamps, ponds, wet rocks, along streams among grass; 700–2900 m. SW Guizhou, NW and S Yunnan [Bangladesh, Bhutan, India, Indonesia (Papua Barat), Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Madagascar].

- 1a. Inflorescences twining to erect; calyx lobes subequal, ovate at anthesis and in fruit ..... 8a. subsp. *scandens*

- 1b. Inflorescences erect; calyx lobes unequal, upper lobe broadly ovate at anthesis, becoming rhombic-elliptic in fruit, lower lobe ovate-elliptic at anthesis, becoming ovate-oblong in fruit ..... 8b. subsp. *firmula*

**8a. *Utricularia scandens* subsp. *scandens***

缠绕挖耳草(原亚种) chan rao wa er cao (yuan ya zhong)

*Utricularia bifida* Linnaeus var. *wallichiana* Thwaites; *U. macrolepis* Wight; *U. wallichiana* Wight (1850) not Benjamin (1845); *U. wallichii* Wight.

Inflorescences twining to erect. Calyx lobes subequal, ovate at anthesis and in fruit. Fl. Aug–Sep, fr. Sep–Oct.  $2n = 12, 14$ .

Bogs, meadows, ponds; 700–800 m. SW Guizhou, S Yunnan [Bangladesh, India, Indonesia (Papua Barat), Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Madagascar].

**8b. *Utricularia scandens* subsp. *firmula* (Oliver) Z. Yu Li, Bull. Bot. Res., Harbin 8(2): 29. 1988.**

尖萼挖耳草 jian e wa er cao

*Utricularia wallichiana* var. *firmula* Oliver, J. Proc. Linn. Soc., Bot. 3: 182. 1859; *U. recta* P. Taylor; *U. scandens* var. *firmula* (Oliver) Subramanyam & Banerjee.

Inflorescences erect. Calyx lobes unequal; lower lobe ovate-elliptic at anthesis, becoming ovate-oblong in fruit; upper lobe broadly ovate at anthesis, becoming rhombic-elliptic in fruit. Fl. Jun–Aug, fr. Jul–Sep.

Bogs, marshes, swamps, wet rocks, along streams among grass; 1300–2900 m. NW Yunnan [Bhutan, N and NE India, N Myanmar?, Nepal].

P. Taylor (Kew Bull., Addit. Ser. 14: 382–384. 1989) treated *Utricularia scandens* subsp. *firmula* as a distinct species, *U. recta*.

**9. *Utricularia foveolata* Edgeworth, Proc. Linn. Soc. London 1: 351. 1847.**

海南挖耳草 hai nan wa er cao

*Utricularia baouleanensis* A. Chevalier; *U. scandens* Oliver (1859), not Benjamin (1847); *U. tenerrima* Merrill.

Annuals, terrestrial. Rhizoids and stolons capillary, branched. Traps on stolons and leaves, shortly stalked to sessile, globose, 0.8–1.2 mm, mouth basal; appendages 2, dorsal, filiform-subulate, sparsely branched, stipitate, glandular. Leaves few, from stolon nodes, petiolate, glabrous; leaf blade linear, 1–3 cm  $\times$  0.4–1 mm, membranous, vein 1, base attenuate onto petiole, margin entire, apex acute to rounded. Inflorescences twining, 15–20 cm, 2–5-flowered, glabrous; peduncle terete, 0.2–0.5 mm thick; scales few, similar to bracts; bracts basifixed, ovate to ovate-oblong, ca. 1.2 mm, apex obtuse to shortly acuminate. Pedicel erect to spreading at anthesis but sharply deflexed in fruit, 2–4 mm, filiform, dorsiventrally flattened and narrowly winged; bracteoles linear-subulate, ca. 1/2 as long as bracts, apex acute. Calyx lobes ovate, 2–4 mm; lower lobe slightly longer and narrower than upper lobe, apex obtuse

to subacute. Corolla pale mauve, 3–4 mm; lower lip suborbicular, galeate, basal swelling obscurely 2-lobed, apex entire or obscurely 3-crenate; spur narrowly conic, slightly longer than lower corolla lip, apex obtuse; palate with a scarcely raised minutely ciliate rim; upper lip oblong, slightly longer than calyx, apex truncate. Filaments ca. 1 mm, straight; anther thecae  $\pm$  distinct. Ovary ovoid; style short but evident; stigma lower lip semicircular, upper lip truncate. Capsule broadly ovoid, ca. 4 mm, slightly dorsiventrally compressed, dehiscing by a single longitudinal ventral slit. Seeds obliquely ovoid to ellipsoid, ca. 0.3 mm; seed coat with prominent elongate reticulations. Fl. Oct–Nov, fr. Nov–Dec.  $2n = 20$ .

Wet grasslands, rice fields; near sea level. Hainan [Bangladesh, India, Indonesia, Philippines, Thailand; tropical Africa, NE Australia, Madagascar].

**10. *Utricularia peranomala*** P. Taylor, Kew Bull. 41: 12. 1986.

合苞挖耳草 he bao wa er cao

Annuals, lithophytic. Stolons and rhizoids capillary, simple. Traps on stolons or leaf blades near margin, shortly stalked, ovoid, ca. 1 mm, mouth lateral; appendages 2, dorsal, subulate, simple, with sessile glands. Leaves few, from peduncle base, glabrous; leaf blade narrowly obovate to linear, 8–10  $\times$  1–1.5 mm, membranous, veins pinnate, base attenuate onto petiole, margin entire, apex rounded. Inflorescences erect, 1.5–2.5 cm, 1- or 2-flowered, glabrous; peduncle terete, ca. 0.3 mm thick; scales absent; bracts basifixed, broadly ovate, ca. 0.5 mm, base shortly connate, apex rounded. Pedicel erect at anthesis but apically decurved in fruit, 2–7 mm, filiform, slightly dorsiventrally compressed; bracteoles basifixed, oblong,  $\pm$  as long as bracts, apex rounded. Calyx lower lobe ovate to oblong, smaller than upper lobe, apex rounded; upper lobe broadly ovate, 1.5–2 mm, apex obtuse. Corolla yellowish, 4–6 mm; lower lip broadly flabellate to transversely elliptic, base with a 4-lobed swelling, apex rounded to retuse; spur subulate, slightly longer than corolla lower lip, almost straight, apex obtuse; palate with a slightly raised ring, fringed with short hairs; upper lip oblong, slightly longer than upper calyx lobe, apex truncate. Filaments ca. 0.6 mm, slightly curved; anther thecae distinct. Ovary globose; style short but evident; stigma lower lip circular, upper lip oblong. Capsule globose, ca. 2.5 mm, dehiscing by a single longitudinal ventral slit. Seeds narrowly ellipsoid-fusiform, ca. 1 mm, curved or straight; seed coat with prominent very elongate reticulations. Fl. Jul–Aug, fr. Aug.

- Wet rocks among moss. NE Guangxi (Ziyuan).

*Utricularia peranomala* is known only from the type collection (T. S. Tsoong 83427), which does not record the elevation.

**11. *Utricularia mangshanensis*** G. W. Hu, Ann. Bot. Fenn. 44: 389. 2007.

莽山挖耳草 mang shan wa er cao

Annuals, bryophilous lithophytes. Rhizoids short, simple; stolons capillary, simple or branched near terminal. Leaves numerous, from peduncle base and stolon nodes, 0.8–2.2 cm  $\times$  1–2.5 mm, glabrous, petiolate or sessile; leaf blade linear to obovate, membranous, pinnately veined, base attenuate, margin entire or on larger leaves irregularly and pinnately parted or

lobed, apex rounded. Traps on stolons or near leaf blade margins, ovoid, 0.6–0.9 mm, stalked, mouth lateral; appendages 2, dorsal, subulate, simple. Inflorescences erect, 3–6 cm, 1- or 2 (or 3)-flowered, glabrous; peduncle terete, 0.4–0.7 mm thick; scales absent; bracts basifixed, broadly ovate, ca. 0.8 mm, apex rounded. Pedicel filiform, 0.6–1.3 cm, ascending at anthesis; bracteoles basifixed, oblong, slightly narrower than bracts, apex rounded. Calyx lobes unequal; lower lobe ovate to elliptic-oblong, apex usually emarginate; upper lobe broadly ovate or cordate, 1.5–2 mm, apex acute. Corolla white with a yellow dot at throat; lower lip broadly flabellate or axelike, slightly undulate, apex rounded; spur subulate, 3.5–5 mm, slightly curved upward, apex unequally 2-lobed; upper lip ovate-oblong, equal to or slightly longer than upper calyx lobe, apex truncate; palate with dense short hairs. Filaments ca. 0.6 mm, curved; anther thecae distinct. Ovary globose; style short but distinct; stigma lower lip circular, upper lip ovate-oblong and much smaller. Capsule and seeds unknown. Fl. Apr–May.

- Among moss on wet cliffs; 700–800 m. Hunan (Yizhang).

**12. *Utricularia brachiata*** Oliver, J. Proc. Linn. Soc., Bot. 3: 187. 1859.

肾叶挖耳草 shen ye wa er cao

Perennials, lithophytic. Tuber 1, at peduncle base, globose to ellipsoid, 1–2 mm. Rhizoids and stolons capillary, simple. Traps on rhizoids and stolons, stalked, ovoid, ca. 1 mm, mouth lateral; appendage 1, dorsal, transversely elliptic to flabellate, fringed with multicellular stipitate glands. Leaves few, from tuber, glabrous; leaf blade reniform, 1–3 cm  $\times$  2.5–6 mm, membranous, veins dichotomously branched, base cordate and attenuate onto long petiole, margin entire, apex rounded to emarginate. Inflorescences erect, 3–8 cm, 1- or 2-flowered, glabrous; peduncle terete, 0.2–0.4 mm thick; scales absent; bracts basolute, oblong, ca. 1.5 mm, base truncate to emarginate, margin erose denticulate, apex rounded. Pedicel spreading, 2–8 mm, filiform, dorsiventrally compressed; bracteoles basolute, similar to bracts. Calyx lobes 3–4 mm, glabrous; lower lobe oblong, much smaller than upper lobe, apex emarginate; upper lobe orbicular, apex emarginate. Corolla white, with a yellow spot at base of lower lip and violet streaks on upper lip; lower lip suborbicular, distinctly 5-lobed; spur narrowly cylindric, 2 or more  $\times$  as long as upper calyx lobe, apex obtuse; palate with a slightly raised rim, fringed with moniliform hairs; upper lip much shorter than upper calyx lobe, apex 2-lobed. Filaments ca. 0.5 mm, curved; anther thecae  $\pm$  distinct. Ovary globose; style very short; stigma lower lip circular, upper lip obsolete. Capsule globose with a ventral keel, ca. 2.5 mm, dehiscing by a longitudinal ventral slit. Seeds ovoid, ca. 0.5 mm, with a tuft of hairs of variable length at each end usually  $\pm$  as long as body of seed and a few shorter hairs on distal surface. Fl. Jul–Sep, fr. Aug–Oct.

Forests among bryophytes on rocks; 2600–4200 m. W Sichuan, SE Xizang, N Yunnan [Bhutan, N India, N Myanmar, Nepal].

**13. *Utricularia forrestii*** P. Taylor, Kew Bull. 41: 13. 1986.

长距挖耳草 chang ju wa er cao

Perennials, lithophytic. Tuber 1, at peduncle base, globose,

1–2 mm. Rhizoids and stolons capillary, simple. Traps on rhizoids and stolons, stalked, ovoid, ca. 1 mm, mouth lateral; appendage 1, dorsal, broadly flabellate, fringed with multicellular stipitate glands. Leaves few, from a short vertical stem between tuber and peduncle base, glabrous; leaf blade broadly obovate, orbicular, or reniform, 4–8 × 1–3 mm, membranous, veins dichotomously branched, base broadly cuneate to subcordate, margin entire, apex rounded. Inflorescences erect, 2–4 cm, 1- or 2-flowered, glabrous; peduncle terete, 0.2–0.3 mm thick; scales absent; bracts basisolute, narrowly ovate, ca. 1 mm, base truncate, apex subacute. Pedicel spreading, 2–8 mm, filiform, dorsiventrally compressed; bracteoles basisolute, similar to bracts. Calyx lobes glabrous; lower lobe oblong to obovate, much smaller than upper lobe, apex emarginate; upper lobe orbicular to broadly transversely elliptic, 2–3 mm, apex emarginate. Corolla mauve to violet, 1.2–1.5 cm; lower lip suborbicular, apex 3-lobed ± to middle; lobes retuse to shortly 2-cleft; spur filiform, 0.9–1.5 cm, much longer than corolla lower lip, curved; palate with a slightly raised rim fringed with hairs; upper lip suborbicular, shorter than upper calyx lobe, apex shortly 2-lobed. Filaments ca. 0.5 mm, curved; anther thecae ± distinct. Ovary ovoid; style very short; stigma lower lip suborbicular, upper lip obsolete. Capsule globose, ca. 2 mm, with a ventral keel, dehiscing by a single longitudinal ventral slit. Seeds narrowly elliptic, ca. 0.5 mm, with a hollow obscurely apically dentate multicellular appendage at each end. Fl. Jul–Aug, fr. Aug–Sep.

Among moss on rocks; 2100–3000 m. W Yunnan [N Myanmar].

**14. *Utricularia kumaonensis*** Oliver, J. Proc. Linn. Soc., Bot. 3: 189. 1859.

毛籽挖耳草 mao zi wa er cao

*Diurospermum album* Edgeworth (1847), not *Utricularia alba* Hoffmannsegg ex Link (1820).

Annuals, epiphytic, lithophytic, or terrestrial. Rhizoids and stolons capillary, simple. Traps on rhizoids and stolons, stalked, ovoid, ca. 1 mm, mouth lateral; appendage 1, dorsal, flabellate, fringed with multicellular stipitate glands. Leaves few, rosulate at peduncle base, petiolate, glabrous; leaf blade broadly obovate, orbicular, or reniform, 2–6 × 1.5–3 mm, membranous, veins dichotomously branched, base broadly cuneate, margin entire, apex rounded. Inflorescences erect, 2–7 cm, 1–3-flowered, glabrous; peduncle terete, 0.2–0.3 mm thick; scales absent; bracts basisolute, ovate-oblong, ca. 0.5 mm, base truncate, apex obtuse. Pedicel erect at anthesis but decurved in fruit, terete, 2–6 mm, filiform; bracteoles basisolute, similar to bracts. Calyx lower lobe oblong, much smaller than upper lobe, apex truncate and emarginate to erose; upper lobe obcordate, ca. 2 mm, base rounded, apex deeply 2-parted. Corolla white, with a basal yellow spot and mauve lobes on lower lip, 3–5(–7) mm; lower lip suborbicular, 5-lobed, middle lobe much larger than lateral lobes; spur broadly cylindric, ± as long as upper calyx lobe, slightly curved, apex obtuse; palate with a slightly raised rim, fringed with short hairs; upper lip subquadrate, ca. 1/2 as long as upper calyx lobe, apex truncate to obscurely 2-lobed. Filaments ca. 0.5 mm, curved; anther thecae distinct. Ovary globose; style very short; stigma lower lip circular, upper lip

nearly obsolete. Capsule obliquely ovoid, 2–2.5 mm, dehiscing by a single longitudinal ventral slit. Seeds few per capsule, ellipsoid, ca. 0.5 mm, with a tuft of hairs at each end, hairs usually longer than body of seed. Fl. Jul–Aug, fr. Aug–Sep.

Among moss on rocks, cliffs, fallen trees; 2600–2700 m. NW Yunnan [Bhutan, N India, N Myanmar, Nepal].

**15. *Utricularia multicaulis*** Oliver, J. Proc. Linn. Soc., Bot. 3: 188. 1859.

多序挖耳草 duo xu wa er cao

Annuals, terrestrial or lithophytic. Rhizoids and stolons capillary, simple. Traps on rhizoids and stolons, shortly stalked, ovoid, ca. 1 mm, mouth lateral; appendage 1, dorsal, flabellate, fringed with multicellular stipitate glands. Leaves few, rosulate at peduncle base, long petiolate, glabrous; leaf blade obovate, 2–8 × 1–1.5 mm, rather fleshy, veins dichotomously branched, base attenuate, margin entire, apex rounded. Inflorescences erect, 1–5 cm, 1–3-flowered, glabrous; peduncle terete, 0.3–0.4 mm thick; scales absent; bracts basisolute, oblong, 0.6–1.2 mm, base truncate, apex obtuse to acute. Pedicel spreading at anthesis but decurved and distally thickened in fruit, terete, 1–5 mm, filiform; bracteoles basisolute, similar to bracts. Calyx lower lobe oblong, much smaller than upper lobe, apex entire, emarginate, or erose; upper lobe orbicular to broadly transversely elliptic, 1–1.5 mm, apex deeply emarginate. Corolla white or pale mauve, with a yellow spot at base of lower lip, 2–5 mm; lower lip 3-lobed, middle lobe much longer than lateral lobes, apex rounded to emarginate; spur cylindric, slightly longer than upper calyx lobe, straight or almost so, apex obtuse; palate with a slightly raised rim fringed with short hairs; upper lip subquadrate, much shorter than upper calyx lobe, apex shortly 2-lobed. Filaments ca. 0.5 mm, slightly curved; anther thecae distinct. Ovary globose; style very short; stigma lower lip circular, upper lip obsolete. Capsule globose to obliquely ovoid, 1.5–2 mm, dehiscing by a single longitudinal ventral slit. Seeds ovoid, 0.7–0.9 mm, distal end with a tuft of short hairs ca. 1/2 as long as body of seed; seed coat with regular longitudinal rows of acute papillae. Fl. Jul–Sep, fr. Aug–Oct.

Moist rocks, open swampy meadows among bryophytes and species of Cyperaceae; 2800–3900 m. SE Xizang, NW Yunnan [Bhutan, India (Sikkim), N Myanmar, Nepal].

**16. *Utricularia salwinensis*** Handel-Mazzetti, Symb. Sin. 7: 873. 1936.

怒江挖耳草 nu jiang wa er cao

Probably perennials, terrestrial or lithophytic. Rhizoids capillary, simple. Stolons capillary, branched. Traps on rhizoids and stolons, stalked, ovoid, ca. 1 mm, mouth lateral; appendage 1, dorsal, flabellate, fringed with multicellular stipitate glands. Leaves few, from peduncle base and stolons, long petiolate, glabrous; leaf blade obovate to orbicular, 2–12 × 1–2 mm, membranous, veins dichotomously branched, base attenuate, margin entire, apex rounded. Inflorescences erect, 3–7 mm, 1-flowered, glabrous; peduncle terete, 0.2–0.4 mm thick; scales absent; bracts basisolute, oblong, ca. 1.5 mm, base truncate, margin 2-cleft or erose, apex acute to truncate. Pedicel erect, spreading, or ± recurved, 2–10 mm; bracteoles basisolute, simi-

lar to bracts. Calyx lower lobe oblong, much smaller than upper lobe, apex emarginate; upper lobe suborbicular, ca. 2 mm, apex emarginate. Corolla white or pale pink, with a yellow spot at base of lower lip; lower lip 3-lobed, middle lobe much larger than lateral lobes, apex rounded; spur narrowly cylindric, ca. 2 × as long as upper calyx lobe, apex obtuse; palate with a slightly raised rim, fringed with moniliform hairs; upper lip subquadrate, much shorter than upper calyx lobe, apex emarginate. Filaments 0.5–0.7 mm, curved; anther thecae ± distinct. Ovary globose; style very short; stigma lower lip circular, upper lip obsolete. Capsule and seeds not seen. Fl. Jul–Aug.

• Among moss on wet cliffs and in bogs; 3200–4000 m. SE Xizang, NW Yunnan.

*Utricularia salwinensis* had been reported from the mountains of N Sumatra in Indonesia (P. Taylor, Fl. Malesiana, ser. 1, 8(2): 292. 1977). However, the Sumatran plants were later described as *U. steenisii* P. Taylor.

**17. *Utricularia striatula*** Smith in Rees, Cycl. 37: *Utricularia* no. 17. 1818.

圆叶挖耳草 *yuan ye wa er cao*

*Meloneura striatula* (Smith) Barnhart; *Utricularia anthrophophora* Ridley; *U. harlandii* Oliver ex Benth; *U. orbiculata* Wallich ex A. Candolle; *U. rosulata* Benjamin; *U. taikankensis* Yamamoto.

Perennials, epiphytic or lithophytic. Rhizoids and stolons capillary, simple. Traps on rhizoids and stolons, stalked, ovoid, 0.6–0.8 mm, mouth lateral; appendage 1, dorsal, deeply 2-cleft, fringed with multicellular stipitate glands. Leaves numerous, from peduncle base and stolons, subsessile to petiolate; leaf blade obovate, orbicular, or transversely elliptic, 3–10 × 2–6 mm, thinly fleshy, veins dichotomously branched, base cuneate, attenuate, or rounded, margin entire, apex rounded. Inflorescences erect, 1–15 cm, 1–10-flowered; peduncle terete, 0.2–0.4 mm thick, glabrous; scales few, similar to bracts; bracts basisolate, narrowly ovate to oblong, 1–1.5 mm, glandular, base truncate, margin irregularly crenulate to denticulate, apex subacute to rounded. Pedicel spreading at anthesis but often pendulous and withered in fruit, 2–6 mm, capillary, slightly dorsiventrally compressed; bracteoles similar to bract but slightly smaller. Calyx lower lobe oblong-elliptic, much smaller than upper lobe, apex rounded to emarginate; upper lobe suborbicular to broadly obcordate, 1.5–2.5 mm, apex rounded to emarginate. Corolla white or violet, with a yellow spot at base of lower lip, 3–10 mm or much smaller when cleistogamous; lower lip transversely elliptic to suborbicular, apex 5-lobed; spur subulate, ± as long as lower lip, straight or curved, apex acute; palate fringed with hairs; upper lip subovate, much shorter than calyx, apex shortly 2-cleft. Filaments ca. 0.6 mm, straight; anther thecae distinct. Ovary ovoid to depressed globose; style very short; stigma lower lip semicircular, upper lip obsolete. Capsule globose, ca. 2.5 mm in diam., dorsiventrally compressed, dehiscing by a single longitudinal ventral slit. Seeds obovoid, 0.2–0.4 mm, densely covered with glochidiate processes except proximal end. Fl. Jun–Oct, fr. Jul–Nov.

Damp rocks, tree trunks; 400–3600 m. S Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi,

Sichuan, Taiwan, S and SE Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Indian Ocean islands (N Andaman Islands)].

**18. *Utricularia limosa*** R. Brown, Prodr. 432. 1810.

长梗狸藻 *chang geng li zao*

*Nelipus limosa* (R. Brown) Rafinesque; *Utricularia verticillata* Benjamin.

Perennials or annuals, subaquatic or terrestrial. Rhizoids and stolons capillary, branched. Traps on stolons and leaves, long stalked, obliquely ovoid, 0.5–1 mm, covered externally with clavate glands, mouth lateral; appendages 2, dorsal, branched, setiform. Leaves numerous, from peduncle base and stolon nodes, long petiolate, to 5 cm including petiole; leaf blade narrowly oblong in outline, pinnately divided; segments alternate, capillary, terete, glabrous. Inflorescences erect, 5–25 cm, 2–10-flowered; peduncle terete, 0.5–0.8 mm thick; scales few, similar to bracts; bracts basisolate, elliptic, 1.5–2 mm, base obliquely truncate, margin erosely denticulate, apex acute. Pedicel ascending, 2–6 mm, filiform, slightly dorsiventrally flattened, minutely papillose; bracteoles absent. Calyx lower lobe obovate-oblong, 1.3–2 mm, apex rounded; upper lobe transversely elliptic, 1.1–1.5 mm, apex rounded. Corolla violet, with a yellow spot at base of lower lip, 4.5–6 mm; lower lip subquadrate, longer than upper lip, 2-lobed to ca. 1/2 its length, lobes ovate-oblong; spur narrowly cylindric from a conic base, somewhat longer than corolla lower lip, apex obtuse; palate with a slightly raised, rounded marginal rim; upper lip broadly ovate, ca. 2 × as long as upper calyx lobe, apex rounded. Filaments ca. 0.6 mm, strongly curved; anther thecae confluent. Ovary globose; style short; stigma lower lip semicircular and margin papillose, upper lip obsolete. Capsule globose, 2–3 mm, dehiscing by an ovate-oblong ventral pore. Seeds globose, 0.2–0.3 mm in diam.; seed coat with prominent nearly isodiametric coarse reticulations. Fl. Aug–Sep, fr. Sep–Oct.

Swamps, rice fields, wet grasslands; near sea level. S Guangdong, S Guangxi, Hainan [Indonesia (Papua Barat), Laos, Malaysia (peninsular), Thailand, Vietnam; N Australia].

**19. *Utricularia punctata*** Wallich ex A. Candolle, Prodr. 8: 5. 1844.

盾鳞狸藻 *dun lin li zao*

*Utricularia fluitans* Ridley.

Perennials, freely suspended aquatic. Rhizoids apparently absent. Stolons filiform, branched. Traps on leaves, shortly stalked, broadly obliquely ovoid, 1–2 mm, mouth lateral; appendages 2, dorsal, branched, setiform, with simple shorter setae. Leaves numerous on stolons, 2–6 cm, divided from near base into 2 or 3 primary segments; segments elliptic in outline, dichotomously divided into numerous further segments; ultimate segments capillary, terete, sparsely minutely setulose. Inflorescences erect, 6–20 cm, 5–10-flowered; peduncle terete, 0.6–1 mm thick, glabrous; scales few, similar to bracts; bracts basisolate, ovate, 2–2.5 mm, glandular. Pedicel erect, 3–10 mm, filiform, slightly dorsiventrally compressed; bracteoles absent. Calyx lobes orbicular, convex, 1–1.8 mm; lower lobe slightly

smaller, apex truncate to retuse; upper lobe apex rounded. Corolla lilac, violet, or white, with a yellow blotch at base of lower lip, 6–10 mm; lower lip transversely oblong-elliptic to subreniform, base with prominent 2-lobed swelling, apex rounded to retuse; spur narrowly conic,  $\pm$  as long as and parallel with lower lip, slightly curved, apex truncate to emarginate; palate margin glabrous; upper lip transversely elliptic, cucullate, apex rounded. Filaments ca. 1.5 mm, curved; anther thecae confluent. Ovary broadly ovoid; style evident, glandular; stigma lower lip transversely elliptic, upper lip semicircular to deltoid. Capsule ellipsoid, ca. 3 mm, dehiscing by longitudinal dorsal and ventral slits. Seed few per capsule, lenticular, ca. 2 mm in diam., margin broadly winged, wing irregularly dentate; seed coat with small prominent reticulations. Fl. Jun–Aug, fr. Jul–Sep.

Lakes, swamps, rice fields; near sea level. S Fujian (Longhai), S Guangxi (Dongxing) [Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

**20. *Utricularia gibba* Linnaeus, Sp. Pl. 1: 18. 1753.**

少花狸藻 shao hua li zao

*Utricularia diantha* Roxburgh ex Roemer & Schultes; *U. exoleta* R. Brown; *U. gibba* subsp. *exoleta* (R. Brown) P. Taylor; *U. khasiana* J. Joseph & Mani; *U. nagurae* Makino; *U. pterosperma* Edgeworth; *Vesiculina gibba* (Linnaeus) Rafinesque.

Annuals or perennials, affixed or suspended aquatic. Rhizoids absent or present, filiform, branched. Stolons filiform, much branched, often mat-forming. Traps lateral on leaf segments, stalked, ovoid, 1–2.5 mm, mouth lateral; appendages 2, dorsal, branched, setiform, with shorter setae. Leaves numerous on stolons, 0.5–1.5 cm; primary segments (1 or) 2, unbranched or sparsely dichotomously branched into 3–8 ultimate segments; ultimate segments capillary, slightly flattened, margin entire or sparsely denticulate, apex and teeth setulose. Inflorescences erect, 2–15 cm, 1–3(–6)-flowered; peduncle terete, 0.3–0.5 mm thick, glabrous; scale 1, similar to bracts; bracts basifixed, semiorbicular, ca. 1 mm, minutely glandular, apex truncate and obscurely dentate. Pedicel erect to spreading, 2–12 mm, filiform; bracteoles absent. Calyx lobes subequal, broadly ovate to orbicular, 1.5–2 mm, apex rounded. Corolla yellow, 4–8 mm; lower lip slightly smaller than upper lip, base with a prominent 2-lobed swelling, apex rounded; spur narrowly conic to cylindric from a conic base, shorter or longer than corolla lower lip, distal part sparsely stipitate glandular, apex obtuse; palate densely pubescent; upper lip broadly ovate to suborbicular, ca.  $2 \times$  as long as upper calyx lobe, apex obscurely 3-lobed. Filaments 1–1.5 mm, curved; anther thecae confluent. Ovary globose; style evident; stigma lower lip transversely elliptic, upper lip obsolete. Capsule globose, 2–3 mm in diam., 2-valvate. Seeds lenticular, 0.8–1 mm in diam., margin broadly winged, wing shallowly and irregularly dentate; seed coat with small prominent reticulations. Fl. Apr–Nov, fr. May–Dec.  $2n = 28$ .

Shallow still or slowly flowing water, pools, lakes, bogs, swamps, marshes, rice fields; near sea level to 900 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Hainan, S Henan, Hubei, Hunan, Jiangsu, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam;

Africa, tropical America, SW Asia, Europe, Indian Ocean islands (Mauritius), Madagascar, North and South America, Pacific islands (New Caledonia, Palau)].

**21. *Utricularia vulgaris* Linnaeus, Sp. Pl. 1: 18. 1753.**

狸藻 li zao

Perennials, suspended aquatic. Rhizoids usually present, filiform, with dichotomously divided branches. Stolons filiform, branched. Traps on leaf segments, stalked, ovoid, 1.5–5 mm, mouth lateral; appendages 2, dorsal, simple or branched, setiform, with shorter simple lateral setae. Leaves numerous on stolons, 1.5–6 cm, divided from base into 2 unequal primary segments; primary segments ovate, elliptic, or ovate-oblong in outline, pinnately divided into secondary segments; secondary segments dichotomously divided into many further segments; ultimate segments capillary, slightly flattened, apically and laterally minutely setulose, without or sometimes with short marginal teeth. Inflorescences erect, 10–30 cm, 3–12-flowered, glabrous; peduncle terete, 1–2.4 mm thick; scales 1–4, similar to bracts; bracts basifixed, broadly ovate, 3–7 mm, base cordate to auriculate, apex acute to obtuse. Pedicel erect at anthesis but decurved in fruit, terete, 0.6–1.5 cm; bracteoles absent. Calyx lobes ovate, 2.5–5 mm, glandular; lower lobe slightly shorter than upper lobe, apex obtuse to emarginate; upper lobe apex acute to subacute. Corolla yellow, 1.2–2 cm; lower lip transversely elliptic to broadly ovate, base with prominent swelling, margin strongly deflexed, apex retuse; spur narrowly conic to narrowly cylindric from a conic base, shorter than or  $\pm$  as long as corolla lower lip, straight or curved upward, apex slightly obtuse; palate distal 1/2 covered with short hairs and stipitate glands; upper lip broadly ovate, ca.  $2 \times$  as long as upper calyx lobe, apex retuse to truncate. Filaments ca. 2 mm, curved; anther thecae  $\pm$  distinct. Ovary globose, densely glandular; style evident; stigma lower lip suborbicular and ciliate, upper lip truncate to broadly deltoid. Capsule globose, ca. 5 mm in diam., circumscissile. Seeds prismatic,  $0.3\text{--}0.4 \times 0.5\text{--}0.7$  mm, 4–6-angled, narrowly winged on all angles; seed coat with small prominent slightly elongate reticulations. Fl. Jun–Aug, fr. Jul–Sep.

Lakes, pools, ditches, rivers, rice fields; near sea level to 3700 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang [Afghanistan, Kazakhstan, Mongolia, Pakistan, Russia, Uzbekistan; N Africa, SW Asia, Europe, North America].

- 1a. Spur conspicuously shorter than corolla lower lip,  $\pm$  straight, with internal glands on dorsal surface only ..... 21a. subsp. *vulgaris*
- 1b. Spur  $\pm$  as long as corolla lower lip, markedly curved upward, with internal glands on both dorsal and ventral surfaces ..... 21b. subsp. *macrorrhiza*

**21a. *Utricularia vulgaris* subsp. *vulgaris***

狸藻(原亚种) li zao (yuan ya zhong)

*Lentibularia vulgaris* (Linnaeus) Moench.

Spur conspicuously shorter than corolla lower lip,  $\pm$  straight, with internal glands on dorsal surface only.  $2n = (36\text{--})40, 44$ .

Lakes, pools; 2900–3700 m. Xizang [Afghanistan, Kazakhstan, Pakistan, Russia, Uzbekistan; N Africa, SW Asia, Europe].

**21b. *Utricularia vulgaris* subsp. *macrorhiza*** (Le Conte) R. T. Clausen, Cornell Univ. Agric. Exp. Sta. Mem. 291: 9. 1949.

弯距狸藻 *wan ju li zao*

*Utricularia macrorhiza* Le Conte, Ann. Lyceum Nat. Hist. New York 1: 73. 1824; *Lentibularia vulgaris* var. *americana* (A. Gray) Nieuwland & Lunell; *Megozipa macrorhiza* (Le Conte) Rafinesque; *U. vulgaris* var. *americana* A. Gray.

Spur  $\pm$  as long as corolla lower lip, markedly curved upward, with internal glands on both dorsal and ventral surfaces.  $2n = 44$ .

Lakes, pools, ditches, rivers, rice fields; near sea level to 3500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang [Mongolia, Russia (Altai to Kamchatka); North America].

P. Taylor (Kew Bull., Addit. Ser. 14: 594–598. 1989) treated *Utricularia vulgaris* subsp. *macrorhiza* as a *U. macrorhiza*.

**22. *Utricularia australis*** R. Brown, Prodr. 430. 1810.

南方狸藻 *nan fang li zao*

*Utricularia japonica* Makino; *U. neglecta* Lehmann; *U. sacciformis* Benjamin; *U. siakujiiensis* Nakajima ex H. Hara; *U. tenuicaulis* Miki; *U. vulgaris* var. *tenuicaulis* (Miki) F. T. Kuo ex J. Y. Hsiao.

Perennials, suspended aquatic. Rhizoids usually present, filiform, bearing numerous short dichotomously divided branches. Stolons filiform, branched. Traps on leaf segments, stalked, ovoid, 0.5–2.5 mm, mouth lateral or basal; appendages 2, dorsal, simple or branched, setiform, with shorter simple lateral setae. Leaves numerous, 1.5–4 cm, divided from base into  $2 \pm$  equal primary segments; primary segment ovate, elliptic, or ovate-oblong in outline, pinnately divided into secondary segments; secondary segments dichotomously divided into further segments; ultimate segments capillary, slightly flattened, margin sparsely denticulate, apex and teeth setulose. Inflorescences erect, (5–)10–30 cm, 3–8-flowered, glabrous; peduncle terete, 1–2 mm thick; scales 1–3, similar to bracts; bracts basifixed, suborbicular, 2–5 mm, base auriculate, apex rounded and obscurely tridentate. Pedicel erect at anthesis but decurved in fruit, terete, 1–2.5 cm; bracteoles absent. Calyx lobes ovate, 3–4 mm, subequal; lower lobe apex emarginate; upper lobe apex rounded. Corolla yellow, 1.2–1.5 cm; lower lip transversely elliptic, base with a prominent swelling, apex rounded to retuse; spur broadly conic, considerably shorter than corolla lower lip, slightly curved, apex obtuse; palate glabrous; upper lip broadly ovate, apex retuse. Filaments ca. 2 mm, curved; anther thecae distinct. Ovary globose, densely covered with sessile glands; style evident; stigma lower lip semicircular and ciliate, upper lip very short or obsolete. Capsule globose, 3–4 mm in diam., circumscissile. Seeds prismatic, 0.5–0.6  $\times$  0.5–0.7 mm, 4–6 angled, narrowly winged on all angles; seed coat with small prominent slightly elongate reticulations. Fl. Jun–Nov, fr. Jul–Dec.  $2n = 40, 44$ .

Lakes, pools, river backwaters, ditches, rice fields; near sea level to 2500 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Kashmir, Korea, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia (Sakhalin), Sri Lanka; Africa, SW Asia, Australia, Europe, Pacific islands (New Zealand)].

**23. *Utricularia intermedia*** Hayne, J. Bot. (Schrader) 1800(1): 18. 1800.

异枝狸藻 *yi zhi li zao*

*Lentibularia intermedia* (Hayne) Nieuwland & Lunell.

Perennials, usually affixed aquatic. Rhizoids usually present, filiform, with short dichotomously divided branches. Stolons filiform, sparsely branched, some green, others without chlorophyll. Traps lateral on reduced leaves on colorless stolons, stalked, ovoid, 1.5–4 mm, mouth lateral; appendages 2, dorsal, branched, setiform, with a few lateral simple setae. Leaves numerous on green stolons, suborbicular to elliptic in outline, 0.3–1.5(–2)  $\times$  0.4–1.8 cm, palmately divided from base into 2 or 3 primary segments; primary segments dichotomously divided from base into 2–5 further segments; ultimate segments flattened, narrowly linear, 0.2–0.7 mm wide, margin entire or sparsely denticulate, laterally and apically setulose. Inflorescences erect, 8–20 cm, 2–5-flowered, glabrous; peduncle terete, 0.4–0.8 mm thick; scales 1–3, similar to bracts; bracts basifixed, broadly ovate to ovate-deltoid, 2–4 mm, base conspicuously auriculate, apex acute. Pedicel erect, terete, 0.5–1.5 cm; bracteoles absent. Calyx lobes ovate, 3–5 mm; lower lobe slightly shorter than upper lobe, apex obtuse, shortly 2-cleft, or truncate; upper lobe apex acute. Corolla yellow, 0.9–1.5 cm; lower lip transversely elliptic, base with a prominent rounded swelling, apex rounded; spur subulate, slightly shorter than corolla lower lip, apex acute; palate glabrous; upper lip broadly ovate, apex rounded. Filaments ca. 2 mm, curved; anther thecae  $\pm$  confluent. Ovary globose, glandular; style relatively long; stigma lower lip circular and ciliate, upper lip deltoid and apex acute or 2-cleft. Capsule globose, 2.5–3 mm in diam., circumscissile. Seeds not seen. Fl. Jun–Sep.  $2n = 44$ .

Bogs, lakes, ponds; 300–4000 m. Heilongjiang, Jilin, Nei Mongol, W Sichuan, S and SE Xizang [Japan, Korea, Kyrgyzstan, Mongolia, Russia; Europe, North America].

**24. *Utricularia minor*** Linnaeus, Sp. Pl. 1: 18. 1753.

细叶狸藻 *xi ye li zao*

*Lentibularia minor* (Linnaeus) Rafinesque; *Utricularia minor* var. *multispinosa* Miki; *U. multispinosa* (Miki) Miki; *U. nepalensis* Kitamura; *U. rogersiana* Lace; *Xananthes minor* (Linnaeus) Rafinesque.

Perennials, usually affixed aquatic. Rhizoids absent. Stolons filiform, terete, sparsely branched, some green, others without chlorophyll. Traps lateral on leaf segments, shortly stalked, ovoid, 0.8–2.5 mm, mouth lateral; appendages 2, dorsal, long, branched, setiform, with a few lateral simple setae. Leaves numerous on green stolons, semicircular to suborbicular in outline, 2–15  $\times$  3–15 mm, palmately divided from base into 2 or 3 primary segments; primary segment dichotomously divi-

ded from base into 2–11 further segments; ultimate segments flattened, narrowly linear, 0.1–0.5 mm wide, margin entire or sparsely denticulate, apex acute, apex and teeth with or without microscopic setulae. Inflorescences erect, 5–20(–25) cm, 2–8-flowered, glabrous; peduncle terete, 0.3–1 mm thick; scales 2–4, similar to bracts; bracts basifixed, broadly ovate to ovate-deltoid, 1.5–2 mm, base conspicuously auriculate, apex acute to obtuse. Pedicel erect at anthesis but spreading and decurved in fruit, terete, 4–8 mm; bracteoles absent. Calyx lobes broadly ovate, 2–3 mm, subequal; lower lobe smaller, apex narrowly truncate; upper lobe apex subacute. Corolla lemon-yellow, 6–8 mm; lower lip broadly obovate, margin deflexed, apex rounded to retuse; spur saccate to obtusely broadly conic; palate elongate, with a raised marginal rim, distally narrowed and glandular; upper lip ovate to ovate-oblong, apex retuse. Filaments ca. 1.5 mm, curved; anther thecae  $\pm$  distinct. Ovary broadly ellipsoid; style relatively long; stigma lower lip broadly ovate and ciliate, upper lip deltoid and apex acute or 2- or 3-cleft. Capsule globose, 2–3 mm in diam., circumscissile. Seeds lenticular-prismatic,  $0.3\text{--}0.4 \times \text{ca. } 1$  mm, scarcely winged on angles; seed coat with small prominent  $\pm$  isodiametric reticulations. Fl. Aug–Sep, fr. Sep–Oct.  $2n = 40, 44$ .

Bogs, ponds, marshes; 3100–3700 m. Heilongjiang, Jilin, Nei Mongol, Shanxi, Sichuan, N Xinjiang, E Xizang, Yunnan [Afghanistan, Bhutan, India, Japan, Kashmir, Kyrgyzstan, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Russia, Uzbekistan; SW Asia, Europe, North America].

**25. *Utricularia aurea*** Loureiro, Fl. Cochinch. 1: 26. 1790.

黄花狸藻 huang hua li zao

*Utricularia confervifolia* Jackson ex D. Don; *U. extensa* Hance; *U. fasciculata* Roxburgh; *U. flexuosa* Vahl; *U. pilosa* (Makino) Makino; *U. vulgaris* Linnaeus var. *pilosa* Makino.

Perennials or annuals, suspended aquatic. Rhizoids usually present, verticillate at base or shortly above base of peduncle, fusiform, inflated, with filiform branches. Stolons filiform to

relatively thick, branched. Traps on leaf segments, stalked, obliquely ovoid, 1–4 mm, mouth lateral or basal; appendages 2 or sometimes absent, dorsal, sparsely branched, setiform. Leaves numerous on stolons, 2–8 cm, divided from base into 3 or 4(or 5) semiverticillate primary segments; primary segments ovate to oblong-lanceolate in outline, 1.5–3 cm wide, pinnately divided into secondary segments; secondary segments dichotomously divided from base into numerous further segments; ultimate segments capillary, slightly flattened, laterally and apically setulose; stipulelike auricles usually present at base of primary segments, semicircular in outline, divided dichotomously into filiform sparsely setulose segments. Inflorescences erect, 5–25 cm, 3–10-flowered, glabrous; peduncle terete, 0.5–1.5 mm thick; scales absent; bracts basifixed, broadly ovate to orbicular, 1–2 mm, apex rounded. Pedicel erect at anthesis but sharply deflexed and thickened in fruit, 0.4–2 cm, dorsiventrally compressed; bracteoles absent. Calyx lobes ovate, subequal, apex rounded to subacute; lower lobe often slightly broader than upper lobe, 2–3 mm at anthesis, becoming fleshy, 7–9 mm, and spreading to reflexed in fruit. Corolla pale yellow, 1–1.5 cm, pubescent or glabrous; lower lip transversely elliptic, base with a prominent 2-lobed swelling, apex rounded to emarginate; spur cylindric from a narrowly conic base,  $\pm$  as long as and parallel with lower lip, straight or slightly curved, apex obtuse to subacute; palate pubescent; upper lip broadly ovate, apex rounded. Filaments 1–1.5 mm, curved; anther thecae  $\pm$  confluent. Ovary ovoid; style evident; stigma lower lip semicircular, upper lip obsolete. Capsule globose, 4–5 mm in diam., circumscissile; persistent style greatly enlarged and elongated, often equaling or exceeding capsule. Seeds prismatic, 1–2 mm wide, 5- or 6-angled, narrowly winged on all angles; seed coat with  $\pm$  isodiametric obscure reticulations. Fl. Jun–Nov, fr. Jul–Dec.  $2n = 80$ .

Pools, lakes, swamps, river backwaters, rice fields; near sea level to 2700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Taiwan, Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan, Kashmir, Korea, Laos, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

## MYOPORACEAE

苦檻藍科 ku jian lan ke

Hong Deyuan (洪德元)<sup>1</sup>; Robert J. Chinnock<sup>2</sup>

Prostrate or erect shrubs or small trees, glabrous, glandular papillate or covered with stellate, villous, or glandular simple or branched trichomes, often with embedded resin cavities protruding from vegetative and floral parts, viscid to resinous. Stipules absent. Leaves simple, alternate to densely spiral, more rarely opposite or whorled, sessile to petiolate; leaf blade margin entire, serrate, crenate, or rarely lobed. Inflorescences a reduced dichasial cyme of 1–12 axillary flowers; bracts absent. Flowers bisexual, rarely functionally male or female. Sepals (4 or) 5 (or 6–9), distinct, basally connate, or rarely forming a deep calyx tube, valvate or imbricate,  $\pm$  persistent. Corolla bilabiate, campanulate, rarely urceolate, actinomorphic, or zygomorphic, 5-lobed, lower lip 1–3-lobed, upper lip 2–4-lobed. Stamens 4(–8), inserted in corolla tube, alternate with corolla lobes, included or exserted; filaments filiform; anther cells confluent, reniform or sagittate. Gynoecium of 2 connate carpels; ovary superior, 2-carpelled, becoming 4(–12)-loculed by division of ovary; ovules 1–3 (or 4) per locule, pendulous, anatropous; stigma capitate. Fruit usually indehiscent, rarely semi-dehiscent or subschizocarpic, dry or drupaceous with fleshy or watery mesocarp; endocarp woody. Seeds with a straight or slightly curved embryo; endosperm absent or sparse.

Seven genera and ca. 250 species: tropical America, E and SE Asia, Australia, Indian Ocean islands (Mauritius and Rodrigues); one species in China.

The family has recently been monographed (R. J. Chinnock, *Eremophila* and allied genera: A monograph of the plant family Myoporaceae, 1–672. 2007), and *Pentacoelium* was re-instated as a genus distinct from *Myoporum* Banks & Solander ex G. Forster. Although *Pentacoelium* is comparable vegetatively with species of *Myoporum*, the flowers are much larger and the fruit are quite different. The fruit of *Pentacoelium* are large and the most complex in the family. The fruit are similar in size and internal structures to *Bontia* Linnaeus, a genus endemic to the Caribbean and surrounding coastal areas of South America. Both genera show fruit features that suggest adaptation to dispersal by water, but the fruit of *Pentacoelium* are more complicated with a star-shaped inner woody zone and up to 10 locules and subapical lacunae extending down into the fruit.

Li Zhenyu. 2002. Myoporaceae. In: Hu Chiachi, ed., Fl. Reipubl. Popularis Sin. 70: 310–313.

### 1. PENTACOELIUM Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 151. 1846.

苦檻藍屬 ku jian lan shu

*Polycoelium* A. Candolle.

Shrubs, evergreen, slightly resinous, glandular papillate, glabrous. Leaves alternate, petiolate. Flowers axillary, solitary or in fascicles, pedicellate. Sepals 5, small, distinct, imbricate. Corolla regular to slightly zygomorphic. Stamens exserted. Fruit slightly fleshy at maturity but soon drying and exocarp separating from endocarp; exocarp papery; endocarp 2-zoned, outer zone light and spongy, inner zone 5–10-rayed star-shaped, hard, woody, and with a locule at base of each ray. Seed 1 per locule.

One species: restricted to coastal areas of SE China, S Japan, and N Vietnam.

**1. *Pentacoelium bontiioides*** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 151. 1846.

苦檻藍 ku jian lan

*Myoporum bontiioides* (Siebold & Zuccarini) A. Gray; *M. chinense* (A. Candolle) A. Gray; *Polycoelium bontiioides* (Siebold & Zuccarini) A. Candolle; *P. chinense* A. Candolle.

Shrubs 1–2 m tall. Stems erect, branched; twigs pale brown, terete, 3–5 mm in diam. Leaves alternate, glabrous; petiole 1–2 cm; leaf blade narrowly elliptic, elliptic, or oblanceolate-elliptic, 4–13  $\times$  1.5–4 cm, softly leathery, secondary veins 3 or 4 on each side of midvein, base attenuate, margin entire or rarely obscurely serrulate, apex acute to shortly acuminate and often mucronate. Flowers axillary, 1 or 2(–4) in fascicles. Pedicel 1–2.7 cm, apically thickened, glabrous. Sepals 5, ovate-

elliptic to triangular-ovate, 3.5–5.5 mm, with some translucent glands, glabrous, persistent, apex acute. Corolla white to pale pinkish purple with purple spots or streaks, funnel-shaped to campanulate, 5-lobed, outside glabrous; tube 1.2–1.5 cm, throat 5–6 mm broad; lobes ovate to broadly ovate, ca. 8 mm, inside basally sparsely pubescent, apex rounded. Stamens inserted in corolla tube ca. 1 mm from base, glabrous; filaments 1.5–1.8 cm; anthers ca. 2 mm. Gynoecium glabrous; ovary ovoid-spherical, ca. 2 mm, with 5–8 locules, apically tapering; style filiform, ca. 2.5 cm; stigma capitate, 5-lobed. Fruit purplish red but drying pale brown, ovoid-spherical, 1–1.5  $\times$  0.9–1.2 cm, fleshy, 5–8-ribbed when dry, apically tapering, glabrous, with 5–8 seeds. Fl. Apr–Jun, fr. May–Jul.

Sandy sites or stony thickets along coasts; near sea level. E Fujian, S Guangdong, S Guangxi (Fangcheng, Hepu), Hainan (Wanning, Xisha Qundao), W Taiwan, E Zhejiang (Dongtou) [S Japan, N Vietnam].

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## PHRYMACEAE

透骨草科 *tou gu cao ke*

Hong Deyuan (洪德元)<sup>1</sup>; Jun Wen (文军)<sup>2</sup>

Herbs, annual or perennial [or subshrubs to shrubs], erect, prostrate, creeping to ascending. Stems 4-angular or winged or terete, occasionally highly reduced. Stipules absent. Leaves simple, opposite; leaf blade margin serrate or entire or variously toothed. Inflorescences a terminal [or axillary] spike [or a terminal raceme or a cyme] or flowers solitary and axillary. Flowers perfect, with [or without] a bract and a bracteole. Calyx connate, 5-lobed or dentate; lobes usually less than 1/3 of calyx length. Corolla connate, tubular or cylindric, 2-lipped; lower lip with 3 imbricate lobes; upper lip 2-lobed. Stamens [2 or] 4, inserted in corolla tube or exserted, anterior 2 longer; anthers longitudinally dehiscent. Gynoecium of 2 connate carpels; ovary superior, 1- or 2-locular; stigma broadly 2-lobed to 2-lipped, receptive only on inner surface and close together upon contact. Fruit an achene (in *Phryma*), loculicidal capsule (e.g., in *Mimulus* Linnaeus) [or occasionally berrylike (in *Leucocarpus* D. Don)]. Seeds numerous, rarely to 1, with an oblong embryo; endosperm scanty.

About 14 genera and 150 species: worldwide, especially well developed in W North America and Australia; two genera and six species (four endemic) in China; one species treated here, one genus and five species previously treated in Fl. China 18 (see comment below).

Z. Yu Li (in FRPS 70: 314–317. 2002) treated Phrymaceae to include only the genus *Phryma*, but recent studies have shown that the family should include a number of genera previously considered to be part of Scrophulariaceae. For China Phrymaceae now includes *Mimulus* with five species (four endemic), which has already been treated for the *Flora of China* in Scrophulariaceae (D. Y. Hong & N. H. Holmgren, Fl. China 18: 40–41. 1998), and *Phryma* with a single species. Two additional genera from Scrophulariaceae in China, *Mazus* Loureiro and *Lancea* J. D. Hooker & Thomson, were included in Phrymaceae by P. R. Beardsley and R. G. Olmstead (Amer. J. Bot. 89: 1093–1102. 2002), but we have excluded these two genera from Phrymaceae (see B. Oxelman et al., Taxon 54: 411–425. 2005; Z. Xia et al., Amer. J. Bot. 96: 519–530. 2009).

Yang Han-pi. 1979. *Mimulus*. In: Tsoong Pu-chiu & Yang Han-pi, eds., Fl. Reipubl. Popularis Sin. 67(2): 164–172; Li Zhenyu. 2002. Phrymaceae. In: Hu Chiachi, ed., Fl. Reipubl. Popularis Sin. 70: 314–317.

### 1. PHRYMA Linnaeus, Sp. Pl. 2: 601. 1753.

透骨草属 *tou gu cao shu*

*Leptostachia* Adanson (1763), not *Leptostachya* Nees (1832, nom. cons. prop.).

Herbs, perennial, erect. Stems 4-angular. Stipules absent. Leaves simple, opposite; leaf blade margin serrate. Inflorescences a terminal [or axillary] spike. Flowers perfect, each with a bract and a bracteole. Calyx connate, tubular, 5-ribbed; limb 2-lipped; abaxial lip with 2 short triangular lobes; adaxial lip with 3 apically ± hooked long subulate lobes. Corolla connate, tubular-funnelform; limb 2-lipped; abaxial lip larger, patent, with 3 imbricate lobes; adaxial lip erect, margin subentire but apically emarginate or shallowly 2-lobed. Stamens 4, inserted in corolla tube, anterior 2 longer; filaments filiform; anthers dorsifixed, cells parallel, not convergent at apex, longitudinally dehiscent. Gynoecium pseudomonomerous (2-carpellate with 1 carpel reduced developmentally); ovary superior, 1-locular, with basal placentation and 1 orthotropous ovule; style single, apical, elongate; stigma 2-lipped. Fruit an achene, enveloped in persistent calyx, 1-seeded. Seeds with an oblong embryo; endosperm thin, with 2 layers of cells.

One species: E and S Asia, E North America.

**1. *Phryma leptostachya* Linnaeus subsp. *asiatica* (H. Hara) Kitamura, Acta Phytotax. Geobot. 17: 7. 1957.**

透骨草 *tou gu cao*

*Phryma leptostachya* var. *asiatica* H. Hara, Enum. Sperm. Jap. 1: 297. 1948; *P. asiatica* (H. Hara) O. Degener & I. Degener; *P. esquirolii* H. Léveillé; *P. humilis* Koidzumi; *P. leptostachya* var. *humilis* (Koidzumi) H. Hara; *P. leptostachya* var. *melanostachya* Kitagawa; *P. leptostachya* var. *nana* (Koidzumi) H. Hara; *P. leptostachya* var. *oblongifolia* (Koidzumi) Honda; *P. nana* Koidzumi; *P. oblongifolia* Koidzumi.

Herbs, perennial, (10–)30–80(–100) cm tall. Stems simple or sometimes with apical branches bearing inflorescences, erect,

4-angular, apically pubescent or rarely subglabrous. Leaves petiolate or sometimes apical ones sessile; petiole to 4 cm, puberulent; leaf blade ovate-oblong, ovate-lanceolate, ovate-elliptic, ovate-triangular, or broadly ovate, 1–16 × 1–8 cm, herbaceous, both surfaces puberulent and sometimes more densely so along veins, secondary veins 4–6 on each side of midvein, base cuneate, rounded, or truncate but often decurrent for middle and basal leaves, margin serrate, dentate, or crenulate, apex acuminate, acute, or rarely subrounded. Spikes terminal or axillary, puberulent; peduncle 3–20 cm; inflorescence axis 10–30 cm; bracts subulate to linear, 1–2.5 mm. Pedicel short, erect at anthesis but later reflexed; bracteoles 2, at base of pedicel, subulate to linear, 0.5–2 mm. Calyx tubular, 5-ribbed, puberulent

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outside; tube 2.5–3.2 mm at anthesis; abaxial teeth 2, triangular, ca. 0.3 mm; adaxial teeth 3, subulate, 1.2–2.3 mm, apex  $\pm$  hooked. Corolla light purplish, pale red, to white, tubular-funnelform, 6.5–7.5 mm, glabrous outside; tube 4–4.5 mm, ca. 1.5 mm broad at mouth, inside anteriorly puberulent; limb 2-lipped; abaxial lip 2.5–3 mm, apex 3-lobed with central lobe larger; adaxial lip erect, 1.3–2 mm, apex 2-lobed. Stamens inserted in corolla tube 2.5–3 mm from base, glabrous; filaments filiform, 1.5–1.8 mm, anterior 2 longer; anthers reniform-spherical, 0.3–0.4  $\times$  ca. 0.5 mm. Gynoecium glabrous; ovary obliquely oblong-lanceolate, 1.9–2.2 mm; style 3–3.5 mm; stigma 2-lipped, basal lip longer and oblong. Achene long ellipsoid, enveloped in persistent clavate calyx; persistent calyx tube 4.5–6 mm. Fl. Jun–Oct, fr. Aug–Dec.

Moist ravines, forests, roadsides, mountain slopes, hillsides; 300–2800 m. Anhui, Chongqing, Fujian, S Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang (Bomi, Gyirong), Yunnan, Zhejiang [Bhutan, N India, Japan, Kashmir, Korea, Nepal, N Pakistan, Russia (Far East), N Vietnam].

*Phryma leptostachya* subsp. *leptostachya* occurs in North America, from SE Canada to SE United States, W to South Dakota. The two intercontinental subspecies are morphologically highly similar, with the North American typical subspecies different in general from subsp. *asiatica* by having calyx tube 2–2.2 mm, adaxial calyx teeth nearly as long as calyx tube at anthesis, and adaxial corolla lip entire or emarginate. Yet they are genetically highly distinct (Z. Nie et al., Amer. J. Bot. 93: 1343–1356. 2005).

## PLANTAGINACEAE

车前科 che qian ke

Li Zhenyu (李振宇)<sup>1</sup>, Wei Lai (魏来)<sup>1</sup>; Ronald K. Hoggard<sup>2</sup>

Herbs or small shrubs, rarely arborescent. Stipules absent. Leaves spirally alternate, usually in a basal rosette, rarely opposite or whorled, simple; leaf blade veins (1 or)3–11, arcuate. Inflorescences spikes, rarely racemes or 1-flowered, pedunculate, each flower with 1 bract. Flowers small, protogynous, bisexual, rarely polygamous or unisexual. Calyx usually 4-parted, persistent, segments imbricate. Corolla scarious or membranous, gamopetalous, actinomorphic or rarely zygomorphic, (3 or)4-lobed; lobes imbricate. Stamens (1 or 2 or)4, inserted on corolla tube, alternate with lobes; anthers free, versatile, with an apical appendage, thecae 2 and parallel. Pistil consisting of 2 carpels; ovary superior, (1 or)2-loculed, axile or rarely basal; style 1, filiform, mostly longitudinally stigmatic. Fruit a pyxis, rarely an indehiscent capsule or nutlet, with 1 to numerous seeds. Seeds minute; cotyledons narrow; endosperm fleshy.

Two genera and more than 210 species: cosmopolitan; one genus and 22 species (three endemic, four introduced) in China.

Li Zhenyu. 2002. Plantaginaceae. In: Hu Chiachi, ed., Fl. Reipubl. Popularis Sin. 70: 318–345.

### 1. PLANTAGO Linnaeus, Sp. Pl. 1: 112. 1753.

车前属 che qian shu

*Bougueria* Decaisne; *Psyllium* Miller.

Herbs, or rarely small shrubs or arborescent, annual, biennial, or perennial, acaulescent or infrequently stemmed, with a taproot, caudex, or only numerous fibrous roots. Leaves simple; petiole vaginate at base; leaf blade ovate, elliptic, oblong, lanceolate, linear, or subulate, margin entire, repand, erose, or toothed, rarely pinnately or palmately cleft. Inflorescences arising from rosette or leaf axil of stem, spikes, narrowly cylindric, capitate, or rarely 1-flowered. Corolla salverform or tubular, persistent; tube cylindric or constricted at throat, as long as or slightly longer than calyx; limb 4-parted. Stamens (1 or 2 or)4; anthers ovoid, suborbicular, ellipsoid, or oblong. Ovary 2-loculed or rarely 1-locular but sometimes with an apical third compartment, placentation axile or rarely basal, with 1 to numerous ovules per locule. Fruit a pyxis, rarely an indehiscent capsule or nutlet, with 1 to numerous seeds. Seeds peltately inserted; testa mucilaginous when wet; embryo straight; cotyledons parallel or vertical to ventral (hilum) side.

About 200 species: cosmopolitan; 22 species (three endemic, four introduced) in China.

- 1a. Stem erect, with elongated internodes; leaves opposite, rarely in whorls of 3; corolla brownish ..... 22. *P. arenaria*
- 1b. Stem absent or very short; leaves usually in basal rosette, rarely densely alternate; corolla white or yellowish.
  - 2a. Plant with only fibrous roots.
    - 3a. Leaf blade lanceolate to linear-lanceolate, 3–4 × as long as wide; corolla yellowish; anthers 1.8–2.2 mm ..... 7. *P. fengdouensis*
    - 3b. Leaf blade broadly ovate to broadly elliptic, less than 2 × as long as wide; corolla white; anthers 0.8–1.5 mm.
      - 4a. Flower sessile; pyxis circumscissile at or just below middle, with (8–)12–14(–34) seeds; seeds 0.8–1.2 mm ..... 3. *P. major*
      - 4b. Flower shortly pedicellate; pyxis circumscissile near base, with (2–)5–15 seeds; seeds (1.2–)1.3–2 mm.
        - 5a. Sepals acuminate at apex, keel projecting beyond apex; anthers ca. 0.8 mm ..... 5. *P. cavaleriei*
        - 5b. Sepals obtuse or acute at apex, keel not projected at apex; anthers 1–1.5 mm.
          - 6a. Petiole not winged at middle; corolla lobes narrowly triangular; anthers 1–1.2 mm ..... 4. *P. asiatica*
          - 6b. Petiole broadly winged; corolla lobes ovate to broadly ovate; anthers ca. 1.5 mm ..... 6. *P. gentianoides*
    - 2a. Plant with a taproot.
      - 7a. Leaf blade broadly ovate to elliptic, veins 7–11; petiole retrorsely pubescent; stamens adnate to near base of corolla tube.
        - 8a. Plants turning black when dry; petiole longer than or equaling blade, not winged; bracts glabrous ..... 1. *P. maxima*
        - 8b. Plants not turning black when dry; petiole much shorter than blade, winged; bracts pubescent ..... 2. *P. media*
      - 7b. Leaf blade obovate, elliptic, lanceolate, or linear, veins 1–5(or 7); petiole with patent, appressed upward, or rarely entangled trichomes; stamens adnate to middle of corolla tube or more apically.
        - 9a. Corolla tube pubescent or lobes hirsute-villous outside.

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- 10a. Leaf blade papery, sparsely villous; corolla lobes densely hirsute-villous outside; stamens adnate to near apex of corolla tube ..... 20. *P. lagocephala*
- 10b. Leaf blade leathery, sparsely strigillose or glabrous; corolla tube pubescent; stamens adnate to middle of corolla tube ..... 21. *P. maritima*
- 9b. Corolla glabrous.
  - 11a. Lower sepals connate to near apex; stamens adnate to middle of corolla tube ..... 16. *P. lanceolata*
  - 11b. All sepals distinct; stamens adnate to or near apex of corolla tube.
    - 12a. Bracts with linear to subulate apex, much longer than flower ..... 17. *P. aristata*
    - 12b. Bracts with obtuse or acute apex, shorter, equaling, or slightly longer than flower.
      - 13a. Leaf blade glabrous or abaxially pubescent, vein 1; seeds 7–30 per pyxis, fusiform.
        - 14a. Bracts broadly ovate to suborbicular; sepals broadly elliptic to orbicular; pyxis with 12–30 seeds ..... 14. *P. polysperma*
        - 14b. Bracts ovate; sepals obovate; pyxis with 7–15 seeds ..... 15. *P. tenuiflora*
      - 13b. Leaf blade hairy on both surfaces, veins (1 or) 3–7; seeds 1–4 per pyxis, ellipsoid to oblong.
        - 15a. Leaf blade elliptic, ovate-lanceolate, obovate-lanceolate, or spatulate, usually more than 1 cm wide.
          - 16a. Leaf blade spatulate to obovate-lanceolate, veins (3 or) 5; flowers heteromorphic; corolla yellowish, lobes erect when flowers fertile; seeds 2 per pyxis, ventral surface grooved ..... 8. *P. virginica*
        - 16b. Leaf blade elliptic to ovate-lanceolate, rarely obovate-elliptic, veins 5 or 7; flowers homomorphic; corolla white, lobes patent to reflexed; seeds 4 per pyxis, ventral surface flat or prominent but not grooved.
          - 17a. Bracts triangular-ovate; corolla lobes 0.5–1 mm; anthers white; pyxis 4–5 mm ..... 9. *P. depressa*
          - 17b. Bracts ovate-elliptic; corolla lobes 1–1.5 mm; anthers reddish brown; pyxis 2.5–3 mm ..... 10. *P. camtschatica*
    - 15b. Leaf blade ± linear to narrowly lanceolate or narrowly elliptic, usually less than 1 cm wide.
      - 18a. Leaf blade arachnoid or silky villous; spikes cylindric to narrowly cylindric.
        - 19a. Leaf blade arachnoid, veins 1 or 3, margin entire or repand-crenate; spikes 1–2.5(–5) cm; flowers dense; anthers ca. 1.2 mm ..... 13. *P. arachnoidea*
        - 19b. Leaf blade sparsely silky villous, veins 3 or 5, margin remotely and retrorsely denticulate or triangular dentate; spikes 4–10 cm; flowers usually interrupted at base; anthers ca. 2 mm ..... 12. *P. perssonii*
      - 18b. Leaf blade villous or lanate; spikes capitate or ovoid at first but later shortly cylindric.
        - 20a. Keel not extending to apex of sepals; seeds 3 or 4 per pyxis, black, (1–)1.5–2 mm, ventral face flat; cotyledons parallel to ventral side ..... 11. *P. komarovii*
        - 20b. Keel extending to apex of sepals; seeds 1 or 2 per pyxis, yellowish brown to brown, (2–)3–4 mm, ventral face with a groove; cotyledons vertical to ventral side.
          - 21a. Plants with short stems, usually branched at base; corolla lobes orbicular-ovate ..... 18. *P. ovata*
          - 21b. Plants stemless; corolla lobes elliptic to narrowly ovate ..... 19. *P. minuta*

1. *Plantago maxima* Jussieu ex Jacquin, Collectanea 1: 82. 1787.

巨车前 ju che qian

Herbs, perennial, robust. Taproot cylindric. Leaves basal; petiole 8–20 cm, densely retrorsely pubescent; blade broadly elliptic, broadly ovate, or broadly obovate, 8–20 × 5–14 cm, thickly papery, turning black when dry, white pubescent, veins

7–11, base broadly cuneate to decurrent onto petiole, margin entire or remotely repand-crenate, apex acute to rounded. Spikes cylindric, 6–20 cm, densely flowered; peduncle 20–50 cm, pubescent; bracts narrowly ovate, slightly shorter than calyx, glabrous, keel apparent. Sepals narrowly elliptic to ovate-elliptic, 2.2–2.5 mm, glabrous, keel broad, extending to apex. Corolla white, glabrous; lobes ovate-lanceolate, 1.5–2 mm, patent to reflexed, apex acute. Stamens lilac turning black when

dry, adnate only to near base of corolla tube, exserted; anthers ovoid-ellipsoid, 1.6–1.8 mm. Pyxis ovoid, 3–4 mm, with 2–4 seeds. Seeds yellowish brown to black, ovoid to narrowly ovoid, 1.9–2.4 mm, ventral face prominent; cotyledons parallel to ventral side. Fl. Jun–Aug, fr. Aug–Sep.  $2n = 24$ .

Meadows; 500–1000 m. N Xinjiang (Altay, Yining) [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; E Europe].

**2. *Plantago media* Linnaeus, Sp. Pl. 1: 113. 1753.**

北车前 bei che qian

*Plantago media* var. *urvilleana* Rapin; *P. stepposa* Kupria-nova.

Herbs, perennial. Taproot cylindric, thick. Leaves basal; petiole 0.5–8 cm, winged, densely retrorsely pubescent; leaf blade elliptic, ovate, or obovate, 4.5–13 × 1.5–5 cm, papery to thickly papery, white pubescent, veins 7 or 9, base cuneate to attenuate, margin entire or remotely repand-crenate, apex acute. Spikes cylindric, 3–8 cm, densely flowered; peduncle 15–40(–45) cm, white pubescent; bracts narrowly ovate, 2–3 mm, basally and adaxially pubescent, keel thick, apex subacute. Sepals as long as bract, glabrous, keel not extending to apex; lower sepals ovate-elliptic to broadly ovate; upper sepals broadly ovate. Corolla white, glabrous; lobes ovate-elliptic to ovate, 1.7–2.3 mm, patent to reflexed. Stamens lilac turning black when dry, adnate to near base of corolla tube, exserted; anthers oblong, 1.7–1.9 mm. Pyxis ovoid-ellipsoid, 2.5–4 mm, with 2–4 seeds. Seeds yellowish brown to brown, ellipsoid, 1.5–2 mm, shiny, ventral face prominent; cotyledons parallel to ventral side. Fl. Jun–Aug, fr. Jul–Sep.  $2n = 12^*, 24$ .

Meadows, wet banks, ravines, mountain slopes, terraces; 1400–2000 m. Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Russia (Far East, Siberia); SW Asia, Europe].

**3. *Plantago major* Linnaeus, Sp. Pl. 1: 112. 1753.**

大车前 da che qian

*Plantago gigas* H. Léveillé; *P. intermedia* Gilibert; *P. jehohlsensis* Koidzumi [“*jepohlsensis*”]; *P. macronipponica* Yamamoto; *P. major* var. *gigas* (H. Léveillé) H. Léveillé; *P. major* subsp. *intermedia* (Gilibert) Lange; *P. major* var. *jehohlsensis* (Koidzumi) S. H. Li; *P. major* var. *kimurae* Yamamoto; *P. major* var. *paludosa* Béguinot; *P. major* var. *pauciflora* (Gilibert) Béguinot; *P. major* subsp. *pleiosperma* Pilger; *P. major* var. *sawadae* Yamamoto; *P. major* var. *sinuata* (Lamarck) Decaisne; *P. pauciflora* Gilibert; *P. sawadae* (Yamamoto) Yamamoto; *P. sinuata* Lamarck; *P. villifera* Kitagawa (1935), not Franchet (1879).

Herbs, perennial. Roots numerous, fibrous. Leaves basal, pubescent to subglabrous; petiole 1–10(–26) cm; leaf blade broadly ovate to broadly elliptic, 3–18(–30) × 2–11(–21) cm, herbaceous to papery, veins (3 or) 5 or 7, base cuneate, subrounded, or cordate, ± decurrent onto petiole, margin remotely dentate to subentire, apex acute to obtuse. Spikes narrowly cylindric to cylindric, 1–20(–40) cm, usually interrupted basally; peduncle 2–18(–45) cm, pubescent; bracts broadly ovate-triangular, 1.2–2 mm, glabrous or pubescent at apex, keel broad and

thick. Flowers sessile. Sepals 1.5–2.5 mm, glabrous or ciliate, keel not extending to apex, apex rounded; lower sepals elliptic to broadly elliptic; upper sepals broader. Corolla white, glabrous; lobes narrowly ovate, 1–1.5 mm, patent to reflexed. Stamens adnate only to near base of corolla tube, exserted; anthers purplish or white, ellipsoid, 1–1.2 mm. Pyxis subglobose, ovoid, or broadly ellipsoid, 2–3 mm, circumscissile at or just below middle, with (8–)12–24(–34) seeds. Seeds yellowish brown, ovoid, ellipsoid, or rhomboid, 0.8–1.2 mm, angled, ventral face prominent to slightly flat; cotyledons parallel to ventral side. Fl. Jun–Aug, fr. Jul–Sep.  $2n = 12, 18, 24$ .

Meadows, wet places, wastelands; near sea level to 2800 m. Anhui, Chongqing, Fujian, Gansu, Guangxi, Hainan, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [India, Nepal, Pakistan; C, N, and SW Asia, Europe].

*Plantago major* is widely naturalized throughout much of the world.

**4. *Plantago asiatica* Linnaeus, Sp. Pl. 1: 113. 1753.**

车前 che qian

Herbs, perennial. Roots numerous, fibrous. Leaves basal; petiole 2–15(–27) cm, sparsely pubescent; leaf blade broadly ovate to broadly elliptic, 4–12 × 2.5–6.5 cm, thinly papery to papery, sparsely pubescent, veins 3–7, base broadly cuneate to subrounded and decurrent onto petiole, margin entire, repand, serrate, or dentate, apex obtuse to acute. Spikes narrowly cylindric, 3–40 cm, loosely to densely flowered, sometimes interrupted basally; peduncle 5–30 cm, white pubescent; bracts narrowly ovate-triangular to triangular-lanceolate, 2–3 mm, glabrous or pubescent at apex, keel thick. Sepals 2–4 mm, keel extending or not extending to apex, apex obtuse, rounded, or acute; lower sepals elliptic, keel broad; upper sepals broadly obovate-elliptic to broadly obovate. Corolla white, glabrous; lobes narrowly triangular, (0.7–)1–1.5 mm, patent to reflexed, apex acuminate to acute. Stamens adnate only to near base of corolla tube, exserted; anthers white, ovoid-ellipsoid, 1–1.2 mm. Pyxis fusiform-ovoid, ovoid, conic-ovoid, or narrowly conic-ovoid, 3–6(–8) mm, circumscissile near base, with 5–15 seeds. Seeds blackish brown, ovoid-ellipsoid to ellipsoid, 1.2–2 mm, angled, ventral face prominent to slightly flat; cotyledons parallel to ventral side. Fl. Apr–Aug, fr. Jun–Sep.

Mountain slopes, ravines, riverbanks, fields, roadsides, wastelands, lawns; near sea level to 3800 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, Sri Lanka].

Although *Plantago asiatica* and *P. erosa* (*P. asiatica* subsp. *erosa*) have sometimes been treated as synonyms of *P. major* (J. Parnell, Fl. Thailand 9(2): 153. 2008), molecular evidence does not support this (N. Rensted et al., Bot. J. Linn. Soc. 139: 323–338. 2002; N. Ishikawa et al., Amer. J. Bot. 96: 1627–1635. 2009).

1a. Sepals 3.5–4 mm, apex acute; pyxis narrowly conic-ovoid, 5–6(–8) mm

..... 4c. subsp. *densiflora*

- 1b. Sepals 2–3 mm, apex rounded to obtuse; pyxis fusiform-ovoid, ovoid, or conic-ovoid, 3–4.5 mm.  
 2a. Leaf blade veins 5 or 7; keel not extending to apex of sepal; corolla lobes ca. 1.5 mm ..... 4a. subsp. *asiatica*  
 2b. Leaf blade veins 3(or 5); keel extending to apex of sepal; corolla lobes (0.7–)1–1.2 mm ..... 4b. subsp. *erosa*

#### 4a. *Plantago asiatica* subsp. *asiatica*

车前(原亚种) che qian (yuan ya zhong)

*Plantago asiatica* var. *brevior* Pilger; *P. asiatica* var. *densiuscula* Pilger; *P. asiatica* var. *laxa* Pilger; *P. asiatica* var. *lobulata* Pilger; *P. formosana* Tateishi & Masamune; *P. hostifolia* Nakai & Kitagawa; *P. major* Linnaeus var. *asiatica* (Linnaeus) Decaisne; *P. major* var. *folioscopa* T. Ito.

Leaf blade veins 5 or 7. Spikes loosely to densely flowered. Sepals 2–3 mm, keel not extending to apex, apex rounded to obtuse. Corolla lobes ca. 1.5 mm. Pyxis fusiform-ovoid to conic-ovoid, 3–4.5 mm, with 5 or 6(–12) seeds. Seeds (1.2–)1.5–2 mm. Fl. Apr–Aug, fr. Jun–Sep.  $2n = 12, 24, 36$ .

Mountain slopes, ravines, riverbanks, fields, roadsides, wastelands, lawns; near sea level to 3200 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Indonesia, Japan, Korea, Malaysia].

4b. *Plantago asiatica* subsp. *erosa* (Wallich) Z. Yu Li, Fl. Reipubl. Popularis Sin. 70: 328. 2002.

疏花车前 shu hua che qian

*Plantago erosa* Wallich in Roxburgh, Fl. Ind. 1: 423. 1820; *P. centralis* Pilger.

Leaf blade veins 3(or 5). Spikes usually loosely flowered and interrupted. Sepals 2–2.5 mm, keel extending to apex, apex rounded to obtuse. Corolla lobes (0.7–)1–1.2 mm. Pyxis conic-ovoid, 3–4 mm, with 6–15 seeds. Seeds 1.2–1.7(–2) mm. Fl. May–Jul, fr. Aug–Sep.  $2n = 24$ .

Mountain slopes, riverbanks, ravines, fields, roadsides; 400–3800 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Qinghai, Shanxi, Sichuan, Xizang, Yunnan [Bangladesh, Bhutan, India, Nepal, Sri Lanka].

4c. *Plantago asiatica* subsp. *densiflora* (J. Z. Liu) Z. Yu Li, Fl. Reipubl. Popularis Sin. 70: 328. 2002.

长果车前 chang guo che qian

*Plantago densiflora* J. Z. Liu, Acta Phytotax. Sin. 27: 298. 1989 [“*densiflorus*”].

Leaf blade veins 3 or 5. Spikes densely flowered, sometimes interrupted basally. Sepals 3.5–4 mm, keel not extending to apex, apex acute. Corolla lobes 1.3–1.5 mm. Pyxis narrowly conic-ovoid, 5–6(–8) mm, with (5–)10–15 seeds. Seeds 1.2–2 mm. Fl. Jun–Aug, fr. Aug–Sep.

• Mountain slopes, roadsides; 700–3500 m. Chongqing, Guizhou, Hubei, Hunan, Xizang, Yunnan.

5. *Plantago cavaleriei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 2: 114. 1906.

尖萼车前 jian e che qian

*Plantago gigas* H. Léveillé var. *cavaleriei* (H. Léveillé) H. Léveillé; *P. schneideri* Pilger; *P. schneideri* var. *delicior* Pilger.

Herbs, perennial. Roots numerous, fibrous. Leaves basal; petiole 5–12 cm; leaf blade broadly ovate to elliptic, (2.5–)3.5–10 × (1–)2–5 cm, papery, pubescent to subglabrous, veins 5(or 7), base broadly cuneate to rounded and decurrent onto petiole, margin entire, remotely serrate, or dentate, apex rounded to acute. Spikes narrowly cylindric, 3–20 cm, usually interrupted basally; peduncle 5–25 cm, pubescent; bracts broadly ovate to broadly ovate-triangular, 1–2.3 mm, keel projecting beyond apex, apex acuminate. Sepals 2–2.8 mm, keel projected at apex, apex acuminate; lower sepals ovate-elliptic, keel broad; upper sepals broadly ovate to broadly ovate-orbicular, keel narrow and obviously projected. Corolla white, glabrous; tube slightly longer than calyx; lobes narrowly triangular, 1–1.5 mm, patent to reflexed, apex acuminate. Stamens adnate only to near base of corolla tube, exserted; anthers white, ovoid, ca. 0.8 mm. Pyxis narrowly conic-ovoid, 4–4.5 mm, circumscissile near base, with 6–9 seeds. Seeds dark brown, ovoid to ellipsoid, angled, 1.2–1.8 mm, ventral face prominent; cotyledons parallel to ventral side. Fl. May–Aug, fr. Jul–Sep.

• Wet mountain valleys, riverbanks, lake banks, roadsides; 200–3500 m. Guizhou, S Sichuan (Meigu), Yunnan.

6. *Plantago gentianoides* Sibthorp & Smith subsp. *griffithii* (Decaisne) K. H. Rechinger, Fl. Iran. 15: 9. 1965.

革叶车前 ge ye che qian

*Plantago griffithii* Decaisne in A. Candolle, Prodr. 13(1): 700. 1852 [“*griffithsii*”]; *P. gentianoides* var. *laxa* Pilger; *P. gentianoides* var. *tatarica* (Decaisne) Pilger; *P. griffithii* var. *alpina* Bornmüller; *P. griffithii* var. *pamirica* Fedtschenko; *P. tatarica* Decaisne.

Herbs, perennial. Roots numerous, fibrous. Leaves basal, glabrous or sparsely pubescent when young; petiole 1–3(–4) cm, broadly winged; leaf blade thinly leathery to leathery when dry, ovate, broadly ovate, or broadly elliptic, (1–)2–6 × 1.5–2.5 cm, veins 3 or 5, base broadly cuneate to subrounded and decurrent onto petiole, margin entire, repand, or shallowly crenate below middle, apex acute to acuminate. Spikes capitate to cylindric, 1–3 cm, densely flowered or interrupted basally; peduncle 2–10 cm, apically appressed pubescent; bracts broadly ovate to broadly ovate-triangular, 2.2–2.5 mm, glabrous, keel broad but not extending to apex. Sepals 2–2.5 mm, glabrous, keel narrower than on bract and extending to apex; lower sepals broadly obovate-elliptic to broadly elliptic; upper sepals broadly elliptic to elliptic. Corolla white turning brown when dry, glabrous; lobes ovate to broadly ovate, 1.2–1.3 mm, patent to reflexed, apex sometimes emarginate. Stamens adnate only to near base of corolla tube, exserted; anthers yellowish brown when dry, ellipsoid, ca. 1.5 mm. Pyxis ellipsoid to ovoid, apex truncate, circumscissile near base, with 2–4(–7) seeds. Seeds brown to blackish brown, ellipsoid, ca. 2 mm, angled, ventral face flat;

cotyledons parallel to ventral side. Fl. Jun–Aug, fr. Aug–Sep.  $2n = 12$ .

Riverbanks, moist stony pastures; 3000–4300 m. SW Xinjiang, NW Xizang [Afghanistan, Kashmir, Kyrgyzstan, Pakistan; SW Asia (Iran)].

*Plantago gentianoides* subsp. *gentianoides* occurs in SE Europe and differs from subsp. *griffithii* by having leaf blade ovate-lanceolate to broadly ovate, herbaceous to papery when dry, base cuneate, apex acute, and anthers yellow when dry.

**7. *Plantago fengdouensis*** (Z. E. Chao & Yong Wang) Yong Wang & Z. Yu Li, *Acta Phytotax. Sin.* 42: 558. 2004.

丰都车前 feng du che qian

*Plantago erosa* Wallich var. *fengdouensis* Z. E. Chao & Yong Wang, *J. Wuhan Bot. Res.* 20: 263. 2002.

Herbs, perennial. Roots numerous, fibrous. Leaves basal; petiole 1.5–10 cm; leaf blade lanceolate to linear-lanceolate, 4–15 × 1–4 cm, thinly papery to papery, glabrous or white pubescent near sinus between lobes, veins 3 (or 5), base narrowly cuneate to decurrent onto petiole, margin dentate to incised, each side with 1–5 triangular to linear lobes or rarely repand, apex acute to acuminate. Spikes narrowly cylindric, 2–15 cm, densely flowered, loose or interrupted basally; peduncle 4–15 cm, glabrous; bracts ovate-triangular, 2–3 mm, apically ciliate, keel thick and extending to apex. Sepals elliptic, 2.2–2.7 mm, glabrous; lower sepals longer than upper ones, keel extending to or near apex, apex subacute to rounded. Corolla yellowish, glabrous; lobes narrowly triangular, 1.4–1.6 mm, patent to reflexed, apex acuminate. Stamens adnate only to near base of corolla tube, exserted; anthers yellow, ellipsoid-ovoid, 1.8–2.2 mm. Pyxis fusiform-ellipsoid, 3–4 mm, circumscissile just below middle, with 2 or 3 seeds. Seeds blackish brown, ellipsoid to ovoid-ellipsoid, sometimes angled, with a shallow groove on ventral face; cotyledons parallel to ventral side. Fl. Apr–May, fr. Apr–May.  $2n = 24^*$ .

● Seasonally inundated alluvial areas on islets; below 200 m. Chongqing (Banan Qu, Fengdu, Zhongxian).

*Plantago fengdouensis* is an amphibious plant with a highly restricted distribution, occurring only between 140 and 160 m on the three alluvial islets in Fengdu and Zhongxian counties and Bannan district within the Three Gorges Dam area. The natural habitats were permanently submerged by the water project in Jun 2003. The living plants are conserved at Wuhan Botanical Garden and Beijing Botanical Garden of the Chinese Academy of Sciences and were reintroduced to Fengdu in 2008.

**8. *Plantago virginica*** Linnaeus, *Sp. Pl.* 1: 113. 1753.

北美车前 bei mei che qian

Herbs, annual or winter annuals. Taproot tenuous. Leaves basal; petiole 0.5–5 cm, winged or not winged; leaf blade oblanceolate, spatulate, or obovate-lanceolate, (2–)3–18 × 0.5–4 cm, sparsely white pubescent, veins (3 or 5), base narrowly cuneate to decurrent onto petiole, margin repand, irregularly dentate, or subentire, apex acute to obtuse. Spikes narrowly cylindric, (1–)3–18 cm, base usually interrupted; peduncle 4–20 cm, hollow, densely white pubescent. Sepals as long as or slightly shorter than bract, pubescent; lower sepals obovate, keel not extending to apex; upper sepals broadly ovate, keel narrower

and projected at apex. Corolla yellowish, glabrous; lobes ovate-lanceolate, 1.5–2.5 mm, erect to reflexed, apex acuminate. Stamens adnate to near apex of corolla tube, included or exserted; anthers yellowish, narrowly ovoid to broadly ellipsoid, 0.3–1.1 mm. Pyxis ovoid, 2–3 mm, circumscissile near base, with 2 seeds. Seeds light brown, ovoid to narrowly ovoid, (1–)1.4–1.8 mm, with a shallow groove on ventral face; cotyledons parallel to ventral side. Fl. Apr–May, fr. May–Jun.  $2n = 12, 24$ .

Naturalized in grasslands, roadsides, and lake banks; near sea level to 800 m. Anhui, Chongqing, Fujian, Guangxi, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [native to North America; naturalized in Central America, Europe, and Japan].

*Plantago virginica* was first collected in China in Nanchang Shi, Jiangxi, in 1951. In China this species usually has cleistogamous coxexual flowers. Cleistogamous female flowers and chasmogamous male flowers are rare. Cleistogamous coxexual flowers have erect corolla lobes, included anthers and stigma, and narrowly ovoid ca. 0.3 mm anthers. Cleistogamous female flowers are similar to coxexual flowers but with vestigial anthers and an exserted stigma. Chasmogamous male flowers have patent to reflexed corolla lobes, exserted stamens, broadly ellipsoid 1–1.1 mm anthers, and often a vestigial ovary.

In North America *Plantago virginica* is typically cleistogamous and coxexual; however, flowers, inflorescences, or entire plants are frequently chasmogamous and functionally male or cleistogamous with exserted stigmas and functionally female.

**9. *Plantago depressa*** Willdenow, *Enum. Pl. Suppl.* 8. 1813.

平车前 ping che qian

Herbs, annual, winter annual, or perennial. Taproot long, ± fleshy or becoming woody when old. Leaves basal, sparsely or densely white pubescent; petiole 2–7 cm; leaf blade elliptic, elliptic-lanceolate, obovate-elliptic, or ovate-lanceolate, 3–15 × 1–5.5 cm, papery, veins 5 or 7, base cuneate and decurrent onto petiole, margin repand-crenate, irregularly serrate, dentate, or entire, apex acute to obtuse. Spikes narrowly cylindric, 6–12 cm, densely flowered, interrupted basally; peduncle 5–18 cm, white pubescent; bracts triangular-ovate, 2–3.5 mm, glabrous, keel extending near or to apex. Sepals 2–2.5 mm, glabrous, keel not extending to apex; lower sepals narrowly obovate-elliptic to broadly elliptic; upper sepals obovate-elliptic to broadly elliptic. Corolla white, glabrous; lobes elliptic to ovate, 0.5–1 mm, patent to reflexed. Stamens adnate to near apex of corolla tube, exserted; anthers white, ovoid-ellipsoid to broadly ellipsoid, 0.6–1.5 mm. Pyxis ovoid-ellipsoid to conic-ovoid, 4–5 mm, circumscissile near base, with 4 seeds. Seeds yellowish brown to black, ellipsoid, 1.2–1.8 mm, ventral face prominent to slightly flat; cotyledons parallel to ventral side. Fl. May–Jul, fr. Jul–Sep.

Meadows, wet mountain slopes, riverbanks, wet places, fields, roadsides; near sea level to 4500 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, E Nei Mongol, Ningxia, Qinghai, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, E Russia].

- 1a. Annuals or winter annuals; taproot ± fleshy; leaves sparsely pubescent, leaf blade 3–12 × 1–3.5 cm, margin repand-crenate, irregularly serrate, or dentate; anthers 0.6–1.1 mm ..... 9a. subsp. *depressa*

- 1b. Perennials; taproot and rootstock woody when old; leaves densely pubescent, leaf blade  $9-15 \times 2.5-5.5$  cm, margin entire or rarely repand-crenate; anthers 0.7–1.5 mm ..... 9b. subsp. *turczaninowii*

**9a. *Plantago depressa* subsp. *depressa***

平车前(原亚种) ping che qian (yuan ya zhong)

*Plantago depressa* var. *magnibracteata* T. Tanaka & T. K. Zheng; *P. sibirica* Poiret; *P. tibetica* J. D. Hooker.

Annuals or winter annuals. Taproot  $\pm$  fleshy. Leaves sparsely pubescent; leaf blade  $3-12 \times 1-3.5$  cm, margin repand-crenate, irregularly serrate, or dentate. Anthers 0.6–1.1 mm. Fl. May–Jul, fr. Jul–Sep.  $2n = 12$ .

Meadows, fields, roadsides, wet places; near sea level to 4500 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, E Russia].

**9b. *Plantago depressa* subsp. *turczaninowii* (Ganeschin) Tzvelev, Arktichesk. Fl. SSSR 8(2): 19. 1983.**

毛平车前 mao ping che qian

*Plantago depressa* var. *turczaninowii* Ganeschin, Trudy Bot. Muz. Imp. Akad. Nauk 8: 193. 1915; *P. depressa* var. *montana* Kitagawa.

Perennials. Taproot and rootstock woody when old. Leaves densely pubescent; leaf blade  $9-15 \times 2.5-5.5$  cm, margin entire or rarely repand-crenate. Anthers 0.7–1.5 mm. Fl. Jun–Jul, fr. Jul–Aug.

Moist meadows, wet mountain slopes, riverbanks; 1000–1500 m. N Hebei, Heilongjiang, Jilin, Liaoning, E Nei Mongol [E Mongolia, E Russia].

**10. *Plantago camtschatica* Link, Enum. Hort. Berol. Alt. 1: 120. 1821.**

海滨车前 hai bin che qian

*Plantago depressa* Willdenow subsp. *camtschatica* (Link) Pilger; *P. villifera* Franchet.

Herbs, perennial. Taproot long,  $\pm$  fleshy. Leaves basal; petiole 1–4 cm; leaf blade narrowly elliptic to elliptic-ovate,  $2.5-10 \times 1-4$  cm, thickly papery, densely white pubescent, veins 5 or 7, base attenuate, margin entire or repand-crenate, apex acute. Spikes cylindric,  $3-9 \times 0.5-1$  cm, densely white pubescent, densely flowered or interrupted basally; peduncle 6–15 cm; bracts ovate-elliptic, 2–2.5(–4) mm, usually pubescent, keel broad and not extending to apex. Sepals 2.5–3 mm, keel broad, thick, and not extending to apex; lower sepals elliptic to obovate-elliptic; upper sepals broadly elliptic to orbicular. Corolla white, glabrous; lobes ovate-elliptic to ovate, 1–1.5 mm, patent to reflexed, apex acute. Stamens adnate to near apex of corolla tube, exerted; anthers reddish brown, ellipsoid, 1–1.2 mm. Pyxis ovoid-ellipsoid to conic-ovoid, 2.5–3 mm, circumscissile near base, with 4 seeds. Seeds dark brown, ellipsoid to ovoid, 1.5–2.2 mm, ventral face flat; cotyledons parallel to ventral side. Fl. May–Jul, fr. Jun–Aug.  $2n = 12$ .

Seaside sandy areas; near sea level. Liaoning (Chang Dao) [Japan, Korea, E Russia (Far East)].

**11. *Plantago komarovii* Pavlov, Byull. Moskovsk. Obsch. Isp. Prir., Otd. Biol. 38: 130. 1929.**

翅柄车前 chi bing che qian

Herbs, perennial. Taproot long. Leaves basal, sparsely white villous or glabrate; petiole 0.8–1.5 cm, broadly winged; leaf blade linear-lanceolate to elliptic,  $2-5 \times 0.2-0.4$  cm, thickly papery, veins 3, base attenuate to decurrent onto petiole, margin entire or remotely denticulate, apex acuminate. Spikes shortly cylindric to capitate, 3–12 mm, densely flowered; peduncle 2–6 cm, sparsely appressed villous; bracts ovate to triangular-ovate, as long as or slightly longer than calyx, keel broad. Sepals 1.5–2 mm, sparsely pilose at base, keel narrow and not extending to apex; lower sepals ovate-elliptic; upper sepals broadly ovate. Corolla white, glabrous; lobes narrowly triangular, 1–1.3 mm, patent to reflexed. Stamens adnate to near apex of corolla tube, exerted. Pyxis ovoid, 2–3 mm, with 3 or 4 seeds. Seeds black, oblong to narrowly ovoid, (1–)1.5–2 mm, ventral face flat; cotyledons parallel to ventral side. Fl. May–Jun, fr. Jul–Aug.  $2n = 12$ .

Stony meadows; 2000–2500 m. N Xinjiang (Hoboksar, Jinghe) [Kazakhstan, W Mongolia].

**12. *Plantago perssonii* Pilger in Engler, Pflanzenr. 102(IV. 269): 440. 1937.**

莒叶车前 ju ye che qian

Herbs, perennial. Taproot more than 1 cm in diam. Leaves basal, silky villous; petiole 1–3 cm, tenuous; leaf blade lanceolate to narrowly lanceolate,  $6-7 \times 0.5-1$  cm, papery, veins 3 or 5, base attenuate, margin remotely and retrorsely denticulate to triangular dentate, apex acuminate. Spikes narrowly cylindric, 3–10 cm, loosely flowered, usually interrupted basally; peduncle 7–15 cm, lanate; bracts narrowly ovate-elliptic to ovate, 2–2.5 mm, keel not extending to apex. Sepals 2.2–2.5 mm, keel narrow and not extending to apex, apex pubescent; lower sepals elliptic; upper sepals broadly ovate, apex attenuate. Corolla white, glabrous; lobes ovate, 1.5–1.8 mm, patent to reflexed, apex narrow and slightly obtuse. Stamens adnate to near apex of corolla tube, exerted; anthers yellow when dry, ellipsoid, ca. 2 mm. Pyxis ovoid-ellipsoid, 3.5–4 mm, circumscissile near base, with 1 or 2 seeds. Seeds brown to blackish brown, ellipsoid, ca. 2 mm, ventral face flat; cotyledons parallel to ventral side. Fl. Jun–Jul, fr. Jul–Aug.

• Stony meadows on slopes; 2600–3200 m. SW Xinjiang (Shache, Yecheng).

**13. *Plantago arachnoidea* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 16. 1841 [“*arachnoides*”].**

蛛毛车前 zhu mao che qian

*Plantago arachnoidea* var. *lorata* J. Z. Liu; *P. lorata* (J. Z. Liu) Shipunov.

Herbs, perennial. Taproot long and thick. Leaves basal, densely arachnoid; petiole 1.5–2.5 cm; leaf blade narrowly elliptic, lanceolate, or linear,  $2-8(-15) \times 0.3-1.2(-1.5)$  cm,

papery, veins 1 or 3, base attenuate, margin entire, repand, or repand-crenate, apex acute to acuminate. Spikes cylindric to narrowly cylindric, 1–2.5(–5) cm, densely flowered or interrupted basally; peduncle 5–20 cm; bracts broadly ovate to ovate, 2–3 mm, margin arachnoid, keel broad and not extending to apex. Sepals as long as bract, keel not extending to apex, margin and apex arachnoid; lower sepals broadly elliptic; upper sepals broadly obovate-elliptic to orbicular. Corolla white, glabrous; lobes broadly ovate, 1–1.5 mm, patent to reflexed, apex acute. Stamens adnate to near apex of corolla tube, exserted; anthers yellow when dry, ellipsoid, ca. 1.2 mm. Pyxis ovoid to narrowly ovoid, 3–4 mm, circumscissile near base, with 1 or 2 seeds. Seeds yellowish brown to blackish brown, oblong to ellipsoid, (1.5–)1.8–2.8 mm, ventral face flat; cotyledons parallel to ventral side. Fl. Jun–Jul, fr. Jul–Aug.

Stony mountain slopes, saline habitats, meadows; 700–3500 m. Xinjiang [Kazakhstan].

**14. *Plantago polysperma*** Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 431. 1842.

多籽车前 duo zi che qian

Herbs, annual. Taproot tenuous. Leaves basal, glabrous; petiole inconspicuous; leaf blade narrowly linear to filamentous-linear, 2–10 cm × 1–2(–3) mm, thickly papery, vein 1, base attenuate, margin entire, apex slightly obtuse. Spikes cylindric to capitate, 0.5–4 cm, elongated to 7 cm after anthesis, densely flowered or interrupted basally; peduncle 2–10 cm, sparsely white pubescent or glabrous; bracts broadly ovate to suborbicular, 1.7–2.3 mm, glabrous, keel extending to apex. Sepals 1.5–1.8 mm, glabrous, keel thin and extending to apex; lower sepals broadly elliptic; upper sepals suborbicular, keel narrow. Corolla white, glabrous; lobes ovate, ca. 1 mm, erect. Stamens adnate to near apex of corolla tube, exserted, covered with erect corolla lobes. Pyxis conic-ovoid, 3–4.5 mm, apex truncate, circumscissile near base, with 12–30 seeds. Seeds dark brown, fusiform, 1–1.5 mm; ventral face flat; cotyledons parallel to ventral side. Fl. May–Jun, fr. Jun–Jul.  $2n = 24$ .

Steppes, saline habitats, sandy areas. N Xinjiang [E Kazakhstan, W Mongolia, S Russia].

**15. *Plantago tenuiflora*** Waldstein & Kitaibel, Descr. Icon. Pl. Hung. 1: 37. 1802.

小花车前 xiao hua che qian

*Plantago bungei* Steudel; *P. pusilla* Bunge (1836), not Nuttall (1818).

Herbs, annual. Taproot tenuous. Leaves basal; petiole inconspicuous; leaf blade linear to narrowly linear, 1–13 × 0.1–0.4 cm, thickly papery, glabrous or abaxially sparsely white pubescent, vein 1, base attenuate, margin entire or remotely denticulate, apex subobtuse. Spikes capitate to narrowly cylindric, 0.5–7 cm, densely flowered or interrupted basally from middle; peduncle 1–12 cm, white pubescent; bracts narrowly ovate to ovate, 2–3 mm, glabrous, keel extending to apex. Sepals 1.5–2 mm, glabrous, keel extending to apex; lower sepals narrowly obovate to elliptic-ovate; upper sepals obovate. Corolla white, glabrous; lobes oblong-ovate, 0.8–1 mm, erect, patent, or re-

flexed, apex subacute. Stamens adnate to near apex of corolla tube, usually covered by erect corolla lobes, rarely exserted; anthers ovoid, ca. 0.3 mm. Pyxis conic-ovoid, 3–4 mm, circumscissile near base, with 7–15 seeds. Seeds reddish brown to blackish brown, fusiform, 1–1.5(–2) mm, ventral face flat; cotyledons parallel to ventral side. Fl. May–Jul, fr. Jun–Aug.  $2n = 24$ .

Saline meadows, alkaline soils; ca. 200 m. N Xinjiang (Junggar Pendi) [Kazakhstan, W Mongolia, S and SW Russia; SW Asia, Europe].

**16. *Plantago lanceolata*** Linnaeus, Sp. Pl. 1: 113. 1753.

长叶车前 chang ye che qian

Herbs, perennial. Taproot long and thick. Leaves basal, glabrous or pubescent; petiole tenuous, 2–10 cm; leaf blade linear-lanceolate, lanceolate, or elliptic-lanceolate, 6–20 × 0.5–4.5 cm, papery, veins (3 or)5(or 7), base narrowly cuneate and decurrent onto petiole, margin entire or remotely denticulate, apex acuminate to acute. Spikes conic-ovoid at first but later capitate to shortly cylindric, 1–5(–8) cm, densely flowered; peduncle 10–60 cm, 5-sulcate, appressed pubescent; bracts ovate to elliptic, 3.5–5 mm, densely hirsute, keel spatulate, apex scarious and caudate. Sepals 2–3.5 mm, abaxially usually hirsute, keel narrow and not extending to apex; lower sepals connate to near apex, broadly obovate, 2-keeled, margin with sparse trichomes; upper sepals distinct, broadly ovate. Corolla white, glabrous; lobes ovate-lanceolate, 1.5–3 mm, patent to reflexed, apex shortly acuminate. Stamens adnate to near middle of corolla tube, exserted; anthers white or yellowish, ellipsoid, 2.5–3 mm. Pyxis narrowly ovoid, 3–4 mm, circumscissile near base, with (1 or)2 seeds. Seeds brown to dark brown, narrowly ellipsoid to oblong, 2–2.6 mm, shiny, with a broad groove on ventral face; cotyledons vertical to ventral side. Fl. May–Jun, fr. Jul–Aug.  $2n = 12^*, 14, 24$ .

Seaside, meadows, boggy places, stony mountain slopes, gravel beds, sandy area, roadsides, wastelands; near sea level to 900 m. Gansu, Henan, Jiangsu, Jiangxi, Liaoning, Shandong, Taiwan, Xinjiang, Yunnan, Zhejiang [Bhutan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe, North America].

**17. *Plantago aristata*** Michaux, Fl. Bor.-Amer. 1: 95. 1803.

芒苞车前 mang bao che qian

*Plantago aristata* var. *minuta* T. K. Zheng & X. S. Wan [“*munuta*”].

Herbs, annual or winter annual. Taproot tenuous. Stem 1–4 cm, erect, obscured by leaf sheaths. Leaves spirally alternate, densely villous to glabrate; petiole, inconspicuous; leaf blade elliptic-linear to linear, 4–20 × 0.1–0.9 cm, papery, veins 3, base attenuate and decurrent onto petiole, margin entire, apex acuminate. Spikes narrowly cylindric, (0.5–)3–10 cm, densely flowered; peduncle 10–20 cm, densely appressed villous; bracts narrowly ovate, basalmost 0.8–4 cm but reduced apically, erect to spreading, densely villous, apex with linear to subulate aristata. Sepals 2–3 mm, keel and apex densely pilose; lower sepals narrowly obovate, keel broad, thick, and not extending to apex; upper sepals ovate, keel narrow and extending to apex. Corolla yellowish, glabrous; lobes broadly ovate, 2–2.5 mm, patent to

reflexed, base nearly auriculate. Stamens adnate to near apex of corolla tube; anthers yellowish, ovoid, ca. 0.4 mm, included to slightly exerted. Pyxis ellipsoid to ovoid, 2.5–3 mm, circumscissile just below middle, with 2 seeds. Seeds brown, ellipsoid to oblong, (1.9–)2.3–2.7 mm, with a broad groove on ventral face; cotyledons vertical to ventral side. Fl. May–Jun, fr. Jun–Jul.  $2n = 20$ .

Naturalized in seaside sandy areas, wastelands, and roadsides; near sea level. Jiangsu (Suqian), Shandong (Qingdao) [native to North America; naturalized in E Asia and Europe].

*Plantago aristata* was first collected in China in Qingdao Shi in 1929.

**18. *Plantago ovata* Forsskål, Fl. Aegypt.-Arab. 31. 1775.**

圆苞车前 yuán bāo chē qián

*Plantago ispaghula* Roxburgh ex Fleming.

Herbs, annual. Taproot long and tenuous, rigid. Stem short, branched basally, internode 2–15 mm, densely white villous-lanate. Leaves spirally alternate, sparsely to densely white villous-lanate; petiole 2–5 cm, tenuous; leaf blade linear to linear-lanceolate, 3–15 cm × 1–6 mm, papery, veins 3, base attenuate and decurrent onto petiole, margin entire or remotely denticulate, apex with 1.5–5 mm subulate tip. Spikes ovoid and 0.5–2 cm at anthesis but narrowly ovoid to shortly cylindric and to 5 cm after anthesis, densely flowered; peduncle 3–22 cm, villous-lanate; bracts broadly ovate to orbicular, 3–4 mm, usually glabrous, keel extending to or near apex. Sepals 2.5–3 mm, keel extending to or near apex; lower sepals obovate-elliptic, glabrous or pubescent; upper sepals elliptic, glabrous. Corolla white, glabrous; lobes orbicular-ovate, 2.5–2.8 mm, patent to reflexed, apex acute. Stamens adnate to near apex of corolla tube, exerted; anthers yellowish brown when dry, ovoid, 0.9–1.3 mm. Pyxis ellipsoid, 4–5 mm, circumscissile near middle, with 2 seeds. Seeds yellowish brown, ellipsoid to ovoid-ellipsoid, 2.5–3 mm, with a groove on ventral face; cotyledons vertical to ventral side. Fl. May–Jun, fr. Jun–Jul.  $2n = 8^*$ , 16.

Introduced for the medicinal seeds, locally naturalized in margins of fields or grasslands; near sea level to 1500 m. Fujian (Xiamen), Xinjiang (Moyu) [native to Mediterranean region; naturalized in C, E, and S Asia and North America].

**19. *Plantago minuta* Pallas, Reise Russ. Reich. 3: 716. 1776.**

小车前 xiǎo chē qián

*Plantago lessingii* Fischer & C. A. Meyer; *P. minuta* subsp. *lessingii* (Fischer & C. A. Meyer) Tzvelev; *P. mongolica* Decaisne.

Herbs, annual. Taproot tenuous. Leaves basal; petiole inconspicuous; leaf blade linear, narrowly lanceolate, or spatulate-linear, 3–8 × 0.2–0.8 cm, rigidly papery, veins 3, base attenuate and decurrent onto petiole, margin entire, apex acuminate. Spikes capitate to shortly cylindric, 0.6–2 cm, densely flowered; peduncle (1–)2–12 cm, tenuous, along with rachis densely grayish to yellowish villous-lanate or sometimes glabrate; bracts broadly ovate to broadly triangular, 2.2–2.8 mm, ± villous or glabrous, keel extending to apex, apex obtuse. Sepals 2.7–3 mm, keel extending to apex, margin wide and scarious;

lower sepals elliptic to broadly elliptic; upper sepals broadly elliptic. Corolla white, glabrous; lobes elliptic to narrowly ovate, 1.4–2 mm, patent to reflexed, apex acute to erose. Stamens adnate to near apex of corolla tube, exerted to included; anthers yellow when dry, suborbicular, ca. 1 mm. Pyxis ovoid to broadly ovoid, 3.5–4(–5) mm, circumscissile near base, with 2 seeds. Seeds yellowish brown, ellipsoid-ovoid to ellipsoid, (2.5–)3–4 mm, shiny, with a broad groove on ventral face; cotyledons vertical to ventral side. Fl. Jun–Aug, fr. Jul–Sep.

Saline places, gravel beds, sandy areas, ravines, boggy places; 400–4300 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang, Xizang [Kazakhstan, Mongolia, S and SW Russia].

**20. *Plantago lagocephala* Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 7: 445. 1851.**

毛瓣车前 máo bàn chē qián

Herbs, annual. Taproot tenuous. Leaves and inflorescences villous. Leaves basal; petiole inconspicuous; leaf blade narrowly lanceolate, lanceolate, or oblanceolate, 3–4 cm × 2–3 mm, papery, veins 3, base attenuate, margin entire, apex acuminate. Spikes ovoid to ovoid-ellipsoid, 8–10 mm but to 1.6 cm after anthesis, densely flowered; peduncle 5–12 cm; bracts broadly ovate, ca. 3 mm, keel narrow and slightly projected at apex. Sepals ca. 3 mm, villous, keel thick and not extending to apex; lower sepals lanceolate-ovate, keel as broad as or slightly narrower than lateral lamina; upper sepals very inequilateral. Corolla yellowish, glabrous except lobes; lobes triangular-ovate, ca. 1 mm, erect to patent, outside densely hirsute-villous. Stamens adnate to near apex of corolla tube; anthers yellowish when dry, broadly ellipsoid, 0.7–0.8 mm, slightly exerted. Pyxis ellipsoid, 3–3.5 mm, circumscissile just below middle, with 2 seeds. Seeds yellowish brown, narrowly ellipsoid to narrowly ovoid-ellipsoid, 2.5–3 mm, shiny, with a broad groove on ventral face; cotyledons vertical to ventral side. Fl. Apr–May, fr. May–Jun.

Stony mountain slopes, saline places, open dry pastures; ca. 200 m. N Xinjiang (Shawan) [Afghanistan, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan].

**21. *Plantago maritima* Linnaeus subsp. *ciliata* Printz, Veg. Siber.-Mongol. Front. 397. 1921.**

盐生车前 yán shēng chē qián

*Plantago maritima* var. *salsa* (Pallas) Pilger; *P. salsa* Pallas.

Herbs, perennial. Taproot long and thick. Leaves basal, ± strigillose; petiole inconspicuous; leaf blade linear, (4–)7–32 cm × (1–)2–8 mm, leathery, veins (1 or)3 or 5, base attenuate and decurrent onto petiole, margin entire and plane to recurved, apex long acuminate. Spikes cylindric, (2–)5–17 cm, densely flowered or interrupted basally, rachis densely strigillose; peduncle (5–)10–30(–40) cm, white strigillose; bracts triangular-ovate to lanceolate-ovate, 2–2.5 mm, margin ciliolate, keel thick but not extending to apex, apex shortly acuminate. Sepals 2.2–3 mm, keel, margin, and apex hirsutulous, keel thick and not extending to apex; lower sepals narrowly elliptic, slightly inequilateral; upper sepals broadly elliptic. Corolla yellowish;

tube outside pubescent; lobes broadly ovate to oblong-ovate, ca. 1.5 mm, patent to reflexed, margin ciliolate. Stamens adnate to middle of corolla tube, exserted; anthers yellow when dry, ellipsoid, 1.8–2 mm. Pyxis conic-ovoid, 2.7–3 mm, with 1 or 2 seeds. Seeds yellowish brown to dark brown, ellipsoid to oblong, 1.6–2.3 mm, ventral face flat; cotyledons vertical to ventral side. Fl. Jun–Jul, fr. Jul–Aug.  $2n = 12$ .

Salt marshes, saline meadows; 100–3800 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi, Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russia (S Siberia); SW Asia].

*Plantago maritima* subsp. *maritima* occurs in Europe and differs from subsp. *ciliata* by having the margin of the corolla lobes glabrous.

**22. *Plantago arenaria*** Waldstein & Kitaibel, Descr. Icon. Pl. Hung. 1: 51. 1802.

对叶车前 dui yè che qian

*Plantago indica* Linnaeus; *P. psyllium* Linnaeus, nom. utique rej. prop.; *Psyllium arenarium* (Waldstein & Kitaibel) Mirbel; *P. indicum* (Linnaeus) Mirbel.

Herbs, annual. Taproot tenuous. Stems, leaves, inflorescences, and sepals white glandular pubescent. Stem erect, (10–) 20–60 cm tall, branched, internode elongate. Leaves cauline, opposite, seldom in whorls of 3; petiole inconspicuous; leaf blade linear to linear-lanceolate, 3–6(–8) cm × 1–4(–5) mm, papery, veins (1 or) 3, base decurrent onto petiole, margin entire,

apex acuminate. Inflorescences arising from leaf axil apically from middle of stem; spikes ovoid to ellipsoid, 0.7–2 cm, densely flowered; peduncle 2–8 cm; basalmost bracts 0.5–2 cm but reduced apically, base orbicular-ovate, apex cuspidate. Sepals broadly veined, keel broad and not extending to apex; lower sepals obovate, 3–4 mm, inequilateral; upper sepals narrowly elliptic, 2.7–3.5 mm. Corolla brownish, glabrous; tube transversely rugose; lobes narrowly ovate, 1.5–2 mm, patent to reflexed. Stamens adnate to near apex of corolla tube, exserted; anthers yellow, ellipsoid, 1.8–2.2 mm. Pyxis ellipsoid, 3.2–3.5 mm, circumscissile near base, with 2 seeds. Seeds brown to blackish brown, ovoid-ellipsoid to ellipsoid, 2.5–2.8 mm, shiny, with a broad groove on ventral face; cotyledons vertical to ventral side. Fl. Jul–Aug, fr. Aug–Oct.  $2n = 12$ .

Cultivated for its medicinal seeds, locally naturalized in sandy areas, meadows, and roadsides; 100–3500 m. Guangxi, Hebei, Jiangsu, Liaoning, Sichuan, Xinjiang, Xizang, Zhejiang [native to N Africa, SW Asia, Europe, Kazakhstan, Kyrgyzstan, Russia (W Siberia), and Tajikistan; naturalized in Australia, India, Japan, North America, and Pakistan].

Editors' note. The name *Plantago indica* Linnaeus (Syst. Nat., ed. 10, 2: 896. 1759) has been considered to be a nomenclaturally superfluous and therefore illegitimate renaming of *P. psyllium* Linnaeus (Sp. Pl. 1: 115. 1753). When a proposal to reject *P. psyllium* (Applequist, Taxon 55: 235–236. 2006) was considered by the Nomenclature Committee for Vascular Plants (Brummitt, Taxon 58: 281. 2009), rejection as proposed was recommended but the Committee also voted that *P. indica* is a legitimate name.

## SPHENOCLEACEAE

尖瓣花科 jian ban hua ke

Hong Deyuan (洪德元)<sup>1</sup>; Nicholas J. Turland<sup>2</sup>

Herbs annual, without latex. Leaves alternate, simple. Inflorescence a dense terminal or leaf-opposed spike, bracteate and bracteolate. Flowers sessile, bisexual, actinomorphic. Calyx epigynous, 5-lobed. Corolla epigynous, tubular, 5-lobed to middle. Stamens 5, inserted at proximal part of corolla tube, alternate with corolla lobes; filament extremely short; anther 2-celled. Ovary inferior, 2-loculed; ovules numerous, anatropous; placentation axile; stigma obscurely 2-lobed, lobes subcapitate. Fruit a capsule, oblate, circumscissile. Seeds numerous, oblong.

One species: widely distributed in Old World tropics, including China; introduced in New World tropics.

Sphenocleaceae are only superficially similar to Campanulaceae s.l., and molecular data place them securely in the Solanales. They lack latex; the style is short and without hairs; there is no secondary pollen presentation; and fruit dehiscence is circumscissile, immediately inside the calyx.

Hong De-yuan. 1983. Campanulaceae (Sphenocleioideae). In: Hong De-yuan, ed., Fl. Reipubl. Popularis Sin. 73(2): 176–177.

### 1. SPHENOCLEA Gaertner, Fruct. Sem. Pl. 1: 113. 1788, nom. cons.

尖瓣花属 jian ban hua shu

*Gaertnera* Retzius (1791), not Schreber (1789), nor Lamarck (1792, nom. cons.), nor *Gaertneria* Medikus (1789); *Pongati* Adanson; *Pongatium* Jussieu; *Rapinia* Loureiro.

Morphological characters and geographic distribution are the same as those of the family.

#### 1. *Sphenoclea zeylanica* Gaertner, Fruct. Sem. Pl. 1: 113. 1788.

尖瓣花 jian ban hua

*Gaertnera pangati* Retzius; *Pongatium indicum* Lamarck, nom. illeg. superfl.; *P. spongiosum* Blanco; *P. zeylanicum* (Gaertner) Kuntze; *Rapinia herbacea* Loureiro; *Sphenoclea dalzielii* N. E. Brown; *S. pongatium* Candolle, nom. illeg. superfl.

Plants glabrous throughout. Stems erect, usually branched, 20–70 cm tall, to 1 cm in diam. Leaves petiolate; petiole to 1 cm; leaf blade abaxially gray or green, adaxially green, long

elliptic, elliptic-lanceolate, or ovate-lanceolate, 2–9 × 0.5–2 cm, margin entire. Spikes 1–4 cm; bracts ovate, apex acuminate; bracteoles broadly linear. Flowers less than 2 mm. Calyx lobes ovate-orbicular. Corolla white, ca. 1.5 mm, shallowly lobed; lobes patent. Capsule 2–4 mm in diam. Seeds brown-yellow, ca. 0.5 mm. Fl. and fr. all year.

Paddy fields, wet places. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, S Yunnan (Xishuangbanna) [Bangladesh, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; NE and tropical Africa, SW Asia, Madagascar; introduced in New World tropics].

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## CAMPANULACEAE

桔梗科 jī gēng kē

Hong Deyuan (洪德元)<sup>1</sup>, Ge Song (葛颂)<sup>1</sup>; Thomas G. Lammers<sup>2</sup>, Laura L. Klein<sup>2</sup>

Herbs, lactiferous, perennial (often with rhizomes or caudices), less often annual, [or shrubs or trees outside of China]. Leaves estipulate, alternate (rarely opposite or whorled), simple, entire or variously toothed or dissected, petiolate or sessile. Flowers tetracyclic, perfect, with a specialized method of proterandrous secondary pollen presentation, resupinate in Lobelioideae, solitary in an axillary or less often terminal position, or aggregated into terminal or axillary inflorescences that appear racemose or paniculate (rarely capitate), pedicellate or rarely sessile; bracts leaflike or reduced, rarely absent; pedicels often bracteolate. Calyx synsepalous, adnate to ovary and forming a hypanthium (free in *Cyananthus*); lobes (3–)5(–10), valvate, sometimes with a reflexed appendage in each sinus, in some *Codonopsis*, inserted well below rim of hypanthium. Corolla sympetalous, actinomorphic or zygomorphic, most often some shade of blue or violet, or white; lobes (4 or)5(–10), valvate. Stamens equaling number of corolla lobes, antisepalous, distinct, coherent, or connate; anthers tetrasporangiate, dithecal, introrsely dehiscent by longitudinal slits, basifixed. Gynoecium syncarpous, 2–5(–10)-locular with axile placentation, [rarely 1-locular with parietal, basal, or apical placentation outside of China]; ovary at least partly inferior (superior in *Cyananthus*), sometimes crowned by an annular or tubular nectary; style solitary, pubescent with pollen-collecting hairs below apex; stigma typically with as many lobes as ovary locules. Fruit a capsule, commonly apically loculicidal or laterally poricidal, or a berry. Seeds usually small, numerous; embryo small, straight; endosperm copious, oily or rarely starchy.

Eighty-six genera and over 2,300 species: cosmopolitan; 16 genera (one endemic, two introduced) and 159 species (77 endemic, two introduced) in China.

Two of us (Lammers and Klein) do not agree with the separation of *Leptocodon* and *Campanumoea* from *Codonopsis* in this treatment. We consider that the single character used in each case, five lamellar glands alternate with the stamens in *Leptocodon* and baccate fruit in *Campanumoea*, is not sufficient to justify recognition of a distinct genus. We regard these two genera as embedded within *Codonopsis*, as was done by Lammers (in C. I. Peng, *Phytogeogr. Bot. Invent. Taiwan*, 43–61. 1992), Morris and Lammers (*Bot. Bull. Acad. Sin.* 38: 277–284. 1997), Lammers (in T. C. Huang, *Fl. Taiwan*, ed. 2, 4: 775–802. 1998), Lammers (in Kubitzki [Kadereit & Jeffrey], *Fam. Gen. Vasc. Pl.* 8: 26–56. 2007), and Lammers (World Checkl. Bibliogr. Campanulaceae. 262–273. 2007). On the other hand, one of us (Hong) notes that two characters distinguish *Leptocodon* from *Codonopsis*. One is the five lamellar glands and the other is the shape of the stigma segments, which are clavate in *Leptocodon* but orbicular-deltoid in *Codonopsis*. *Campanumoea* differs from *Codonopsis* not only in having baccate fruit but also in its pollen, which is shortly 5-colpate (vs. 5–8-long-colpate in the core group of *Codonopsis*). *Campanumoea* is not a very distinct genus, and it seems that it would be equally reasonable to sink it into *Codonopsis* or to separate it. However, if it were sunk, then it would also be reasonable to sink *Adenophora* into *Campanula* because the former genus differs from the latter only in having a nectar disk around the style.

*Pentaphragma* Wallich ex G. Don and *Sphenoclea* Gaertner were included in Campanulaceae in FRPS but are treated in this volume as Pentaphragmataceae and Sphenocleaceae, respectively. See the notes under those two families.

Hong De-yuan, Lian Yong-shan & Shen Lian-dai. 1983. Campanulaceae (Campanuloideae and Lobelioideae). In: Hong De-yuan, ed., *Fl. Reipubl. Popularis Sin.* 73(2): 1–173.

T. G. Lammers. 1998. Campanulaceae. In: Tseng-Chieng Huang, ed., *Fl. Taiwan*, ed. 2, 4: 775–802.

- 1a. Flowers resupinate at anthesis; odd (unpaired) calyx lobe in a ventral (anterior) position prior to resupination; corolla zygomorphic (sometimes only slightly so); stamens connate, forming an asymmetric tube; locules and stigmas 2 (Lobelioideae).
- 2a. Corolla strongly zygomorphic, unilabiate or bilabiate, lobes  $\pm$  as long as tube or slightly shorter, tube cleft to base on dorsal surface; staminal column free from corolla, exerted from dorsal fissure of corolla ..... 15. *Lobelia*
- 2b. Corolla scarcely zygomorphic, salverform, lobes less than 1/3 as long as tube, tube entire; staminal column adnate to corolla below middle, scarcely exerted from mouth of corolla ..... 16. *Hippobroma*
- 1b. Flowers oriented normally; odd (unpaired) sepal in a dorsal (posterior) position; corolla actinomorphic; stamens distinct or coherent into a symmetric tube at anthesis but eventually separating; locules and stigmas (2 or)3–6 (Campanuloideae).
- 3a. Fruit a berry; ovary and fruit apically flat.
  - 4a. Herbs twining; calyx lobes ovate-deltoid or ovate-lanceolate, margin entire ..... 4. *Campanumoea*
  - 4b. Herbs erect; calyx lobes linear or linear-lanceolate, margin dentate, rarely entire ..... 5. *Cyclocodon*
- 3b. Fruit a capsule; ovary and fruit apically conical.
  - 5a. Fruit dehiscent apically (i.e., above calyx lobes).
    - 6a. Calyx completely free from ovary, inserted below it; corolla and stamens inserted below ovary ..... 1. *Cyananthus*
    - 6b. Calyx tube adnate to ovary, forming a hypanthium (though lobes sometimes apparently inserted

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- at base or middle rather than its rim); corolla and stamens inserted on rim of hypanthium (i.e., atop ovary).
- 7a. Glands 5, alternate with stamens, orbicular, compressed; herbs twining ..... 2. *Leptocodon*
- 7b. Glands absent; herbs erect, climbing, or twining.
- 8a. Taproot greatly thickened, carrotlike or tuberous; flowers large, corolla 15–50 mm; stigmas ovoid or orbicular,  $\pm$  as long as broad.
- 9a. Plants not malodorous; stems erect or ascending; locules 5, alternating with calyx lobes ... 7. *Platycodon*
- 9b. Plants often malodorous; stems often scandent, climbing, or twining; locules 3 ..... 3. *Codonopsis*
- 8b. Taproot fibrous or but scarcely thickened; flowers small, corolla 2–12 mm; stigmas filiform or linear, much longer than broad.
- 10a. Leaves pinnately lobed or parted; calyx lobes echinate; corolla lobes and stamens typically 4; pollen 4- or 5-colpate; seeds triquetrous ..... 6. *Echinocodon*
- 10b. Leaves entire or toothed; calyx lobes entire or toothed; corolla lobes and stamens typically 5; pollen 3-porate; seeds terete or compressed ..... 8. *Wahlenbergia*
- 5b. Fruit dehiscing laterally (i.e., below calyx lobes).
- 11a. Corolla rotate, lobed for 1/2 or more its length.
- 12a. Plants annual, roots fibrous; flowers both chasmogamous and cleistogamous, latter often predominating; corolla lobes cut for 1/2–3/4 their length, lanceolate ..... 13. *Triodanis*
- 12b. Plants perennial, root carrotlike; flowers all chasmogamous; corolla lobes divided to base, linear ..... 14. *Asyneuma*
- 11b. Corolla campanulate, lobed less than 2/5 its length.
- 13a. Flowers large, corolla typically 15–75 mm; fruit dehiscing via 2 or 3 definite pores in firm sclerenchymatous pericarp.
- 14a. Flowers without an obvious nectar disk ..... 9. *Campanula*
- 14b. Flowers with a conspicuous tubular (rarely annular) nectar disk ..... 10. *Adenophora*
- 13b. Flowers small, corolla 5–12 mm; fruit dehiscing irregularly via ruptures and tears of membranous or papery pericarp.
- 15a. Plants perennial via tuberiferous stolons; stems terete; flowers long pedicellate; seeds > 1.5 mm, testa finely striate ..... 11. *Peracarpa*
- 15b. Plants annual; flowers sessile; stems 3-winged; seeds < 1 mm, testa reticulate ..... 12. *Homocodon*

**1. CYANANTHUS** Wallich ex Benth in Royle, Ill. Bot. Himal. Mts. 1: 309. 1836,  
nom. cons., not Rafinesque (1815).

蓝钟花属 lan zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

Herbs, annual or perennial, caudices of latter thick, lignified, covered with numerous scales, usually branched, stems thus caespitose. Leaves alternate, but sometimes 4 or 5 leaves aggregated below pedicel, appearing whorl-like. Flowers solitary, terminal on main stems and branches, rarely in a dichasium and dichasia aggregated on top of stem and branches, pedicellate. Calyx tubular or tubular-campanulate, 5- or rarely 4-lobed. Corolla tubular-campanulate, (3–)5-lobed. Stamens 5, often aggregated and surrounding ovary at upper part. Ovary superior, conical, mostly 5-locular, less frequently 4- or 3-locular. Fruit a capsule, loculicidal. Seeds numerous, brown-red or brown-black.

Eighteen species: Himalaya and the Hengduan Mountains; 17 species (nine endemic) in China.

- 1a. Plant annual, lacking a caudex (3. *C.* sect. *Annui*).
- 2a. Plants dwarf, less than 20 cm tall; flowers almost sessile, typically 4-merous; corolla usually less than 10 mm, rarely up to 15 mm ..... 17. *C. hookeri*
- 2b. Plants taller; flowers pedicellate, typically 5-merous; corolla usually more than 15 mm.
- 3a. Calyx covered with red-brown setae, base of setae swollen, black verrucose; calyx lobes obovate-oblong, broadest at middle or above middle; corolla pale yellow or white ..... 14. *C. lichiangensis*
- 3b. Calyx villous; calyx lobes sublinear or triangular, broadest below middle; corolla blue or blue-purple.
- 4a. Leaves glabrous or sparsely puberulent; flowers in dichasia, fascicled at top of stem; calyx lobes linear ..... 15. *C. fasciculatus*
- 4b. Leaves hairy; flowers solitary, terminal on top of stem and branches, rarely 3–5-fascicled; calyx lobes triangular ..... 16. *C. inflatus*
- 1b. Plant perennial with a robust caudex densely clothed in persistent and straw-colored scales.
- 5a. Calyx with brown-black setae, sometimes mixed with other hairs; corolla lobes suborbicular, broadly ovate, or oblong, as long as or slightly longer than broad (2. *C.* sect. *Cyananthus*).

- 6a. Calyx covered with brown-black and white setae; stems sparsely arachnoid.
  - 7a. Leaf blade cordate to triangular-ovate, base cordate or rounded, margin obviously crenulate ..... 12. *C. cordifolius*
  - 7b. Leaf blade linear-elliptic, base cuneate, margin entire or sinuous ..... 13. *C. sherriffii*
- 6b. Calyx covered with only brown-black setae; stems villous, scaberrulose, or sericeous.
  - 8a. Leaves less than 11 mm ..... 11. *C. microphyllus*
  - 8b. Leaves more than 10 mm.
    - 9a. Leaf blade usually oblanceolate, spatulate, or obovate, margin with 3–9 obtuse lobes above middle ..... 8. *C. lobatus*
    - 9b. Leaf blade elliptic or ovate-lanceolate, margin entire or sinuous-crenulate above middle.
      - 10a. Leaves hispidulous on both surfaces; pedicels 12–32 mm; no leaves aggregated below pedicels ..... 9. *C. pedunculatus*
      - 10b. Leaves adaxially glabrous, abaxially densely sericeous; pedicels 5–12 mm; several leaves aggregated below pedicels, whorl-like ..... 10. *C. sericeus*
- 5b. Calyx glabrous or covered with hairs other than brown-black setae; corolla lobes usually oblong, longer than broad (1. *C. sect. Stenolobi*).
  - 11a. Flowers several on a stem in racemelike inflorescence; leaves ovate-lanceolate, abaxially densely sericeous; margin strongly recurved ..... 7. *C. longiflorus*
  - 11b. Flowers solitary and terminal on a stem; leaves rhombic, flabellate, spatulate, or ovate, rarely lanceolate, rarely sericeous, margin spreading or slightly recurved.
    - 12a. Leaves usually rhombic, flabellate, or spatulate, (2–)2.5–4.8(–5.5) mm, base usually truncate or broadly cuneate, obviously petiolate.
      - 13a. Flowers 1.6–2.4 cm; leaves rhombic, base broadly cuneate ..... 1. *C. delavayi*
      - 13b. Flowers 2.5–4.8 cm; leaves spatulate to rhombic, margins serrate to sinuous-crenulate, rarely entire ..... 2. *C. formosus*
    - 12b. Leaves usually spatulate, elliptic, ovate, or obovate-lanceolate, (3–)4.5–16 mm, base cuneate or rounded, attenuate into shortly petiolate, or leaves sessile.
      - 14a. Plants densely covered with long yellow-brown appressed hairs except corolla; scales on caudexes 10–15 × ca. 3 mm; corolla 3–4 cm, lobed to 1/3 ..... 4. *C. wardii*
      - 14b. Plants glabrous or covered with other types of hairs than above, leaves adaxially white hirsute or white hispidulous; scales on caudexes much smaller; corolla 2–2.5(–3.8) cm, lobed to middle.
        - 15a. Leaves spatulate, petiole short, narrowly winged, (0.5–)1.3–5 mm ..... 3. *C. macrocalyx*
        - 15b. Leaves elliptic, ovate, narrowly ovate, or narrowly obovate, sessile or petiole extremely short, less than 1(–1.7) mm.
          - 16a. Leaves shortly petiolate or sessile, elliptic, narrowly elliptic, or oblanceolate, base cuneate; flowers blue or blue-purple ..... 5. *C. incanus*
          - 16b. Leaves sessile, broadly ovate or obovate-lanceolate, base rounded; flowers yellow or white ..... 6. *C. flavus*

1. *Cyananthus* sect. *Stenolobi* (Franchet) Y. S. Lian in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 13. 1983.

多年生组 duo nian sheng zu

*Cyananthus* [unranked] *Stenolobi* Franchet, J. Bot. (Morot) 1: 258. 1887.

Plants perennial. Caudex densely clothed in persistent and straw-colored scales. Leaves alternate. Flowers solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 3–5 leaves. Calyx glabrous or covered with hairs other than brown-black setae, often ± swollen and saclike after anthesis. Corolla lobes usually oblong, longer than broad.

Seven species: Himalaya and the Hengduan Mountains; seven species (five endemic) in China.

1. *Cyananthus delavayi* Franchet, J. Bot. (Morot) 1: 280. 1887.

细叶蓝钟花 xi ye lan zhong hua

*Cyananthus barbatus* Franchet (1885), not Edgeworth (1846); *C. microrhombeus* C. Y. Wu; *C. microrhombeus* var. *leiocalyx* C. Y. Wu.

Caudexes branched; scales deltoid-lanceolate, ca. 2 × 1 mm. Stems caespitose, prostrate or ascending, slender, 7–20 cm, branched, white- or yellowish hispid, more densely so toward

apex. Leaves alternate; blade suborbicular, ovate, or deltoid, 2–5 × 1–7 mm, abaxially silvery sericeous, adaxially hispidulous, base cuneate, obtuse, rounded, or truncate, margin slightly recurved, entire, sinuous, or crenulate, apex rounded or obtuse; petiole 1–3 mm, white hispid. Flowers solitary, terminal on main stems and some branches, each subtended by a whorl-like aggregation of 3–5 leaves; pedicels 3–9 mm. Calyx brown hirsute or glabrescent; tube cylindrical at anthesis, 4.5–9 × 3.5–7 mm, base rounded or truncate, becoming enlarged in fruit; lobes narrowly triangular, 1.5–4 × 1–3 mm, both sides hirsute.

Corolla blue, tubular-campanulate, 1.8–3.4 cm, outside glabrous, inside densely villous at throat; lobes linear-oblong, 6–12 mm. Ovary 5-locular, subequal to calyx in length at anthesis; style extending to corolla throat; stigma 5-fid. Capsules conical, longer than calyx. Seeds brown, oblong or ellipsoid, ca.  $1.8 \times 0.3$  mm. Fl. Sep.

• Grassy calcareous slopes, forests, forest margins; 1900–4000 m. SW Sichuan, N Yunnan.

**2. *Cyananthus formosus*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 172. 1912.

美丽蓝钟花 *mei li lan zhong hua*

*Cyananthus chungdienensis* C. Y. Wu.

Roots carrotlike, up to 10 mm wide. Caudexes robust, often branched; scales persistent, linear-lanceolate, 3.5–5 mm. Stems caespitose, prostrate to ascending, pale purple, slender, 5–25 cm, simple or with short branches. Leaves alternate, lowermost leaves scalelike; blade ovate or rhombic,  $3-9 \times 2-6$  mm, abaxially densely white hirsute, adaxially sparsely white hirsute or glabrous, base obtuse or subtruncate, margin revolute, crenulately 3–5-lobed or -parted, rarely entire, apex truncate; petiole 2–7 mm. Flowers large, solitary and terminal on main stems and branches, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 3–5 mm. Calyx densely hirsute with long pale brown stiff hairs; tube cylindrical, 7–12 mm; lobes triangular or narrowly triangular,  $4-6 \times 2-3.5$  mm, both sides hirsute, margins ciliate. Corolla dark blue or purple-blue, 2.5–4.8 cm, outside glabrous, inside densely villous at throat; lobes narrowly obovate or oblong,  $1/3-1/2$  as long as tube, apex with a tuft of hairs outside. Ovary 5-locular, nearly as long as calyx tube; style extended up to corolla throat; stigma 5-fid. Fl. Aug–Sep.

• Grassy slopes, forest glades, forest margins, scree; 2800–4600 m. SW Sichuan (Muli), NW Yunnan (Heqing, Lijiang, Zhongdian).

**3. *Cyananthus macrocalyx*** Franchet, J. Bot. (Morot) 1: 279. 1887.

大萼蓝钟花 *da e lan zhong hua*

Caudexes robust, lignified, branched, covered toward apex with persistent ovate-lanceolate scales; scales 2–6 mm. Stems caespitose, ascending, 5–20 cm, simple, sparsely white villous or glabrous. Leaves alternate, increasing in size toward apex; blade suborbicular, rhombic, or spatulate,  $5-10 \times 1-6$  mm, abaxially densely white hirsute, adaxially sparsely hispidulous, base attenuate into petiole, margin revolute, entire, or sinuous-serrate, apex obtuse or acute; petiole 1–4 mm. Flowers solitary, terminal, subtended by a whorl-like aggregation of 4 or 5 flowers; pedicels 4–10 mm. Calyx yellow-green or purplish, brown hirsute, glabrescent, or glabrous, conspicuously veined; tube cylindrical at anthesis, 7–13 mm, basally subglobose in fruit; lobes triangular, both sides brown hirsute, or sometimes glabrous outside. Corolla yellow, sometimes purple- or red-veined, less frequently purple basally and yellow apically, tubular-campanulate, 2–3 cm, outside glabrous, inside densely villous at throat; lobes oblanceolate, ca.  $2/3$  as long as tube. Ovary extended up to throat. Capsules exserted above calyx. Seeds oblong, ca. 1.3 mm, smooth. Fl. Jul–Aug.

Alpine meadows, grassy slopes; 2500–5300 m. SE Gansu, S Qinghai, W Sichuan, SE Xizang, Yunnan [Bhutan, NE India (Assam, Sikkim), Myanmar, E Nepal].

- 1a. Leaf blade ovate to suborbicular, margin entire; calyx more than 11 mm ..... 3a. subsp. *macrocalyx*  
 1b. Leaf blade obovate-spatulate, margin crenulate; calyx less than 11 mm ..... 3b. subsp. *spathulifolius*

**3a. *Cyananthus macrocalyx* subsp. *macrocalyx***

大萼蓝钟花(原亚种) *da e lan zhong hua* (yuan ya zhong)

*Cyananthus incanus* J. D. Hooker & Thomson var. *leiocalyx* Franchet; *C. leiocalyx* (Franchet) Cowan; *C. leiocalyx* subsp. *lucidus* K. K. Shrestha; *C. macrocalyx* var. *flavopurpureus* C. Marquand; *C. macrocalyx* var. *pilosus* C. Marquand; *C. neurocalyx* C. Y. Wu; *C. pilosus* (C. Marquand) K. K. Shrestha.

Leaf blade ovate, broadly elliptic, or rhombic, margin entire or sparsely crenulate. Pedicel typically less than 5 mm. Calyx tube more than 11 mm.

• Alpine meadows, grassy slopes; 2500–5000 m. SE Gansu (Zhugqu), S Qinghai (Nangqên), W Sichuan, Yunnan.

**3b. *Cyananthus macrocalyx* subsp. *spathulifolius*** (Nannfeldt) K. K. Shrestha, Acta Phytotax. Sin. 35: 412. 1997.

匙叶蓝钟花 *chi ye lan zhong hua*

*Cyananthus spathulifolius* Nannfeldt, Acta Horti Gothob. 5: 30. 1930.

Leaf blade obovate, spatulate, elliptic, or narrowly elliptic, margin slightly crenulate or subentire. Pedicel 5–10 mm. Calyx tube usually less than 12 mm, rarely up to 16 mm.

Alpine meadows; 3000–5300 m. SE Xizang [Bhutan, NE India (Assam, Sikkim), Myanmar, E Nepal].

**4. *Cyananthus wardii*** C. Marquand, J. Linn. Soc., Bot. 48: 196. 1929.

棕毛蓝钟花 *zong mao lan zhong hua*

Roots ca. 5 mm in diam. Caudexes with 2 or 3 grades of branching, densely covered with persistent straw-colored scales; scales elliptic or spatulate,  $10-15 \times 2-4$  mm. Stems several from each branch of caudex, caespitose, 10–18 cm, lower half with small, straw-colored, elliptic scales, sparsely yellow arachnoid. Leaves alternate, sessile or nearly so, increasing in size toward apex; blade elliptic or spatulate,  $5-11 \times 3-5$  mm, both surfaces densely covered with brown-yellow arachnoid hairs, base cuneate, margin entire, apex rounded, acute, or obtuse. Flowers solitary and terminal, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 2–4 mm, covered with brown-yellow arachnoid hairs. Calyx densely covered with brown-yellow arachnoid hairs; tube cylindrical,  $10-12 \times 6-8$  mm; lobes ovate or triangular,  $1/3-1/2$  as long as tube, apex acute or obtuse. Corolla tubular, 3–4 cm, outside glabrous but inside densely villous; lobes obovate, ca.  $1/2$  as long as tube, outside with a yellow villous tuft at apex. Stamens ca.  $1/2$  as long as corolla tube. Style slightly exceeding corolla tube, glabrous.

- 3400–5000 m. SE Xizang.

**5. *Cyananthus incanus*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 20. 1857.

灰毛蓝钟花 *hui mao lan zhong hua*

*Cyananthus dolichosceles* C. Marquand; *C. incanus* var. *decumbens* Y. S. Lian; *C. incanus* subsp. *orientalis* K. K. Shrestha; *C. incanus* var. *parvus* C. Marquand; *C. incanus* subsp. *petiolatus* (Franchet) D. Y. Hong & L. M. Ma; *C. neglectus* C. Marquand; *C. petiolatus* Franchet; *C. petiolatus* var. *pilifolius* (C. Y. Wu) Y. S. Lian; *C. pilifolius* C. Y. Wu; *C. pilifolius* f. *leiocalyx* C. Y. Wu; *C. pilifolius* var. *minor* C. Y. Wu; *C. pilifolius* var. *pallidocoeruleus* C. Y. Wu.

Caudexes robust, branched, with persistent scales toward apex; scales ovate or lanceolate, ca. 4 mm. Stems caespitose, simple or branched below, white villous. Leaves alternate, gradually increasing in size toward apex, shortly petiolate; blade elliptic, narrowly elliptic, or oblanceolate, 4–12 × 1.5–4 mm, both surfaces white hirsute, base cuneate or attenuate, margin revolute, subentire, or sinuous, apex obtuse or acute. Flowers solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 4–13 mm, hirsute. Calyx densely or sparsely hirsute with yellow-brown stiff hairs, rarely glabrous; tube narrowly ellipsoid, 5–10 mm; lobes triangular, 2–4 mm, inside densely white hirsute, margin long ciliate. Corolla dark blue or blue-purple, 25–38 mm, outside glabrous, inside densely villous at throat; lobes narrowly obovate or oblong, ca. 2/3 as long as tube. Ovary subequal to calyx tube in length at anthesis; style extended up to corolla throat. Capsule exerted beyond calyx, 5-loculicidal, 10–13 mm. Seeds pale brown, oblong. Fl. Jul–Sep, fr. Sep–Oct.

Grassy slopes, forest glades, grassy places at forest and thicket margins, alpine meadows; 2700–5300 m. S Qinghai, W Sichuan, E Xizang, NW Yunnan (Dêqên, Zhongdian) [Bhutan, NE India (Sikkim), Nepal].

**6. *Cyananthus flavus*** C. Marquand, Bull. Misc. Inform. Kew 1924: 247. 1924.

黄钟花 *huang zhong hua*

Roots carrot-shaped, up to 5 mm in diam. Caudexes robust, multibranched, covered with persistent scales toward apex; scales ovate, ca. 3 × 1 mm. Stems caespitose, ascending, 5.5–16 cm, simple or with short branches, densely white villous to subglabrous. Leaves alternate, gradually increasing in size toward apex, sessile or nearly so; blade elliptic, obovate-lanceolate, or broadly ovate, 5–16 × 3–8 mm, both surfaces gray-white hirsute or glabrous, base cuneate, margin entire or sometimes slightly sinuate, slightly recurved, apex acute, obtuse, or rounded. Flowers solitary and terminal, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicel 1–2 cm, usually glabrous, rarely sparsely hirsute. Calyx glabrous, except yellow hirsute inside lobes; tube broadly cylindrical, 8–12 mm, base rounded or truncate, enlarging in fruit; lobes triangular, 3–4 × ca. 3 mm. Corolla white or various shades of yellow, 2.5–3 cm, outside glabrous, inside densely white- or yellow villous at throat; lobes obovate-oblong or obovate-elliptic, 14–16 × 5–7

mm, apex often very sparsely brown villous. Capsule subequal to calyx in length; style exceeding corolla tube. Fl. Jul–Aug.

- Grassy slopes; 2700–3600 m. SW Sichuan, NE and NW Yunnan.

- 1a. Flowers yellow, pale yellow, or greenish yellow; leaves broadly ovate, apex typically obtuse or rounded ..... 6a. subsp. *flavus*
- 1b. Flowers white; leaves elliptic or obovate-lanceolate, apex typically acute ..... 6b. subsp. *montanus*

**6a. *Cyananthus flavus* subsp. *flavus***

黄钟花(原亚种) *huang zhong hua* (yuan ya zhong)

*Cyananthus flavus* var. *glaber* C. Y. Wu.

Leaves broadly ovate, apex obtuse. Flowers yellow, pale yellow, or greenish yellow.

- Grassy slopes; 3100–3600 m. NW Yunnan (Lijiang, Zhongdian).

**6b. *Cyananthus flavus* subsp. *montanus*** (C. Y. Wu) D. Y. Hong & L. M. Ma, Acta Phytotax. Sin. 29: 46. 1991.

白钟花 *bai zhong hua*

*Cyananthus montanus* C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 89. 1965, based on *Wahlenbergia mairei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 285. 1913; *Atropanthe mairei* (H. Léveillé) H. Léveillé; *C. albiflorus* D. F. Chamberlain, nom. illeg. superfl.; *C. mairei* (H. Léveillé) Cowan (1938), not H. Léveillé (1916).

Leaves elliptic or obovate-lanceolate, apex acute. Flowers white.

- Grassy slopes; 2700–3400 m. SW Sichuan (Xichang, Zhaojue), NE Yunnan (Huize).

**7. *Cyananthus longiflorus*** Franchet, J. Bot. (Morot) 1: 280. 1887.

长花蓝钟花 *chang hua lan zhong hua*

*Cyananthus argenteus* C. Marquand; *C. obtusilobus* C. Marquand.

Caudexes robust, ± lignified, branched, with some scales toward apex; scales ovate, ca. 2 mm. Stems caespitose, erect, 4–22 cm tall, lignified toward base, densely gray-white lanate; branches very short. Leaves alternate; blade elliptic or ovate, 5–15 × 2–8 mm, abaxially densely silvery sericeous, adaxially sparsely puberulent or glabrescent, base cuneate, margin revolute, entire, apex acute or obtuse; petiole 2–4 mm. Flowers solitary, terminal on main stems and branches, subsessile, subtended by a whorl-like aggregation of 3–5 leaves. Calyx villous; tube cylindrical, 10–15 mm at anthesis; lobes triangular or lanceolate, 3–7 mm, pubescent throughout. Corolla blue-purple, tubular-campanulate, 3.5–5 cm, outside glabrous, inside densely villous at throat; lobes obovate-oblong, ca. 1/2 as long as to equaling tube, with a setose tuft at apex. Style almost extending up to corolla throat. Capsules slightly longer than calyx at maturity. Seeds oblong, ca. 1.3 mm. Fl. Jul–Sep.

- *Pinus* forests, dry slopes, sand dunes; 2800–4300 m. W Yunnan.

2. *Cyananthus* sect. *Cyananthus*

## 宽瓣组 kuan ban zu

Plants perennial. Caudex densely clothed in persistent and straw-colored scales. Calyx densely covered only with brown-black setae, or mixed with such hairs. Corolla lobes suborbicular, broadly ovate or oblong, as long as or slightly longer than broad.

Nine species: SW China, Himalaya; six species (two endemic) in China.

**8. *Cyananthus lobatus*** Wallich ex Benth in Royle, Ill. Bot. Himal. Mts. 1: 309. 1836.

裂叶蓝钟花 lie ye lan zhong hua

*Cyananthus lobatus* var. *farreri* C. Marquand.

Roots carrot-shaped, up to 1.3 cm in diam. Caudexes robust, branched, with persistent scales toward apex; scales ovate or lanceolate, ca. 4 mm. Stems caespitose, decumbent or ascending, 10–50 cm, simple or branched, sparsely villous toward apex. Leaves alternate, sessile or with petiole less than 5 mm; blade obovate, oblanceolate, spatulate, or rhombic, 7–35 × 5–18 mm, subleathery, abaxially villous, adaxially sparsely hispidulous or glabrescent, base cuneate, margin slightly revolute, 3–9-parted or -lobed toward apex. Flowers solitary, terminal on main stems and branches; pedicels 1–3 cm, brown hirsute. Calyx tube cylindrical, 0.3–1.5 cm, densely brown-red to brown-black hispid; lobes triangular to lanceolate, 1/4–1/2 as long as tube, both sides brown hispid. Corolla pale blue to blue-purple, tubular-campanulate, 3–5.5 cm, outside glabrous, inside densely villous at throat; lobes suborbicular, almost 1/2 as long as tube, apex with a tuft of short brown hairs in center. Ovary conical, subequal to calyx tube in length; style extending up to middle part of corolla; stigma large, 5-fid. Fl. Aug–Sep.

Grassy slopes, forests; 2800–4500 m. SE Xizang (Nyingchi, Yading, Zayü), NW Yunnan (Bijiang, Gongshan, Weixi) [Bhutan, N India, N Myanmar, Nepal].

"*Cyananthus insignis*" (R. E. Grahame, Gard. Chron., ser. 3, 107: 10. 1940) belongs here but was not validly published because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

**9. *Cyananthus pedunculatus*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 434. 1881.

有梗蓝钟花 you geng lan zhong hua

Roots carrot-shaped, up to 1.2 cm in diam. Caudexes robust, branched, covered with persistent scales toward apex; scales straw-colored, elliptic to lanceolate. Stems caespitose, ascending or sprawling, 10–20 cm, usually simple, hispidulous. Leaves alternate, gradually increasing in size toward apex, subsessile; blade elliptic, ovate-lanceolate, lanceolate, or linear-lanceolate, 7–16 × 2–6 mm, both surfaces hispidulous, base rounded, obtuse, or cuneate, margin entire or shallowly sinuous above middle. Flowers solitary, terminal; pedicels 1.2–4 cm, brown- or black villous. Calyx densely brown-black hirsute; tube cylindrical, 9–15 × 5–10 mm; lobes lanceolate-triangular, 2/5–1/2 as long as tube. Corolla purple-blue, funnelform-campanulate, 2.5–4.5 cm, throat glabrous or sparsely villous; lobes suborbicular, ca. 1/2 as long as tube, apex with brown hirsute tuft. Ovary subequal to calyx in length; style extending up to corolla throat; stigma 5-fid. Fl. Aug–Sep.

Alpine scrub; 3600–4900 m. S Xizang (Yadong) [Bhutan, NE India, Nepal].

**10. *Cyananthus sericeus*** Y. S. Lian, Acta Phytotax. Sin. 17(3): 122. 1979.

绢毛蓝钟花 juan mao lan zhong hua

Caudexes robust, branched, densely covered with narrowly ovate or ovate-oblong persistent scales toward apex; scales 3–5 mm. Stems slender, 20–30 cm tall, densely sericeous when young, eventually glabrescent. Leaves alternate, those toward base scalelike, ca. 2 × 1 mm, sparsely villous; blade of middle and upper leaves narrowly elliptic, 8–12 × 2–4 mm, abaxially densely retrorsely and appressed sericeous, adaxially glabrous or sparsely hairy. Flowers solitary and terminal, subtended by a whorl-like aggregation of 3 or 4 leaves; pedicels 5–12 mm, brown- or black villous. Calyx densely brown- or black hirsute; tube cylindrical, 15–20 × 9–11 mm; lobes lanceolate-triangular, ca. 1/2 as long as tube, margin white villous. Corolla blue, with darker blue veins, 3.5–4 cm, glabrous; lobes broadly obovate, ca. 1/2 as long as tube. Ovary conical, slightly shorter than calyx. Style almost extending up to corolla throat. Fl. Sep.

• Rocky crevices; 3500–3600 m. SE Xizang (Cona).

**11. *Cyananthus microphyllus*** Edgeworth, Trans. Linn. Soc. London 20: 81. 1846.

小叶蓝钟花 xiao ye lan zhong hua

*Cyananthus linifolius* Wallich ex J. D. Hooker & Thomson, nom. illeg. superfl.; *C. nepalensis* Kitamura.

Caudexes robust, branched, densely covered with scales toward apex; scales elliptic to lanceolate, ca. 5 × 2 mm. Stems brownish red, slender, 5–25 cm, branched toward base, glabrous or sparsely puberulent. Leaves alternate, almost sessile; blade ovate, lanceolate, or linear-elliptic, 5–13 × 1.5–5 mm, abaxially sericeous, adaxially glabrous, base rounded to subcordate, margin revolute, entire, or sinuous, apex obtuse or acute. Flowers solitary and terminal; pedicels 3–10 mm, brown- or black setose. Calyx brown- or black setose; tube cylindrical, 7–10 mm, base truncate; lobes triangular, 1/2–2/3 as long as tube, both sides hairy. Corolla blue-purple or blue, cylindrical-campanulate, 1.8–2.8 cm, glabrous or brown- or black setose, densely white fimbriate villous inside; lobes obovate-oblong, subequal to tube in length. Ovary conical, nearly as long as calyx; style extending up to corolla throat. Seeds shiny brown, oblong, ca. 2 × 0.5–0.7 mm. Fl. Sep.

Mountain slopes; 3300–4300 m. S Xizang (Nyalam) [N India, Nepal].

Chinese plants are *Cyananthus microphyllus* subsp. *microphyllus*; *C. microphyllus* subsp. *williamsonii* K. K. Shrestha is known only from Nepal.

**12. *Cyananthus cordifolius*** Duthie, Bull. Misc. Inform. Kew 1912: 37. 1912.

心叶蓝钟花 *xin ye lan zhong hua*

Caudexes robust, branched. Stems decumbent, slender, 14–27 cm, sparsely arachnoid-villous, sterile-branched at middle. Leaves alternate, subsessile, those of main stem with blade cordate to triangular-ovate, 10–15 × 5–9 mm, abaxially sparsely villous, adaxially glabrous or sparsely puberulent, base cordate, obtuse, or rounded, margin serrate, apex acute or obtuse; leaves on sterile branches with blade much smaller, elliptic-ovate, almost entire, base rounded or rarely cordate. Flowers solitary and terminal; pedicels 5–18 mm, brown- or black setose. Calyx densely brown- or black setose; tube cylindrical, 11–16 × 5–8 mm, base truncate; lobes lanceolate-triangular, slightly shorter than tube, inside both black- and white villous. Corolla blue or pale blue, cylindrical-campanulate, 2.5–3.5 cm, densely villous at throat; lobes oblong, 12–15 × 5–6 mm. Ovary conical-ovoid, slightly shorter than calyx; style extending up to corolla throat. Fl. Aug.

Mountain thickets; 3000–4000 m. S Xizang (Gyirong) [NW India, Nepal].

**3. *Cyananthus* sect. *Annui*** (Y. S. Lian) D. Y. Hong & L. M. Ma, Acta Phytotax. Sin. 29: 48. 1991.

蓝钟花组 *lan zhong hua zu*

*Cyananthus* subsect. *Annui* Y. S. Lian in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 183. 1983.

Plants annual, lacking a caudex. Calyx sometimes 4-lobed. Corolla sometimes 3- or 4-lobed. Ovary sometimes 3- or 4-locular.

Four species: Himalaya and the Hengduan Mountains; four species (two endemic) in China.

**14. *Cyananthus lichiangensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 109. 1913.

丽江蓝钟花 *li jiang lan zhong hua*

Stems caespitose, 10–30 cm tall, glabrous, simple or with slender branches. Leaves sparse, alternate; petiole 2–5 mm, villous; blade ovate or triangular, 5–13 × 5–11 mm, both surfaces hispidulous, base truncate or obtuse, margin revolute, entire, sinuous, or crenulate, apex obtuse. Flowers solitary, terminal on both main stems and branches, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 2–5 mm, glabrous. Calyx with red-brown setae outside, base of setae swollen, often black verrucose; tube cylindrical, 8–10 × 6–9 mm; lobes obovate-oblong or obdeltoid, ca. 1/3 as long as tube, broadest part at or above middle, outside sparsely red-brown setose, inside appressed red-brown villous. Corolla pale or greenish yellow, sometimes blue- or purple striate, cylindrical-campanulate, ca. 2 × as long as calyx tube, outside glabrous, inside densely villous at throat; lobes oblong, 1/3–1/2 as long as tube, apex acute or obtuse. Ovary nearly as long as calyx tube; style extending up to corolla throat. Capsules exserted beyond calyx at maturity. Seeds oblong, ca. 1 × 0.5 mm, obtuse at both ends. Fl. Aug.

• Grassy slopes, grassy places at forest margins; 3000–4000 m. SW Sichuan, Xizang, N Yunnan (Dêqên, Lijiang, Zhenxiang).

**15. *Cyananthus fasciculatus*** C. Marquand, Bull. Misc. Inform. Kew 1924: 247. 1924.

**13. *Cyananthus sherriffii*** Cowan, New Fl. & Silva 10: 181. 1938.

杂毛蓝钟花 *za mao lan zhong hua*

Caudexes robust, somewhat lignified, branched, densely covered toward apex with persistent scales; scales oblong or lanceolate, up to 10 mm. Stems caespitose, dark brown, slender, 5–15 cm, sparsely arachnoid-pubescent. Leaves alternate, gradually increasing in size toward apex, sessile or shortly petiolate; blade linear or narrowly elliptic, 4–8 × 1–3 mm, abaxially silvery sericeous, adaxially sparsely arachnoid-villous along mid-vein. Flowers solitary, terminal on longer stems, subtended by a whorl-like aggregation of 4 or 5 leaves that are 8–12 × 2–3.5 mm; pedicels 5–8 mm. Calyx glaucous and densely brown- or black setose; tube cylindrical, 10–15 × 5–7 mm, base truncate; lobes triangular or lanceolate, ca. 1/3 as long as tube, both sides pubescent. Corolla blue or gray-blue, cylindrical-campanulate, ca. 2.5 cm, outside glabrous, inside villous at throat; lobes oblong, apex with a brown villous tuft. Ovary conical, nearly as long as calyx; style extending up to corolla throat; stigma 5-fid. Fl. Jul–Aug.

• Alpine meadows or thickets; 3200–5000 m. S Xizang (Lhünzê, Nangxian).

束花蓝钟花 *shu hua lan zhong hua*

Stems 30–100 cm, branched, glabrous or sparsely villous; branches long and spreading. Leaves alternate, scattered; petiole slender, 5–10 mm, glabrous or sparsely villous; blade ovate or suborbicular, 4–16 × 4–15 mm, abaxially usually glabrous, adaxially sparsely hispidulous, base obtuse, truncate, or subcordate, apex rounded or obtuse. Flowers in dichasia, aggregated at top of main stems and branches, subtended by whorl-like aggregations of 4 or 5 leaves; pedicels 2–4 mm, slender, glabrous. Calyx moderately to densely brown setose; tube subcylindrical, broader toward rounded base, 5–8 × 3–5 mm; lobes usually 5 (some on lower branches with only 4), narrowly triangular, ciliate. Corolla pale blue, cylindrical-campanulate, 14–17 mm, outside glabrous, inside villous near throat; lobes (4 or) 5, obovate-oblong, ca. 5 × 1.5–3 mm. Ovary subequaling calyx tube; style exserted above corolla tube. Capsules exceeding calyx at maturity. Seeds ellipsoid, ca. 0.5 × 0.2 mm, both ends acute. Fl. Sep–Oct.

• Forests, thickets, grassy slopes; 2400–3500 m. W Sichuan, N Yunnan.

**16. *Cyananthus inflatus*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 21. 1857.

胀萼蓝钟花 *zhang e lan zhong hua*

*Cyananthus forrestii* Diels; *C. pseudoinflatus* P. C. Tsoong.

Stems erect or ascending, up to 80 cm, branched, sparsely villous or glabrous. Leaves alternate, sparse; petiole slender, 2–7 mm, villous; blade orbicular, ovate, or triangular, 5–15 × 3–10 mm, abaxially hirsute, adaxially hispidulous, base rounded, truncate, or obtuse, margin entire or obscurely crenulate, apex obtuse. Flowers usually solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 3–5 leaves; pedicels 2–5 mm, slender, brown hirsute. Calyx densely brown hirsute outside; tube urceolate at anthesis, 7–12 mm, becoming conspicuously inflated after flowering; lobes 5, deltoid, 1/4–2/5 as long as tube, both sides brown hirsute. Corolla pale blue, cylindrical-campanulate, almost 2 × as long as calyx, outside glabrous, inside densely villous at throat; lobes 5, narrowly obovate, nearly 1/2 as long as tube. Ovary slightly shorter than calyx; style extending up to corolla throat. Capsules ovoid, exceeding calyx in height at maturity, 5-loculicidal. Seeds brown-red, ellipsoid, ca. 0.5 × 0.2 mm, obtuse at both ends. Fl. Aug–Sep.  $2n = 14$ .

Alpine meadows, grassy and shrubby slopes; 1900–4900 m. W Guizhou (Weining), W Sichuan, S Xizang, N Yunnan [Bhutan, N India, Myanmar, Nepal].

**17. *Cyananthus hookeri*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 435. 1881.

蓝钟花 lan zhong hua

*Cyananthus cronquistii* K. K. Shrestha; *C. hookeri* var. *densus* C. Marquand; *C. hookeri* var. *grandiflorus* C. Marquand; *C. hookeri* var. *hispidus* Franchet; *C. hookeri* var. *levicalyx* Y. S. Lian; *C. hookeri* var. *levicaulis* Franchet.

Stems usually caespitose, suberect or ascending, 4–20 cm, glabrous to rather densely villous; branches 1.5–10 cm. Leaves alternate; blade rhombic or ovate, 3–7 × 2–6 mm, abaxially sparsely to rather densely hirsute, adaxially sparsely to rather densely hispidulous, base obtuse or truncate, abruptly attenuate into petiole, margin crenate or sometimes entire, apex obtuse or subacute; petiole 1–4 mm. Flowers small, solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 3–5 leaves, almost sessile. Calyx densely hirsute outside with long stiff yellow-brown hairs, rarely subglabrous; tube ovoid, 3–8 mm; lobes (3 or)4(or 5), triangular, 1/3–1/2 as long as tube, both sides hirsute. Corolla purple-blue, cylindrical, 7–15 mm, outside glabrous, inside densely villous at throat; lobes usually (3 or)4(or 5), narrowly obovate or oblong, apex often with 3 or 4 brown-yellow villous hairs. Stamens 4. Style extending above corolla throat; stigma 4-fid. Capsules ovoid, exserted above calyx at maturity. Seeds narrowly ovoid, ca. 1.2 × 0.4 mm. Fl. Aug–Sep.

Thickets, grasslands; 2700–4500 m. SE Gansu (Tao He basin), S Qinghai (Tongren, Yushu), W Sichuan (W of Kangding and Lixian), E Xizang (E of Namling), N Yunnan [Bhutan, NE India (Sikkim), Nepal].

## 2. *LEPTOCODON* (J. D. Hooker & Thomson) Lemaire, Ill. Hort. 3. Misc. 49. 1856.

细钟花属 xi zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

*Codonopsis* subg. *Leptocodon* J. D. Hooker & Thomson, Ill. Himal. Pl. t. 16, A. 1855.

Vines, perennial. Stems slender. Leaves alternate, but on branches often opposite or subopposite. Flowers solitary, outside axils, less frequently in axils, or opposite to leaves. Calyx 5-lobed, tube broadly obconical. Corolla tubular, 5-lobed. Stamens 5; filaments long, base slightly dilated, alternate with 5 free, lamellar glands. Ovary semi-inferior, with superior part narrowly conical, 3-locular; style long; stigma 3-fid, segments clavate. Capsule 3-loculicidal at superior part. Seeds numerous.

Two species: Bhutan, SW China, N India, N Myanmar, E Nepal; two species (one endemic) in China.

- 1a. Plants glabrous throughout except young leaves sparsely villous; calyx lobes linear-oblong, often reflexed, distant from each other, glabrous, base clawlike ..... 1. *L. gracilis*  
 1b. Plants ± hairy, rarely sparsely villous only on leaf margin; calyx lobes ovate to narrowly ovate, not reflexed, overlapping each other, at least villous on margin, base obtuse, truncate, or cordate, but not clawlike ..... 2. *L. hirsutus*

**1. *Leptocodon gracilis*** (J. D. Hooker & Thomson) Lemaire, Ill. Hort. 3: Misc. 49. 1856.

细钟花 xi zhong hua

*Codonopsis gracilis* J. D. Hooker & Thomson, Ill. Himal. Pl. t. 16, A. 1855; *Campanumoea gracilis* (J. D. Hooker & Thomson) G. Nicholson.

Plants glabrous throughout except young leaves sparsely villous, odorous. Roots unknown. Stems long, slender, branched. Leaves alternate, rarely those on branchlets opposite, long petiolate; blade abaxially gray, adaxially green, ovate-orbicular, 0.9–2.5 × 0.9–2.5 cm, membranous, base truncate or obtuse, margin sinuate-crenate, apex obtuse. Flowers pendent; pedicels slender, 1–5 cm, straight or curved. Calyx glabrous;

tube 2–3 mm; lobes narrowly oblong, 5–8 × 1–2 mm, margin with 1 or 2 pairs of callose serratures. Corolla blue or purple, 2.8–3.5 cm; tube ca. 4 mm in diam.; limb 1–1.5 cm in diam.; lobes triangular, 4–5 mm. Filaments ca. 2 cm. Style ca. 2 cm. Inferior part of capsule semiglobose or obconic, 4–5 mm; superior part conical or ovoid, 8–10 mm. Seeds red-brown, linear-oblong, 1.5–1.8 mm, smooth. Fl. Aug–Oct.

Forests, thickets; 2000–2500 m. SW Sichuan (Huili, Muli, Yanbian), NW Yunnan [Bhutan, N India, N Myanmar, E Nepal].

**2. *Leptocodon hirsutus*** D. Y. Hong, Acta Phytotax. Sin. 18: 246. 1980.

毛细钟花 mao xi zhong hua

*Codonopsis hirsuta* (D. Y. Hong) K. E. Morris & Lammers

(1999), not (Handel-Mazzetti) D. Y. Hong & L. M. Ma (1992); *C. hongii* Lammers.

Plants malodorous. Roots slender, not thickened. Stems hirsute on young parts. Leaves on main stems alternate, those on branchlets almost opposite, all leaves long petiolate; blade abaxially villous, rarely extremely sparsely villous. Flowers subopposite to leaves. Calyx lobes ovate, overlapping each

other at anthesis, separated at fruiting, upright, 5–7 × 3–4 mm, hirsute on abaxial side and margin, base cordate or subtruncate, not clawlike, margin sinuate-crenate. Inferior part of capsule semiglobose, 8–10 mm in diam.; superior part conical, ca. 10 mm. Seeds ellipsoid, ca. 1 mm. Fl. Jul–Aug, fr. Oct–Nov.

• Mixed forests, thickets, grasslands; 2000–2700 m. SE Xizang (Bomi, Cona, Zayü), NW Yunnan (Gongshan, Weixi).

### 3. CODONOPSIS Wallich in Roxburgh, Fl. Ind. 2: 103. 1824.

党参属 dang shen shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

*Glosocomia* D. Don.

Herbs, perennial, often fetid. Roots thickened, carrot-shaped, fusiform, or tuberous, mostly fleshy, rarely lignified. Stems erect, ascending, climbing, procumbent, or twining. Leaves alternate, opposite, or fascicled (pseudovercillate). Flowers solitary, terminal on main stems and branches, sometimes opposite to leaves, rarely axillary. Calyx tube variously adnate to ovary, often 10-ribbed; lobes 5. Corolla epigynous, 5-lobed for less than 1/2 its length and campanulate, funnelform, or tubular, or 5-fid for more than 3/4 its length and rotate, various shades of purple and blue, yellow, green, or white. Stamens 5; filaments often dilated at base, glabrous or hairy, rarely alternating with lamellar glands; anthers basifixed, connective glabrous or setose. Ovary inferior or at least inferior to corolla, 3-locular; ovules numerous; style glabrous or hairy; stigma usually 3-fid, lobes broad. Fruit with persistent calyx, an ovoid or obconic loculicidal capsule. Seeds numerous, ellipsoid, oblong, or globose, winged or wingless, smooth, faintly striate, or reticulate; embryo straight, embedded in copious endosperm.

Forty-two species: C, E, and S Asia; 40 species (24 endemic) in China.

- 1a. Plants usually not fetid; fruit an obconic capsule, dehiscent apex relatively short; seed testa smooth or finely striate.
  - 2a. Corolla campanulate, lobed for less than 1/2 its length (2. *C. subg. Obconicapsula*) ..... 36. *C. dicentrifolia*
  - 2b. Corolla rotate, divided for more than 3/4 its length (3. *C. subg. Pseudocodonopsis*).
    - 3a. Stem erect or procumbent, scapiform; leaves rosulate ..... 37. *C. rosulata*
    - 3b. Stem twining or suberect; leaves opposite or alternate, not rosulate.
      - 4a. Stem usually more than 1 m, twining and leafy throughout ..... 39. *C. convolvulacea*
      - 4b. Stem usually less than 1 m, erect or twining only at apex; leaves mostly aggregated toward stem base.
        - 5a. Stem and adaxial surface of leaves hirsute; leaves ovate, serrate ..... 38. *C. hirsuta*
        - 5b. Stem and leaves glabrous; leaves linear, entire ..... 40. *C. graminifolia*
  - 1b. Plants commonly fetid; fruit an ovoid capsule, dehiscent apex elongate; seeds reticulate (1. *C. subg. Codonopsis*).
    - 6a. Stem twining, leafy throughout, often over 1 m (*C. sect. Codonopsis*).
      - 7a. Leaves pseudovercillate, in fascicles of 3 or 4 at apex of lateral branches.
        - 8a. Roots usually fusiform; leaf apex acute; calyx lobes 2–3 cm; corolla 2.5–3.5 cm; seeds winged ..... 1. *C. lanceolata*
        - 8b. Roots tuberous; leaf apex obtuse; calyx lobes 1–1.5 cm; corolla 2–2.5 cm; seeds terete ..... 2. *C. ussuriensis*
      - 7b. Leaves alternate or opposite, not pseudovercillate.
        - 9a. Corolla tubular.
          - 10a. Leaves deeply incised, large serrate, base cordate to broadly cuneate ..... 14. *C. deltoidea*
          - 10b. Leaves shallowly incised, serrate, or subentire, base cuneate to rounded ..... 15. *C. tubulosa*
        - 9b. Corolla campanulate, globose-campanulate, or tubular-campanulate.
          - 11a. Calyx lobes linear to linear-lanceolate, well separated, 10–20 × 2–3 mm, length/width ratio > 5 ..... 8. *C. viridis*
          - 11b. Calyx lobes wider, proximate, length/width ratio < 3.
            - 12a. Calyx ± pubescent.
              - 13a. Leaves less than 3 × 3 cm; calyx tube hirsute, lobes ovate-orbicular or rhombic-ovate, dentate and hirsute; corolla globose-campanulate ..... 6. *C. subglobosa*
              - 13b. Leaves much more than 3 × 3 cm; calyx tube sparsely hairy, lobes narrowly oblong or lanceolate, subentire, densely puberulent; corolla broadly campanulate ..... 7. *C. affinis*
          - 12b. Calyx glabrous.
            - 14a. Lower leaves cordate, truncate, or rounded at base.
              - 15a. Stem almost simple; leaves subentire or slightly sinuous on margins ..... 3. *C. cordifolioidea*
              - 15b. Stem branched; leaves serrate on margins.

- 16a. Corolla large, more than  $1.5 \times 1.7$  cm, usually longer than calyx lobes ..... 4. *C. pilosula*  
 16b. Corolla small, less than  $1 \times 1.5$  cm, shorter than or subequal to calyx lobes ..... 5. *C. micrantha*
- 14b. Lower cauline leaves cuneate or rounded (occasionally cordate) at base.  
 17a. Stems and leaves glabrous; leaves entire.  
 18a. Leaves  $0.5-2 \times 0.5-1.5$  cm, apex acute or obtuse ..... 9. *C. farreri*  
 18b. Leaves  $6-7 \times 2-2.5$  cm, apex shortly acuminate ..... 10. *C. rotundifolia*  
 17b. Stems and leaves  $\pm$  hairy; leaves crenulate or serrate on margins.  
 19a. Calyx lobes ciliate, reflexed ..... 11. *C. henryi*  
 19b. Calyx lobes glabrous, not reflexed.  
 20a. Leaf blade  $3-15 \times 1-7$  cm, apex acuminate ..... 12. *C. levicalyx*  
 20b. Leaf blade up to  $2.3 \times 1.7$  cm, apex rounded or acute ..... 13. *C. kawakamii*
- 6b. Stems erect or ascending (sometimes climbing or procumbent but not twining), often scapiform, less than 1 m tall (*C. sect. Erectae*).  
 21a. Stems without branches like pinnate leaves and usually sterile.  
 22a. Corolla tubular or tubular-campanulate; filaments villous; stems mostly procumbent or climbing.  
 23a. Corolla 2-4 cm, yellow-green, base shaded brown-red, glabrous ..... 16. *C. benthamii*  
 23b. Corolla only ca. 1.7 cm, yellowish, with purple-blue spots, densely puberulent outside ..... 17. *C. pianmaensis*  
 22b. Corolla campanulate; filaments not villous; stems mostly erect or scapiform.  
 24a. Leaves located at lower part of stems, main stems scapiform.  
 25a. Petiole 2-7 cm, leaf blade  $2-13 \times 1.5-5$  cm; main stem with 1-4 flowers; calyx lobes  $5-7 \times$  ca. 3 mm, with sinus between them broad and obtuse; corolla less than 1.5 cm wide ..... 19. *C. subscaposa*  
 25b. Petiole less than 1 cm, leaf blade  $5-8 \times 1.5-3$  cm; main stem with 1 or 2 flowers; calyx lobes  $8-12 \times 4-6$  mm, with sinus between them narrow; corolla up to 3 cm wide ..... 20. *C. meleagris*  
 24b. Leaves evenly arranged on main stems, not scapiform.  
 26a. Leaves opposite; plants glabrous throughout ..... 21. *C. purpurea*  
 26b. Leaves alternate.  
 27a. Plants  $\pm$  hairy; corolla less than 2 cm ..... 18. *C. subsimplex*  
 27b. Plants glabrous; corolla more than 3.5 cm.  
 28a. Leaves lanceolate,  $1.5-6.5$  cm, entire; calyx lobes narrowly lanceolate,  $18-20 \times 2-3$  mm ..... 23. *C. gombalana*  
 28b. Leaves broadly lanceolate,  $5-14 \times 3-7$  cm, serrate; calyx lobes  $20-30 \times 6-10$  mm ..... 24. *C. chimiliensis*
- 21b. Stems with branches like pinnate leaves and usually sterile.  
 29a. Veins on leaves conspicuous, leaf margins revolute forming thick periphery.  
 30a. Corolla broadly tubular, ca. 1.2 cm; lower slender branches sometimes fertile ..... 35. *C. bhutanica*  
 30b. Corolla campanulate, more than 1.5 cm; lower slender branches sterile.  
 31a. Leaves subentire; flowers entirely glabrous.  
 32a. Leaves not more than  $1.8 \times 1.5$  cm, sparsely puberulent abaxially; corolla purple-green, with purple veins ..... 30. *C. alpina*  
 32b. Leaves up to  $3.2 \times 2.6$  cm, glabrous on both surfaces; corolla pale blue, with red-brown spots inside ..... 31. *C. cardiophylla*  
 31b. Leaves crenulate; flowers  $\pm$  hairy on some parts.  
 33a. Calyx lobes  $5-7 \times 2-3$  mm, with sinus between them broad and obtuse ..... 34. *C. chlorocodon*  
 33b. Calyx lobes more than 10 mm, with sinus between them narrow and acute.  
 34a. Corolla glabrous throughout; calyx tube mostly glabrous, lobes ovate or ovate-lanceolate, broadest at middle, hispidulous only at apex outside ..... 32. *C. viridiflora*  
 34b. Corolla villous inside; calyx tube mostly hairy, lobes narrowly triangular, broadest at base, mostly entirely hispidulous ..... 33. *C. tsinlingensis*
- 29b. Veins on leaves inconspicuous, leaf margins not revolute.  
 35a. Corolla tubular or tubular-campanulate, at least lower part tubular.  
 36a. Corolla tubular; connective setose ..... 25. *C. thalictrifolia*  
 36b. Corolla tubular-campanulate, lower half tubular but abruptly expanded at middle; connective glabrous ..... 26. *C. bulleyana*
- 35b. Corolla broadly campanulate.  
 37a. Plants white with dense white hairs; leaf blade less than  $1.5 \times 1$  cm ..... 28. *C. canescens*  
 37b. Plants green with sparse hairs; leaf blade usually larger.  
 38a. Calyx lobes  $15-20 \times 6-8$  mm, hairy only at apex; leaf blades  $1-5 \times 0.8-3.2$  cm ..... 22. *C. clematidea*  
 38b. Calyx lobes much smaller, hairy throughout; leaf blades mostly smaller.  
 39a. Corolla villous both inside and outside ..... 29. *C. argentea*  
 39b. Corolla glabrous or hairy only toward lobes outside ..... 27. *C. foetens*

1. *Codonopsis* subg. *Codonopsis*

党参亚属 dang shen ya shu

Plants fetid, often strongly so. Roots carrot-shaped, fusiform, or tuberous. Stems erect, ascending, climbing, procumbent, or twining. Corolla epigynous, 5-lobed for less than 1/2 its length and campanulate, funnelform, or tubular. Fruit an ovoid loculicidal capsule or globose berry. Seed testa reticulate.

Thirty-seven species: Tajikistan to Russia (Far East), Japan, and Indonesia (Java); 35 species (21 endemic) in China.

Species nos. 1–15, with stem twining, leafy throughout, often over 1 m, are assigned to *Codonopsis* sect. *Codonopsis*. Species nos. 16–35, with stems erect or ascending, often scapiform, sometimes climbing or procumbent but never twining, less than 1 m tall, belong to *C. sect. Erectae* (Komarov) D. Y. Hong.

1. *Codonopsis lanceolata* (Siebold & Zuccarini) Trautvetter, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 46. 1879.

羊乳 yang ru

*Campanumoea lanceolata* Siebold & Zuccarini, Fl. Jap. 1: 174. 1841; *C. japonica* Siebold ex E. Morren; *Codonopsis bodinieri* H. Léveillé; *Glosocomia lanceolata* (Siebold & Zuccarini) Maximowicz.

Plants glabrous throughout or occasionally sparsely villous on stems and leaves. Caudexes subcylindrical. Roots usually fusiform-thickened, 10–20 × 1–6 cm. Stems twining, yellow-green but with purplish shade, more than 100 cm, often branched. Leaves on main stems alternate, lanceolate, ovate, or elliptic, 8–14 × 3–7 mm; usually leaves 2–4-fascicled on top of branchlets, subopposite or verticillate, petiole 1–5 mm; blade abaxially gray-green, adaxially green, ovate, narrowly ovate, or elliptic, 3–12 × 1.3–5.5 cm, abaxially rarely hirsute, veins obvious, base attenuate or sometimes rounded, margin usually entire or sparsely sinuate, occasionally revolute and hispid, apex acute or obtuse. Flowers solitary or paired on top of branchlets; pedicels 1–9 cm. Calyx adnate to ovary by half; tube hemispherical; lobes ovate or deltoid, 1–3 × 0.5–1 cm, entire, acute; sinus between calyx lobes acute or gradually becoming broader after anthesis. Corolla broadly campanulate, 2–4 × 2–3.5 cm, shallowly lobed; lobes yellow-green or milk-white, with purple spots, deltoid, 0.5–1 cm, revolute. Disk dark green, fleshy. Filaments subulate, slightly dilated at base, 4–6 mm; anthers 3–5 mm; ovary inferior. Capsule hemispherical at base, rostrate toward apex, 1.6–3.5 cm in diam. Seeds numerous, brown, winged, seed body oblong or ellipsoid. Fl. and fr. Jul–Aug.  $2n = 16$ .

Shrublands, broad-leaved forests; 200–1500 m. Anhui, Fujian, Hebei, Henan, Hubei, Hunan, Jiangsu, Shandong, Shanxi, Zhejiang [Japan, Korea, Russia (Far East)].

2. *Codonopsis ussuriensis* (Ruprecht & Maximowicz) Hemsley, J. Linn. Soc., Bot. 26: 6. 1889.

雀斑党参 que ban dang shen

*Glosocomia ussuriensis* Ruprecht & Maximowicz, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 223. 1857; *Codonopsis lanceolata* (Siebold & Zuccarini) Trautvetter var. *ussuriensis* (Ruprecht & Maximowicz) Trautvetter; *G. lanceolata* (Siebold & Zuccarini) Maximowicz var. *ussuriensis* (Ruprecht & Maximowicz) Regel.

Plants glabrous throughout, or stems and leaves sparsely villous. Roots gray-yellow, tuberous or oblong, 1–3 cm in diam.

Stems twining, green, white, or dark-purple, slender, glabrous or internodes sparsely villous. Leaves on main stems alternate, lanceolate or ovate, smaller, those on top of branches usually 3–5-fascicled, pseudoverticillate; petiole short; blade abaxially gray-green, adaxially green, elliptic, lanceolate, or oblong, 2–6 × 1–2.5 cm, abaxially glabrous or sparsely villous, adaxially glabrous, base attenuate, margin entire, occasionally revolute, apex acute or obtuse. Flowers solitary, terminal on slender branches; pedicels 2–5 cm; bracts single, small, lanceolate or narrowly ovate. Calyx tube adnate to ovary up to its middle, semiglobose; lobes narrowly lanceolate or ovate-deltoid, 10–20 × 6–8 mm, margin entire, apex acute. Corolla campanulate, 2–3 × 1.5–2.5 cm, shallowly lobed; lobes dark purple, deltoid, inside with remarkable black-purple stripes or black spots. Filaments 3–5 mm, slightly dilated at base; anthers 2–4 mm. Capsules hemispherical at base, rostrate toward apex, ca. 15 mm. Seeds numerous, dark brown, lucid, ovoid, wingless. Fl. Jul–Aug.  $2n = 16$ .

Ravines, moist meadows, mostly in sandy soil; ca. 800 m. E Heilongjiang, E Jilin [Japan, Korea, Russia (Far East)].

3. *Codonopsis cordifolioides* P. C. Tsoong, Contr. Inst. Bot. Natl. Acad. Peiping 3: 93. 1935.

心叶党参 xin ye dang shen

Plants glabrous or subglabrous or only leaves sparsely shortly setose. Stems twining, more than 1 m, with a few very short branches. Leaves on main stems lax, alternate, ca. 10 cm distant between 2 leaves; petiole filiform, 5–9 cm; blade abaxially gray-green, adaxially green, broadly ovate, up to 10 × 7 cm, base subcordate, with a square sinus, subentire, apex shortly acuminate or acute; veins conspicuous, lateral veins from base; leaves on branches usually only 2 and opposite, petiole less than 1 cm, blade similar to those on main stems in shape, but sinus not square. Flowers solitary, opposite to leaves; pedicels 3–6 cm. Calyx tube adnate to ovary up to its middle, semiglobose; lobes deltoid-lanceolate, ca. 10 × 5–6 mm, margin entire, apex acuminate; sinus between calyx lobes narrow. Corolla campanulate, 1.7–1.8 × 1–1.2 cm, 5-lobed to middle; lobes dark blue, lanceolate-deltoid. Filaments dilated at base, ca. 5 mm; anthers ca. 5 mm. Capsule semiglobose in lower half, rostrate above, ca. 1.5 cm in diam. Seeds numerous, brown, ellipsoid, obscurely reticulate. Fl. and fr. Sep–Oct.

• Forests; 1700–2200 m. NW Yunnan (Fugong, Gongshan).

4. *Codonopsis pilosula* (Franchet) Nannfeldt, Acta Horti Gothob. 5: 29. 1930.

党参 dang shen

Roots carrot-shaped or fusiform-cylindrical, 15–30 × 1–3 cm, often branched. Stems twining, 1–2 m, glabrous, branched; lateral branches 15–30 cm; branchlets 1–5 cm, sterile or fertile. Leaves on main stems and branches alternate, those on branchlets opposite; petiole 0.5–2.5 cm, sparsely shortly setose; blade abaxially gray-green, adaxially green, ovate or narrowly ovate, 1–7.3 × 0.8–5 cm, abaxially sparsely or densely appressed hirsute or villous, rarely glabrous, base subcordate, rounded, or truncate, margin crenulate, apex obtuse or acute. Flowers solitary and terminal on branches, pedicellate. Calyx adnate to ovary up to middle; lobes broadly lanceolate or narrowly oblong, 10–23 × 6–8 mm, margin subentire or sinuate, apex obtuse or acute; sinus between calyx lobes narrow and pointed. Corolla yellow-green, with purple spots inside, broadly campanulate, 1.8–2.3 × 1.8–2.5 cm, shallowly lobed; lobes deltoid, apex acute. Filaments slightly dilated at base, ca. 5 mm; anthers elongate, 5–6 mm. Stigma white setose. Capsule hemispheric at base, conical toward apex, 1–2.4 cm. Seeds numerous, red-brown to dark brown, oblong to ellipsoid, ca. 1 mm, smooth. Fl. and fr. Jul–Oct.  $2n = 16$ .

Forests, thickets, meadows or scrub at forest margins; 900–3900 m. Chongqing, E Gansu, N Guizhou, Hebei, Heilongjiang, Henan, W Hubei, NW Hunan, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, NW Yunnan; one subspecies widely cultivated [Korea, Mongolia, Russia (Far East)].

- 1a. Calyx tube almost entirely free from ovary; ovary almost entirely superior to calyx ..... 4c. subsp. *tangshen*  
 1b. Calyx adnate to ovary up to middle or near middle; ovary half-inferior to calyx.  
 2a. Leaves glabrous or often hispidulous ..... 4a. subsp. *pilosula*  
 2b. Leaves usually hirsute ..... 4b. subsp. *handeliana*

#### 4a. *Codonopsis pilosula* subsp. *pilosula*

党参(原亚种) dang shen (yuan ya zhong)

*Campanumoea pilosula* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 72. 1883; *Codonopsis glaberrima* Nannfeldt; *C. microtubulosa* Z. T. Wang & G. J. Xu; *C. modesta* Nannfeldt; *C. pilosula* var. *glaberrima* (Nannfeldt) P. C. Tsoong; *C. pilosula* var. *modesta* (Nannfeldt) L. T. Shen; *C. pilosula* var. *volubilis* (Nannfeldt) L. T. Shen; *C. silvestris* Komarov; *C. volubilis* Nannfeldt.

Leaves 1–7.3 × 0.8–5 cm, glabrous or often hispidulous. Calyx lobes 1.4–1.8 cm. Corolla 1.7–2.3 cm.

Forests, thickets; 900–2900 m. E Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, N Sichuan (Heishui, Pingwu, Songpan) [Korea, Mongolia, Russia (Far East)].

#### 4b. *Codonopsis pilosula* subsp. *handeliana* (Nannfeldt) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 532. 1992.

闪毛党参 shan mao dang shen

*Codonopsis handeliana* Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1078. 1936; *C. pilosula* var. *handeliana* (Nannfeldt) L. T. Shen.

Leaves 1–3 × 0.8–2.5 cm, both surfaces usually hirsute. Calyx lobes 1.5–2 cm. Corolla 2–2.6 cm.

• Forests, thickets, meadows at forest margins; 2300–3900 m. W Sichuan, NW Yunnan.

#### 4c. *Codonopsis pilosula* subsp. *tangshen* (Oliver) D. Y. Hong, Novon 20: 423. 2010.

川党参 chuan dang shen

*Codonopsis tangshen* Oliver, Hooker's Icon. Pl. 20: t. 1966. 1891.

Calyx nearly entirely free from ovary, inferior; tube nearly absent or only up to 1.5 mm. Ovary inferior only for corolla.

• Scrub at forest margins; 900–2300 m. Chongqing, N Guizhou, W Hubei, NW Hunan, SE Shaanxi, NE Sichuan; also cultivated on a large scale.

#### 5. *Codonopsis micrantha* Chipp, J. Linn. Soc., Bot. 38: 382. 1908.

小花党参 xiao hua dang shen

*Campanumoea violifolia* H. Léveillé; *Melothria violifolia* H. Léveillé.

Roots narrowly cylindrical, 20–30 × 0.5–1 cm. Stems twining, yellow-green or green, more than 1 m, branched, sparsely villous or subglabrous. Leaves alternate, or opposite on branches; petiole 2–5 cm; blade gray-green abaxially, green adaxially, ovate to broadly ovate, 2–5.5 × 2.4–4 cm, abaxially sparsely villous, base cordate with a broad obtuse or subsquare sinus, margin crenate or serrate, apex obtuse or acute. Flowers axillary or opposite leaves; pedicels 1–2.5 cm, glabrous. Calyx tube semiglobose; lobes inserted at middle, triangular or lanceolate, 8–15 × 3.5–5.5 cm, glabrous or sparsely ciliate, apex acute, separated by narrow acute sinuses. Corolla white, campanulate, 7–8 × 6–9 mm, glabrous or ciliate; lobes triangular, equaling tube. Filaments slightly dilated at base, ca. 3 mm; anthers ca. 2 mm. Capsule semiglobose below, conical and rostrate above, 8–11 mm in diam., superior part very short, 2.5–3.5 mm. Seeds numerous, brown-yellow, ovoid, slightly compressed, ca. 1 × 0.5 mm, minutely foveolate. Fl. and fr. Jul–Oct.

• Mountain scrub, sunny forests; 1900–2600 m. SW Sichuan, N Yunnan.

#### 6. *Codonopsis subglobosa* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 108. 1913.

球花党参 qiu hua dang shen

Roots fusiform, carrot-shaped or cylindrical, 12–50 × 1.5–8 cm. Stems twining, 2–4 m, branched, sparsely white hirsute. Leaves on main stem and branches alternate, those on branchlets subopposite; petiole 0.5–2 cm, sparsely white hirsute; blade abaxially gray-green, adaxially green, ovate, 0.5–3 × 0.5–2.5 cm, abaxially hirsute, adaxially hispidulous, base subcordate, truncate, or rounded, margin shallowly sinuate or crenulate, apex obtuse or acute. Flowers solitary, terminal on branchlets or opposite to leaves; pedicels 2.5–6 cm, hirsute. Calyx tube fully adnate to ovary, semiglobose, with 10 conspicuous sparsely white hirsute ribs; lobes rhombic, elliptic, or ovate, 9–13 × 4.5–

8 mm, conspicuously veined, abaxially white hirsute, margins serrate, separated by broad flat sinuses. Corolla pale yellow-green with dark red-purple on lobes and sometimes at base, globose-campanulate,  $2-2.5 \times 2.5-3.7$  cm; lobes broadly triangular, ca.  $1/2$  as long to nearly as long as tube. Filaments slightly dilated; anthers ellipsoid, 4–6 mm. Capsule semiglobose below, conical and rostrate above,  $14-15 \times 15-18$  mm. Seeds numerous, yellow-brown, ellipsoid or ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Stony mountain meadows, wooded limestone cliffs, scrub by streams; 2500–3700 m. W Sichuan, E Xizang, NW Yunnan (Dêqên, Lijiang).

**7. *Codonopsis affinis*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 12. 1857.

大叶党参 da ye dang shen

Roots much thickened, fusiform, branched. Stems twining, yellow-green or green, more than 2 m, branched, subglabrous or sparsely white hirsute. Leaves on main stems and major branches alternate, those on branchlets subopposite; petiole 1–6 cm, shortly white hirsute; blade abaxially gray-green, adaxially green, ovate or ovate-oblong,  $2.5-15 \times 1-9$  cm, abaxially densely white hirsute, adaxially sparsely white hirsute, base deeply cordate to rounded, margin entire to shallowly crenate, apex shortly acuminate. Flowers solitary, terminal, or opposite leaves; pedicels 1–4 cm, hispidulous. Calyx tube adnate to whole ovary, semiglobose, obscurely 10-ribbed, hispidulous; lobes distant from each other, linear-oblong or linear-lanceolate,  $8-17 \times 2-3$  mm, both surfaces white lanate, margin wavy, apex acute or  $\pm$  obtuse; veins obscure. Corolla yellow-green at lower and middle parts, purple-red at upper part, broadly campanulate, ca.  $2 \times 2$  cm, outside hirsute apically, shallowly 5-lobed; lobes triangular. Filaments slightly dilated at base; anthers ellipsoid, ca. 5 mm, glabrous. Capsule semiglobose or subglobose below, conical and rostrate above, 1.5–5 cm in diam., rostrum ca. 4 mm. Seeds numerous, yellow-brown, ellipsoid or ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

Forests; 2300–3200 m. S Xizang (Nyalam) [Bhutan, N India, N Myanmar, Nepal].

**8. *Codonopsis viridis*** Wallich in Roxburgh, Fl. Ind. 2: 103. 1824.

细萼党参 xi e dang shen

*Campanula viridis* (Wallich) Sprengel; *Codonopsis griffithii* C. B. Clarke; *C. viridis* var. *hirsuta* Chipp; *Glosocomia viridis* (Wallich) Ruprecht; *Wahlenbergia viridis* (Wallich) A. Candolle.

Roots unknown. Stems twining, more than 1 m, glabrous, branched. Leaves alternate; petiole 0.5–2 cm, puberulent; blade ovate to lanceolate,  $2-10 \times 1-6$  cm, abaxially densely pubescent, adaxially hispidulous, base cordate to rounded, margin minutely serrate or subentire, apex acute to acuminate. Flowers axillary, almost opposite to leaves, forming cymes; pedicels 2.5–7 cm, glabrous at lower and middle part, pubescent at top. Calyx adnate to ovary up to middle part; tube semiglobose, 10-ribbed, glabrous or sparsely pubescent; lobes linear to linear-

lanceolate,  $10-20 \times 2-3$  mm, both sides hispidulous entirely or only above, with 1 or 2 verrucose denticles on each side, sinus between calyx lobes broad and truncate. Corolla pale greenish white, flushed and spotted crimson, purple inside, or tube white, lobes deep purple, campanulate,  $2-3.2 \times 2-3$  cm, pubescent less frequently, outside glabrous, lobed to  $1/3$ ; lobes deltoid, sometimes recurved. Filaments slightly dilated at base, ca. 6 mm, glabrous; anthers as long as filaments, glabrous. Capsules globose in inferior part, conical in superior part,  $1-2 \times 1.2-1.6$  cm. Seeds brownish yellow, oblong, ca. 0.7 mm. Fl. Sep–Nov, fr. Oct–Nov.

Scrub on open slopes, forest margins; 1500–3000 m. SE Xizang (Cona) [Bhutan, N India, Nepal, Pakistan].

**9. *Codonopsis farreri*** J. Anthony, Notes Roy. Bot. Gard. Edinburgh 15: 181. 1926.

秃叶党参 tu ye dang shen

*Codonopsis farreri* var. *grandiflora* S. H. Huang.

Stems twining, 60–500 cm, branched. Leaves on main stems and major branches alternate or subopposite, those on branchlets opposite or pseudoverticillate; petiole 0.7–1.5 cm; blade ovate, lanceolate, or elliptic,  $0.5-3.5 \times 0.5-1.5$  cm, both surfaces glabrous, base cuneate or rounded, margin entire, apex acuminate, acute, or slightly obtuse. Flowers solitary, terminal; pedicels 4–5 cm. Calyx tube adnate to ovary only up to middle; lobes lanceolate or narrowly oblong,  $2-2.8 \times 0.3-0.6$  cm, subentire, apex acute or slightly obtuse. Corolla pale green or greenish yellow, with brown-red or purple reticulate markings, campanulate,  $3.3-5.8 \times 3-5$  cm; tube 2–3.5 cm; lobes deltoid,  $1.2-1.8 \times 1.2-2$  cm, acute. Filaments slightly dilated at base, 6–13 mm; anthers elongate, 4–7 mm.

Alpine forests and thickets; 3600–4000 m. NW Yunnan (Bijiang, Fugong) [N Myanmar].

**10. *Codonopsis rotundifolia*** Benth in Royle, Ill. Bot. Himal. Mts. 1: 254. 1836.

长叶党参 chang ye dang shen

*Codonopsis longifolia* D. Y. Hong.

Plants twining, 1–1.8 m, glabrous throughout. Roots carrot-shaped, ca.  $18 \times 1$  cm, not branched. Stems purple, branched. Leaves on main stems and major branches alternate, larger; petiole 0.5–2 cm; blade lanceolate or ovate-lanceolate,  $5-7 \times 0.8-2.5$  cm, thin, base rounded to cuneate, margin entire, apex shortly acuminate; those on branchlets similar but much smaller. Flowers solitary, terminal; pedicels 6–13 cm. Calyx tube adnate to ovary up to middle, semiglobose; lobes broadly linear,  $22-30 \times 5-8$  mm, margin entire, apex obtuse or acute. Corolla yellow-green with purple reticulate markings,  $50-55 \times 25-28$  mm. Fl. and fr. Aug–Sep.

Mountain slopes; 3200–3700 m. S Xizang (Nyalam), NW Yunnan (Gongshan) [NW India, Kashmir, Nepal].

**11. *Codonopsis henryi*** Oliver, Hooker's Icon. Pl. 20: t. 1967. 1891.

川鄂党参 chuan e dang shen

Stems twining, more than 1 m; branches short, less than 3 cm, with 2–4 leaves, sterile or with terminal flowers, sparsely puberulent or glabrescent at internodes. Leaves on main stems alternate, those on branches subopposite; petiole 0.2–2 cm, puberulent; blade abaxially gray-green, adaxially green, ovate-lanceolate or lanceolate, 3–15 × 1–7 cm, abaxially appressed puberulent, adaxially puberulent, base decurrent or cuneate, margin conspicuously dentate, apex acuminate. Flowers solitary, terminal on branches; pedicels ca. 1 cm, puberulent. Calyx tube adnate to ovary up to middle, semiglobose, puberulent or gradually glabrescent; lobes distant from each other, triangular, 6–10 × 3–7 mm, apex acute, puberulent and ciliate, sinus between lobes broad and obtuse. Corolla campanulate or ± tubular-campanulate, 1.5–3 cm; lobes triangular, glabrous. Stamens glabrous; filaments slightly dilated at base, ca. 7 mm, glabrous; anthers ca. 5 mm. Capsule ca. 1.5 cm in diam. Fl. and fr. Jul–Sep.

• Forest margins, scrub; 2300–3800 m. Chongqing, W Hubei, N Sichuan.

**12. *Codonopsis levicalyx*** L. T. Shen, Acta Phytotax. Sin. 13(3): 55. 1975.

光萼党参 guang e dang shen

*Codonopsis levicalyx* var. *hirsuticalyx* L. T. Shen; *C. rotundifolia* Benth var. *angustifolia* Nannfeldt.

Roots carrot-shaped, 10–35 × 0.5–1.4 cm. Stems twining, up to 2 m, branched, branches 15–30 cm, fertile or sterile, sparsely hirsute. Leaves on main stems alternate, those on branches opposite; petiole less than 10 mm; blade ovate or ovate-lanceolate, ca. 13 × 5 cm, abaxially sparsely or densely hirsute, adaxially sparsely hirsute, base cuneate or obtuse, margin crenulate or entire, apex acute or shortly acuminate. Flowers terminal on main stems or branches; pedicels glabrous, up to 10 cm. Calyx adnate to ovary up to middle; tube semiglobose, glabrous or sparsely hirsute; lobes ovate-triangular, 10–15 × ca. 6 mm, glabrous or hirsute, margin entire or crenulate, apex acute or obtuse, sinus between lobes narrow and pointed. Corolla yellow-green, with purple veins, campanulate, 1.8–2.5 × ca. 1.5 cm, glabrous; lobes deltoid, acute. Stamens glabrous; filaments slightly dilated at base, ca. 3 mm; anthers ca. 3 mm. Fl. Jul–Aug.

• Forests, scrub; 2300–3300 m. W Sichuan, SE Xizang.

A study conducted by D. Y. Hong after this treatment was finalized found *Codonopsis levicalyx* to comprise two species. The specimens from Sichuan belong to *C. henryi*, whereas those from SE Xizang represent a new species, which is to be published in 2011 or 2012.

**13. *Codonopsis kawakamii*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 165. 1911.

台湾党参 tai wan dang shen

Roots carrot-shaped. Main stems scrambling or twining, fertile, sparsely villous; branches sterile or fertile, with subopposite leaves. Leaves on main stems alternate, those on branches subopposite; petiole 5–18 mm, hirsute; blade ovate or deltoid, 7–23 × 5–17 mm, abaxially hispid, adaxially hispidulous, base rounded or truncate, rarely shallowly cordate, margin mostly entire or sinuous, or very obscurely crenate, apex acute or obtuse. Flowers solitary, terminal on main stems and some branches, slightly pendent; pedicels 1–2.5 cm, sparsely hispid.

Calyx tube adnate to ovary up to middle, hemispherical, glabrous or rarely sparsely hairy; lobes ovate to lanceolate, 5–9 × 3–5 mm, subentire, sparsely hispid, apex acute; sinus between calyx lobes narrow and acute at anthesis. Corolla greenish yellow or pale blue, tubular, 1.5–2 cm, subglabrous, shallowly lobed. Stamens glabrous; filaments slightly dilated at base, ca. 3 mm; anthers ca. 3 mm. Capsule 10–15 × 6–12 mm. Seeds brown, ellipsoid, ca. 1.5 mm. Fl. Aug–Sep, fr. Oct.

• Grassy slopes; 2500–3100 m. Taiwan (Nantou).

**14. *Codonopsis deltoidea*** Chipp, J. Linn. Soc., Bot. 38: 387. 1908.

三角叶党参 san jiao ye dang shen

Roots conical or cylindrical, 15–30 × 1–1.4 cm, ± branched. Stems twining, more than 1 m; branches and branchlets short, no more than 5 cm, leafy, sterile or with terminal flowers, sparsely villous or eventually glabrescent. Leaves alternate or opposite; petiole 1–8 cm, villous or hirsute; blade abaxially gray-green, adaxially green, deltoid or broadly ovate, 3–10 × 4–10 cm, both surfaces sparsely puberulent or hirsute, base shallowly cordate, truncate, or rounded, margin coarsely dentate, apex acuminate or acute. Flowers terminal on main stems, branches, and/or branchlets, solitary or sometimes in few-flowered cymes; pedicels 1–2 cm, villous. Calyx tube adnate to ovary up to middle, semiglobose or broadly obconic, 4–5 × 7–8 mm, glabrous; lobes ovate-lanceolate or triangular, 9–13 × 3–7 mm, margin denticulate, often white ciliate, apex acuminate or acute. Corolla pale yellow-green, with purple veins, tubular, 2–2.5 × 0.9–1.5 cm; lobes deltoid, ca. 1/3 as long as tube. Filaments slightly dilated at base, ca. 6 mm, glabrous; anthers ca. 3 mm. Capsules semiglobose below, broadly conical above. Seeds numerous, yellow-white, ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Mountain forest margins, scrub; 1800–2800 m. W Sichuan (Emei Shan).

**15. *Codonopsis tubulosa*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 112. 1908.

管花党参 guan hua dang shen

*Codonopsis accrescenticalyx* H. Léveillé; *C. pilosa* Chipp.

Roots carrot-shaped, 10–20 × 0.5–2 cm, simple or branched below middle. Stems usually 1–3 m and twining, rarely ascending and 50–75 cm, branched; branches and branchlets both leafy, sterile or with a terminal flower, subglabrous or sparsely villous. Leaves opposite or tending to alternate at top of stems and branches; petiole short, 1–7 mm, puberulent; blade abaxially gray-green, adaxially green, lanceolate, ovate, or elliptic, 2.5–8 × 0.7–4 cm, abaxially sparsely or densely puberulent, adaxially hispidulous, base cuneate or rounded, margin crenate or subentire, apex acute or obtuse. Flowers terminal; pedicels 1–6 cm, villous. Calyx tube adnate to ovary up to middle, hemispheric, subglabrous to densely villous; lobes broadly ovate, 10–18 × 5.5–12 mm, ciliate, abaxially sparsely villous, adaxially glabrous, margins crenate or verrucose toothed, apex obtuse or acute. Corolla yellow-green, tubular, 2–3.7 × 0.5–1.6 cm, glabrous, shallowly lobed; lobes deltoid, acute at apex. Filaments dilated at base, ca. 10 mm, ciliate; anthers 3–5 mm. Capsule globose below, conical above.

Seeds brown-yellow, ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Mountain scrub, grasslands; 1900–3000 m. W Guizhou (Nanyang, Panxian), S Sichuan, Yunnan (Dali, Lanping, Mengzi).

**16. *Codonopsis benthamii*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 14. 1857.

大萼党参 *da e dang shen*

*Codonopsis macrocalyx* Diels; *C. macrocalyx* var. *coerulescens* Handel-Mazzetti; *C. macrocalyx* var. *parviloba* J. Anthony.

Roots carrot-shaped or cylindrical, 20–30 × 1.5–2.5 cm. Stems erect, climbing, or ascending, up to 2 m, branched; branches and branchlets leafy, sterile or with a terminal flower, sparsely puberulent. Leaves alternate or those on branches subopposite; petiole 1–6 cm, sparsely villous; blade abaxially gray-white, adaxially green, broadly ovate, triangular-ovate, ovate, or ovate-lanceolate, 3–9 × 1.5–7 cm, abaxially sparsely or densely puberulent, adaxially sparsely puberulent, base truncate, cuneate, or rounded, margin irregularly pinnatifid to shallowly lobed, or dentate, crenate, or rarely subentire, apex acute or obtuse. Flowers terminal, long pedicellate; pedicels villous or occasionally subglabrous. Calyx tube adnate to ovary up to middle, 10-ribbed, glabrous or sparsely villous; lobes ovate or deltoid, 10–25 × 5–15 mm, both surfaces glabrous, margin crenulate, ciliate, apex acuminate, acute, or obtuse; sinus between lobes narrow and pointed. Corolla yellow-green, pale brown-red at base, tubular, 2–4 × 1.5–2 cm, glabrous, shallowly lobed; lobes triangular, apex acute. Stamens villous; filaments slightly dilated at base, 6–10 mm; anthers 5–6 mm. Capsule 1.2–1.6 cm in diam. Seeds brown-yellow, ovoid, wingless. Fl. and fr. Jul–Oct.

Grassy slopes, forest margins, scrub, by streams; 2800–3700 m. W Sichuan (Baoping, Muli), SE Xizang (Markam, Yadong, Zayü), NW Yunnan [Bhutan, NE India, N Myanmar, Nepal].

**17. *Codonopsis pianmaensis*** S. H. Huang, Acta Bot. Yunnan. 6: 393. 1984.

片马党参 *pian ma dang shen*

Stems decumbent or climbing, 80–120 cm, branched, subglabrous. Leaves alternate; petiole 0.8–3.5 cm; blade ovate-deltoid, 2–5.5 × 1.5–4 cm, abaxially sparsely or densely puberulent, adaxially sparsely puberulent, base cuneate or obtuse, margin irregularly serrate, apex acuminate; leaves on branches smaller. Flowers solitary and terminal; pedicels 1–6.5 cm. Calyx adnate to ovary up to middle, semiglobose, puberulent; lobes ovate-deltoid, ca. 12 × 8 mm, margin repand, apex acute; sinus between lobes acute. Corolla yellow, with purple-blue spots inside, tubular-campanulate, ca. 17 × 10 mm, outside densely puberulent; lobes triangular. Filaments dilated at base, ca. 7 mm, densely villous; anthers oblong, ca. 4.5 mm, abaxially densely puberulent. Ovary semi-inferior. Fl. Jul.

• Grassy slopes with shrubs; ca. 3500 m. W Yunnan (Lushui).

**18. *Codonopsis subsimplex*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 16. 1857.

藏南党参 *zang nan dang shen*

Roots carrot-shaped, 15–20 × 0.5–1.2 cm. Stems erect or ascending, 35–70 cm, few branched, subglabrous or sparsely white villous. Leaves on main stems alternate, those on branches subopposite; petiole 0.5–1.5 cm, sparsely white villous; blade broadly ovate, ovate, or subelliptic, 3–7 × 2–4.5 cm, abaxially hispidulous but hirsute along veins, adaxially hispidulous, base cordate, truncate, or rounded, margin sparsely crenulate, apex acute or obtuse. Calyx tube fully adnate to ovary; lobes triangular or ovate, 11–16 × 6–8.5 mm, margin dentate, sparsely ciliate, apex acute or obtuse; sinus between calyx lobes acute. Corolla pale yellow-green or pale blue, broadly campanulate, 1.5–2.3 × 1.5–2.5 cm, glabrous; lobes ovate-deltoid, ca. 1/3 as long as tube. Filaments slightly dilated at base, 2–3 mm; anthers ca. 5 mm. Capsules semiglobose below, broadly conical above, ca. 8 mm in diam., rostrum 4–6 mm. Seeds numerous, yellow, ellipsoid, ca. 1.5 mm, wingless. Fl. Jul–Aug, fr. Sep–Oct. *2n* = 16.

Mountain forests or scrub; ca. 3100 m. S Xizang (Mainling, Yadong) [Bhutan, NE India, Nepal].

**19. *Codonopsis subscaposa*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 114. 1908.

抽葶党参 *chou ting dang shen*

Roots carrot-shaped, 15–20 × 0.5–1 cm. Stems erect, 40–100 cm, simple or sparingly branched, sparsely pubescent, eventually glabrescent. Leaves on main stems alternate, those on branches opposite; petiole 1–7(–10) cm, sparsely villous; blade abaxially gray-green, adaxially green, ovate, elliptic, narrowly elliptic, or lanceolate, 2–8(–13) × 1–3.8(–5) cm, abaxially glabrous or sparsely villous along veins, adaxially sparsely puberulent or glabrous, base rounded, obtuse, cuneate, or attenuate, margin dentate or crenate, apex acute or obtuse. Flowers terminal or axillary, often 1–4 at tops of stems and branches, long pedicellate. Calyx tube adnate to ovary up to middle, semiglobose, 10-ribbed, sparsely villous; lobes triangular or narrowly elliptic, 5–8 × 2–3 mm, glabrous, margin serrulate or crenulate, apex acute. Corolla yellowish or greenish white with red-purple veins, or red-purple with yellowish spots, broadly campanulate, 1.5–3 × 2–4 cm, 5-fid to middle, both sides glabrous or sparsely villous at apex of lobes. Stamens glabrous; filaments dilated at base, 6–8 mm; anthers 4–5 mm. Capsule obconic at base, conical at apex, 14–15 mm. Seeds brown-yellow, ovoid, smooth. Fl. and fr. (Apr–)Jul–Oct.

• Grassy slopes, wet meadows, open woods; 2500–4200 m. W Sichuan, NW Yunnan (Zhongdian).

**20. *Codonopsis meleagris*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 172. 1912.

珠鸡斑党参 *zhu ji ban dang shen*

Roots carrot-shaped, 13–20 × 0.5–1.5 cm. Stems erect, simple or with elongate branches in lower part, 40–90 cm, sparsely hairy, eventually glabrescent. Leaves on main stems alternate, those on branches opposite, sessile or with short petiole less than 1 cm; blade abaxially gray-green, adaxially green, ovate, elliptic, or lanceolate, 4–8.5 × 1.5–3.5 cm, abaxially

densely hirsute, adaxially glabrous or sparsely hispidulous, base cuneate or attenuate, margin crenate, apex obtuse or rounded. Flowers terminal or axillary, long pedicellate. Calyx tube adnate to ovary up to top, semiglobose, 10-ribbed, glabrous or sparsely scaberrulose; lobes ovate or ovate-triangular,  $8-12 \times 4-6$  mm, glabrous, margins entire or sparsely serrulate, apex acute or obtuse. Corolla yellowish green with red-purple veins, or red-purple with yellowish green spots, broadly campanulate,  $2.2-3(-4) \times 2.4-3(-4)$  cm, both sides glabrous; lobes deltoid, ca.  $1/2$  as long as tube, often sparsely villous at apex. Stamens glabrous; filaments slightly dilated at base, ca. 7 mm; anthers ca. 5 mm. Capsules semiglobose below, conical above, ca.  $10 \times 8$  mm. Seeds numerous, brown-yellow, ovoid, wingless. Fl. and fr. Jul-Oct.

• Grassy slopes, open forests; 3000–4000 m. NW Yunnan (Lijiang).

**21. *Codonopsis purpurea*** Wallich in Roxburgh, Fl. Ind. 2: 105. 1824.

紫花党参 *zi hua dang shen*

*Campanula purpurea* (Wallich) Sprengel; *Glosocomia purpurea* (Wallich) Ruprecht; *Wahlenbergia purpurea* (Wallich) A. Candolle.

Plants glabrous throughout. Roots fusiform or carrot-shaped. Stems erect or sprawling, 30–50 cm, few branched. Leaves opposite or those at top sometimes alternate; petiole 1–7 mm; blade ovate or lanceolate,  $4-9 \times 1.6-3.5$  cm, base rounded or obtuse, margin subentire or sinuous, apex acute or acuminate. Flowers terminal or opposite leaves at top. Calyx tube adnate to ovary for its entire length, broadly obconic,  $6-10 \times 15-18$  mm; lobes triangular,  $10-20 \times 6-9$  mm, margin entire, apex acute or acuminate. Corolla dark red-purple, broadly campanulate or funnelform-campanulate,  $2-3.4 \times 2.4-4$  cm; lobes triangular, equaling tube. Filaments slightly dilated, ca. 6 mm; anthers ca. 5 mm. Capsules semiglobose below, conical above, 1.5–2 cm in diam.; valves 5–8 mm. Seeds numerous, yellow, oblong, ca.  $2 \times 1$  mm, narrowly winged. Fl. and fr. Sep–Oct.

Grassy slopes, scrub, epiphytic on trunks in forests; 2000–3300 m. S Xizang (Nyalam), W Yunnan (Jingdong) [N India, Nepal].

**22. *Codonopsis clematidea*** (Schrenk) C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 433. 1881.

新疆党参 *xin jiang dang shen*

*Wahlenbergia clematidea* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 38. 1841; *Codonopsis clematidea* var. *obtusata* (Chipp) Kitamura; *C. obtusata* (Chipp) Nannfeldt; *C. ovata* Benth. var. *cuspidata* Chipp; *C. ovata* var. *obtusata* Chipp; *C. ovata* var. *ramosissima* J. D. Hooker & Thomson; *Glosocomia clematidea* (Schrenk) Fischer ex Regel.

Roots carrot-shaped,  $25-45 \times 1-3$  cm. Stems single or caespitose, erect or ascending, or slightly procumbent, 50–100 cm tall; branches slender, erect or slightly spreading, mostly at lower part but those at upper part usually fertile, hispidulous when young. Leaves on main stems smaller and alternate, those on branches opposite; petiole up to 2.5 cm, sparsely hispidulous; blade ovate, oblong, broadly lanceolate, or lanceolate, 1–

$3.5(-5.2) \times 0.8-2(-3.2)$  cm, abaxially densely hispidulous, adaxially sparsely or densely hispidulous, base slightly cordate or rounded, margin entire or occasionally crenulate or sinuate, apex acute. Flowers solitary, terminal on main stems and branches, long pedicellate; pedicels sparsely white hispidulous. Calyx tube adnate to ovary up to middle, hemispheric, 10-ribbed, glabrous or rarely sparsely white scaberrulose; lobes ovate, elliptic, or lanceolate,  $10-20 \times 6-8$  mm, glabrous or apex sparsely puberulent, margin entire, apex acute; sinus between calyx lobes narrow and pointed. Corolla pale blue with dark blue veins and purple spots inside, broadly campanulate,  $1.7-2.6$  cm, glabrous. Stamens glabrous; filaments slightly dilated at base, 5–6 mm; anthers oblong, 5–6 mm. Capsule semiglobose below, conical above, rostrum acute,  $15-20 \times 12-15$  mm in total; persistent calyx lobes much enlarged, revolute. Seeds numerous, pale brown-yellow to brown, narrowly ellipsoid or oblong, terete, smooth. Fl. and fr. Jul–Oct.  $2n = 16$ .

Mountain forests, ravines, by streams; 1700–2500 m. Xinjiang, W Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan].

**23. *Codonopsis gombalana*** C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 81. 1965.

贡山党参 *gong shan dang shen*

Roots carrot-shaped. Stems erect or ascending, 50–160 cm tall, branched at all parts, leafy, lower branches sterile, upper ones fertile. Leaves alternate; petiole slender, 4–17 mm; blade elliptic to narrowly lanceolate,  $15-65 \times 3-18$  mm, both surfaces glabrous, base broadly cuneate to rounded, margin entire, apex acute or obtuse. Flowers solitary and terminal; pedicels 1–3 cm. Calyx tube almost entirely free from ovary or adnate to ovary up to middle, semiglobose, 10-ribbed; lobes linear-lanceolate,  $18-20 \times 2.5-3$  mm, 3-veined, margin entire and slightly recurved, apex acuminate; sinus between lobes broad. Corolla yellow-green with purple veins, tubular-campanulate, ca.  $4.5 \times 4$  cm, 5-lobed; lobes deltoid, ca.  $1.6 \times 1.6$  cm, apex acute. Filaments slightly dilated at base, ca. 1.3 cm; anthers ca. 6 mm. Capsule semiglobose below, conical above; persistent calyx lobes very much enlarged, ca.  $2 \times$  as large as at anthesis. Seeds numerous, brown-yellow, subellipsoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Mountain scrub, bamboo thickets; ca. 3600 m. NW Yunnan (Gongshan).

**24. *Codonopsis chimiliensis*** J. Anthony, Notes Roy. Bot. Gard. Edinburgh 15: 184. 1926.

滇缅党参 *dian mian dang shen*

Plants glabrous throughout. Stems erect, multi-branched, 60–90 cm. Leaves alternate; petiole 0.5–2 cm; blade ovate to ovate-lanceolate,  $5-14 \times 3-7$  cm, base rounded, decurrent, margin crenulate, apex acute to shortly acuminate. Flowers solitary, terminal; pedicels 3–10 cm. Calyx entirely free from ovary; lobes oblong-lanceolate,  $18-30 \times 6-10$  mm, margin entire, apex acute. Corolla pale creamy yellow, with pale purple veins, campanulate; tube  $1.6-2 \times 2.4-3$  cm; lobes triangular,  $1.2-1.5 \times 0.8-1.2$  cm, apex acute. Filaments filiform, ca. 8 mm.

• Grassy slopes; 3600–4300 m. W Yunnan (Bijiang).

The type specimen of this species was collected from the border between China and Myanmar.

**25. *Codonopsis thalictrifolia*** Wallich in Roxburgh, Fl. Ind. 2: 106. 1824.

唐松草党参 tang song cao dang shen

*Campanula thalictrifolia* (Wallich) Sprengel; *Codonopsis mollis* Chipp; *C. thalictrifolia* var. *mollis* (Chipp) L. T. Shen; *Glosocoma tenera* D. Don, nom. illeg. superfl.; *G. thalictrifolia* (Wallich) Wallich; *Wahlenbergia thalictrifolia* (Wallich) A. Candolle.

Roots carrot-shaped, 15–20 × 0.5–1 cm. Stems erect or ascending, main stems robust, fertile, 15–30 cm tall, glabrous or sparsely villous; branches sterile, slender, leafy, aggregated at base of main stems, 4–6 cm, villous. Leaves on main stems alternate, those on branches subopposite; petiole ca. 2 mm, white hirsute; blade ovate or suborbicular, 3–20 × 3–17 mm, both surfaces villous, base cordate or truncate, margin subentire or crenate, apex obtuse or acute. Flowers solitary, terminal on main stems, slightly pendent. Calyx tube adnate to ovary up to middle, hemispheric, 3–5 × 6–10 mm, glabrous or villous; lobes triangular or oblong, 6–7 × 2–3 mm, outside hairy, margin entire, apex acute or obtuse; sinus between lobes broad and obtuse. Corolla tubular-campanulate, 2–4.8 × 1.5–4.3 cm, shallowly lobed; lobes triangular, 2–4 × 7–9 mm, apex obtuse; tube pale blue, 18–23 × 6–9 mm, glabrous or occasionally sparsely villous. Filaments slightly dilated at base, ca. 1 cm; anthers ca. 3 mm, villous at connective. Capsule hemispherical at base, conical toward apex, rostrate. Seeds numerous, brown-yellow, ellipsoid, smooth. Fl. Jul–Sep, fr. Sep–Oct.

Grassy slopes, scrub; 3600–5300 m. C and S Xizang [NE India, Nepal].

**26. *Codonopsis bulleyana*** Forrest ex Diels, Notes Roy. Bot. Gard. Edinburgh 5: 171. 1912.

管钟党参 guan zhong dang shen

*Cyananthus mairei* H. Léveillé.

Roots carrot-shaped, 15 × 0.5 cm. Main stems erect or ascending, 25–55 cm tall, sparsely white villous; branches aggregated at lower part, leafy, sterile, 1–10 cm, densely villous. Leaves on main stems alternate, those on branches subopposite; petiole 1–2.5 mm, densely villous; blade cordate, broadly ovate, or ovate, 8–18 × 8–14 mm, white villous, base cordate or rounded, margin sinuous or obscurely crenate, or subentire, apex acute or obtuse. Flowers solitary, terminal on main stems, slightly pendent; pedicels 4–8 cm, glabrous or villous. Calyx tube adnate to ovary up to middle, hemispheric, sparsely villous; lobes deltoid or ovate, 8–10 mm, both sides sparsely hispidulous, margin somewhat sinuous, revolute, apex acute; sinus between lobes narrow and pointed, or broad and obtuse due to being revolute. Corolla pale blue but tube purplish, tubular-campanulate, 2.2–3 cm, shallowly lobed; lobes broad, margin and apex involute; tube 1–1.2 cm in diam.; limb 2–3.5 cm in diam. Stamens glabrous; filaments ca. 6 mm; anthers ca. 5 mm. Capsule hemispheric at base, conical toward apex, rostrate, 2–2.4 × 1–1.5 cm; persistent calyx lobes revolute. Seeds numerous, brown-yellow, ellipsoid, ca. 1.5 mm. Fl. Jul–Sep, fr. Sep–Oct.

• Grassy slopes, scrub; 3300–4200 m. SW Sichuan, SE Xizang, N Yunnan.

**27. *Codonopsis foetens*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 16. 1857.

臭党参 chou dang shen

Roots slender, 10–55 × 1–2 cm. Caudexes abundantly branched, and thus stems several to many from one caudex, caespitose. Main stems erect or ascending, 20–40 cm tall, villous; branches numerous, aggregated in lower part, 1–10 cm tall, usually sterile. Leaves on main stems alternate, those on branches opposite or subopposite; blade cordate or ovate, 5–30 × 5–24 mm, both surfaces variously pubescent, margin entire or nearly so, apex acute or obtuse; petiole 2–3 mm. Flowers solitary (rarely several), terminal on main stems and sometimes branches, ± pendent; pedicels 1–8 cm. Calyx tube adnate to ovary up to middle, semiglobose or hemispherical, glabrous or very sparsely white hispidulous; lobes ovate, ovate-oblong, or ovate-lanceolate, 7–20 × 2–7 mm, rather densely hispidulous, entire, recurved at margin, apex acute or obtuse. Corolla pale blue or pale purple with interior markings, campanulate or subglobose-campanulate, 2–4.5 × 2.5–3 cm; lobes suborbicular, 8–12 mm, apex obtuse or acute. Stamens glabrous; filaments slightly dilated at base, ca. 5 mm; anthers 4–5 mm. Capsule obconical at inferior part, conical at superior part, ca. 2 × 1.5 cm. Seeds brown-yellow, ellipsoid or oblong, ca. 1 mm, smooth. Fl. Jul–Sep, fr. Sep–Oct.

Grassy slopes, alpine scrub, crevices, forests, meadows at forest margins on N-facing slopes; 3300–4600 m. SE Gansu, S Qinghai, W Sichuan, E and S Xizang, NW Yunnan [Bhutan, N India].

- 1a. Leaf blades 5–9 × 5–7 mm, very rarely up to 15 × 12 mm; margin of calyx lobes often recurved ..... 27a. subsp. *foetens*
- 1b. Leaf blades mostly 10–15 × 10–15 mm; margin of calyx lobes very rarely recurved ..... 27b. subsp. *nervosa*

**27a. *Codonopsis foetens* subsp. *foetens***

臭党参(原亚种) chou dang shen (yuan ya zhong)

Leaves on main stems alternate, mostly yellow scaly, only several upper ones green and ordinary, those on branches opposite or subopposite, all ordinary leaves with petiole 2–3 mm; blade cordate or cordate-ovate, 5–9 × ca. 5 mm, both surfaces rather densely white hispidulous, margin entire, apex obtuse. Calyx lobes ovate-oblong or ovate-lanceolate, ca. 8 × 4–5.5 mm, rather densely hispidulous, margin recurved, entire. Corolla pale blue or pale purple with dark purple veins, campanulate or broadly campanulate, 2–3 cm; lobes suborbicular, 8–12 mm, apex obtuse or acute. Fl. Jul–Sep, fr. Sep–Oct.

Alpine scrub, crevices; 3900–4600 m. S Xizang [Bhutan, N India].

**27b. *Codonopsis foetens* subsp. *nervosa*** (Chipp) D. Y. Hong, Novon 20: 422. 2010.

脉花党参 mai hua dang shen

*Codonopsis ovata* Benth. var. *nervosa* Chipp, J. Linn. Soc., Bot. 38: 385. 1908; *C. macrantha* Nannfeldt; *C. nervosa* (Chipp) Nannfeldt; *C. nervosa* subsp. *macrantha* (Nannfeldt) D. Y. Hong & L. M. Ma; *C. nervosa* var. *macrantha* (Nannfeldt) L. T. Shen.

Leaves on main stems alternate, those on branches subopposite; petiole 2–3 mm, white villous; blade broadly cordate, cordate, or ovate, 1–3 × 1–2.4 cm, abaxially sparsely white hirsute, adaxially densely white hirsute, subentire, apex acute or obtuse. Flowers solitary, rarely several, terminal on main stems and branches, slightly pendent; pedicels 1–8 cm. Calyx lobes ovate or lanceolate, 7–20 × 2–7 mm, densely white hispidulous but usually more sparsely or even becoming glabrous toward base, margin entire, apex acute or obtuse. Corolla pale blue, often with red-purple spots at base inside, subglobose-campanulate, 2–4.5 × 2.5–3 cm, shallowly lobed; lobes obtuse, involute, villous at apex and along veins on abaxial side. Fl. Jul–Sep, fr. Sep–Oct.

• Grassy slopes, scrub, forests, meadows at forest margins on N-facing slopes; 3300–4500 m. SE Gansu, S Qinghai, W Sichuan, E Xizang, NW Yunnan.

**28. *Codonopsis canescens*** Nannfeldt, Svensk Bot. Tidskr. 34: 386. 1940.

灰毛党参 hui mao dang shen

Roots carrot-shaped, 20–30 × 1–2.5 cm. Main stems single or several from one root, erect or ascending, 25–85 cm tall, leafy in middle part; branches mostly aggregated in middle part, leafy, usually sterile, densely white villous. Leaves on main stems alternate, those on branches subopposite; petiole less than 2 mm; blade ovate, broadly ovate, or subcordate, 1–1.5 × 0.5–1.2 cm, both surfaces densely white hispidulous, margin entire, apex acute or obtuse. Flowers solitary, terminal on main stems and upper branches; pedicels 2–15 cm. Calyx tube adnate to ovary up to middle, hemispherical, 10-ribbed, densely white hispidulous; lobes ovate to lanceolate, 4–6 × 2–4 mm, densely white puberulent, entire; sinus between lobes broad and obtuse. Corolla pale blue or blue-white, with blue veins at base inside, broadly campanulate, 1.5–1.8 × 2–3 cm, shallowly lobed; lobes deltoid, villous at apex and on abaxial side. Stamens glabrous; filaments slightly dilated at base, 2–2.5 mm; anthers ca. 3 mm. Capsule hemispherical at base, conical toward apex, 0.8–1.5 cm. Seeds numerous, brown-yellow, ellipsoid or oblong, ca. 1 mm, smooth. Fl. Jun–Sep, fr. Sep–Oct.

• Grassy slopes, sunny or stony river terraces; 3000–4200 m. S Qinghai (Nangqên, Yushu), NW Sichuan, E Xizang (Gonjo, Jomda, Markam).

**29. *Codonopsis argentea*** P. C. Tsoong, Contr. Inst. Bot. Natl. Acad. Peiping 3: 92. 1935.

银背叶党参 yin bei ye dang shen

Roots not seen. Stems erect or ascending, ca. 30 cm tall; branches fertile, densely leafy, pale brown or yellow, lanate. Leaves on main stems alternate, those on branches subopposite; petiole absent or less than 3 mm; blade ovate or oblong-

ovate, 7–20 × 2–12 mm, abaxially white tomentose, adaxially appressed tomentose, base cordate, margin sinuous or subentire, slightly recurved, apex obtuse. Flowers terminal on main stems and branches, slightly pendent; pedicels brownish yellow, tomentose. Calyx tube adnate to ovary up to middle, semiglobose, 10-ribbed; lobes triangular-ovate or ovate-lanceolate, ca. 8 × 4 mm, brownish yellow tomentose, subentire, recurved, apex acute or obtuse; sinus between calyx lobes broad and obtuse. Corolla pale blue, campanulate, ca. 2.2 × 2–2.5 cm, shallowly lobed; lobes rounded, setose on both sides, apex acute. Stamens glabrous; filaments slightly dilated at base, ca. 6 mm; anthers 4–5 mm. Fruit unknown.

• Exposed rocky slopes; 2000–2300 m. Guizhou (Fanjing Shan).

**30. *Codonopsis alpina*** Nannfeldt, Notes Roy. Bot. Gard. Edinburgh 16: 154. 1931.

高山党参 gao shan dang shen

*Codonopsis foetens* J. D. Hooker & Thomson var. *major* Handel-Mazzetti.

Roots carrot-shaped, 14–15 × 0.7–1 cm. Main stems erect or ascending, 15–25 cm, or even longer, glabrous or sparsely white hirsute; branches aggregated at lower part, leafy, sterile, sparsely white hirsute. Leaves on main stems sparse and alternate, those on branches subopposite, rarely alternate; petiole 4–6 mm, glabrous or sparsely hirsute; blade ovate, 1.2–1.8 × 0.6–1.5 cm, abaxially sparsely white hispidulous, adaxially glabrous or subglabrous, base cordate or rounded, margin sinuous or subentire, recurved, apex acute or obtuse. Flowers solitary, terminal on main stems; pedicels sparsely hirsute. Calyx tube adnate to ovary up to middle, obconical or semiglobose, 10-ribbed; lobes triangular, 8–12 × 5–7 mm, both sides glabrous, margin entire or sinuous, recurved, apex acute or obtuse; sinus between lobes obtuse. Corolla purple-green with purple veins, broadly campanulate, 2.5–3 × 2.5–3 cm, glabrous; lobes deltoid-orbicular, equaling tube. Stamens glabrous; filaments slightly dilated at base, 6–8 mm; anthers 4–5 mm. Fl. Aug.

• Alpine open stony grassy slopes; 4000–4300 m. SE Xizang (Markam, Zayü), NW Yunnan (Dêqên, Gongshan).

**31. *Codonopsis cardiophylla*** Diels ex Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 117. 1908.

光叶党参 guang ye dang shen

Roots carrot-shaped, 10–15 × 1–1.5 cm. Stems several from one caudex, ascending or suberect, 20–60 cm tall; branches 10–17 cm, very sparsely white hispidulous, glabrescent, those at lower part slender, sterile, those at upper part fertile. Lower and middle leaves subopposite but upper ones alternate; petiole 0.5–3 mm, glabrous or hirsute; blade ovate or lanceolate, 1–3 × 0.5–2.5 cm, abaxially sparsely hispidulous, adaxially subglabrous, base subcordate, truncate, or rounded, margin entire, recurved, apex obtuse. Flowers terminal on main stems and upper branches; pedicels sparsely hirsute, eventually glabrescent. Calyx tube adnate to ovary up to middle, semiglobose, 10-ribbed, glabrous; lobes triangular or

lanceolate, 9–12 × 4–5 mm, glabrous or hispidulous, margin entire, apex obtuse; sinus between lobes acute. Corolla pale blue, with red-purple or brown-red spots, broadly campanulate, 2–3.2 × 2.3–3 cm; lobes ovate, ca. 1/2 as long as tube, inside villous, apex acute. Stamens glabrous; filaments slightly dilated at base, 6–7 mm; anthers ca. 5 mm. Capsules semiglobose below, conical above, 8–10 mm in diam.; valves 5–7 mm. Seeds brown-yellow, ellipsoid, 1–1.5 × ca. 0.5 mm, wingless. Fl. and fr. Jul–Oct.

• Grassy slopes or cliffs; 2000–2900 m. W Hubei, S Shaanxi (Foping, Huaxian, Weinan), S Shanxi (Yuanqu).

**32. *Codonopsis viridiflora*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 27: 496. 1882.

绿花党参 lǜ huā dāng shēn

*Codonopsis bicolor* Nannfeldt.

Roots carrot-shaped, 10–15 × 1–1.5 cm. Stems 1–3 from one caudex, suberect, 30–70 cm tall; branches at lower part, sparsely hirsute or subglabrous. Leaves on main stems alternate, tending smaller and bractlike, those on branches opposite or subopposite and thus branches like pinnate leaves; blade broadly ovate, ovate, or lanceolate, 1.5–3.5(–5) × 0.8–3 cm, both surfaces hispidulous, base slightly cordate or rounded, margin crenate or subentire, apex acute or obtuse. Flowers 1–3, terminal on main stems and branches; pedicels 6–15 cm, subglabrous or lower part sparsely hispidulous. Calyx tube adnate to ovary up to middle, hemispheric, 3–4 × 10–13 mm, 10-ribbed, glabrous; lobes ovate, lanceolate, or oblong 10–15 × 6–8 mm, sparsely hispidulous near apex or occasionally glabrous abaxially, ciliate, sparsely crenate at margin, apex acute or obtuse. Corolla yellow-green, purplish only at base, campanulate, 1.7–2.5 × 2–3 cm, glabrous throughout, lobed to half; lobes triangular, 8–10 × 9–11 mm. Stamens glabrous; filaments slightly dilated at base, ca. 5 mm; anthers ca. 5 mm. Capsule ca. 1.5 cm in diam. Seeds numerous, brown-yellow, ellipsoid, wingless. Fl. and fr. Jul–Oct.

• Alpine meadows or forest margins; 3000–4000 m. SE Gansu, S Ningxia (Jingyuan), E Qinghai (Huangyuan), Shaanxi (Taibai Shan), W Sichuan, E Xizang (Jomda), NW Yunnan (Dèqên).

**33. *Codonopsis tsinlingensis*** Pax & K. Hoffmann, Repert. Spec. Nov. Regni Veg. Beih. 12: 500. 1922.

秦岭党参 qín líng dāng shēn

Roots carrot-shaped, 10–20 × 0.6–3.5 cm. Stems several from one caudex, erect or ascending, 26–35 cm tall; branches slender, with leaves aggregated at top, white hirsute. Leaves on main stems alternate, those on branches subopposite; petiole less than 1 cm, white hirsute; blade ovate or broadly ovate, 1–2.6 × 0.6–1.8 cm, hispidulous, base rounded or cordate, margin crenulate to subentire, slightly revolute, apex acuminate, acute, or obtuse. Flowers solitary, terminal; pedicels 3–15 cm, densely hispid. Calyx tube adnate to ovary up to middle, hemispherical, 10-ribbed, hispid entirely or along ribs, rarely glabrous; lobes narrowly triangular, 8–10 × 4–6 mm, abaxially hispidulous, margin entire, revolute toward middle rib, apex acute. Corolla

pale purple, with purple spots inside, campanulate, 20–30 × 20–30 mm, 5-fid almost to middle, inside villous. Stamens glabrous; filaments slightly dilated at base, ca. 5 mm; anthers ca. 4 mm. Capsule hemispherical at base, conical toward apex. Seeds brown-yellow, ellipsoid. Fl. and fr. Jul–Oct.

• Alpine scrub, grassy slopes; 2700–3600 m. Shaanxi (Taibai Shan).

**34. *Codonopsis chlorocodon*** C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 82. 1965.

绿钟党参 lǜ zhōng dāng shēn

*Codonopsis viridiflora* Maximowicz var. *chlorocodon* (C. Y. Wu) S. H. Huang.

Roots carrot-shaped, up to 20 cm or longer. Stems erect, 60–100 cm tall, lower branches leafy, sterile, middle ones often absent, upper ones, if present, fertile but leafless. Leaves on main stems alternate, those on branches opposite, sessile or with petiole up to 1 cm; blade triangular, ovate, or lanceolate, 10–25 × 5–20 mm, glabrous or sparsely hispid, base shallowly cordate, rounded, or truncate, margin entire or crenate, revolute, apex acute. Flowers solitary, terminal on main stems, but upper branches often with 1 or 2 flowers. Calyx tube adnate to ovary up to middle, hemispheric, campanulate, or obconic, 10-ribbed; lobes distant from each other, narrowly triangular or lanceolate, 4–6 × 2–3 mm, margins entire or with denticles above, glabrous or very sparsely hispidulous at upper part. Corolla pale yellow-green, tubular-campanulate, 1.5–1.8 cm. Capsule ca. 1 cm in diam., obtuse or slightly cuneate at base. Seeds brown-yellow, ellipsoid, ca. 1.5 mm. Fl. Jun–Aug, fr. Sep.

• Sunny grassy slopes, open thickets; 2700–3700 m. W Sichuan, NW Yunnan (Dèqên).

**35. *Codonopsis bhutanica*** Ludlow, J. Roy. Hort. Soc. 97: 127. 1972.

西藏党参 xī zāng dāng shēn

*Codonopsis xizangensis* D. Y. Hong.

Roots carrot-shaped, up to 20 × 1.8 cm. Stems erect or procumbent, 20–50 cm, branches several to many at lower and middle part, slender. Leaves on main stems alternate, those on branches opposite or nearly so; all leaves sessile or with petiole up to 4 mm; blade cordate, 10–24 × 8–24 mm, glabrous or villous or sparsely hispidulous, margin recurved. Flowers solitary, terminal on main stems and sometimes on upper branches, and rarely also on some slender branches. Calyx tube adnate to ovary up to middle, glabrous; lobes narrowly ovate, 5–13 × 3–5 mm, hispidulous entirely or only at upper part, margins recurved to middle rib; sinus between lobes narrow and pointed. Corolla pale blue with dark blue at base, tubular, 12–15 mm, lobed to 1/3. Stamens glabrous. Capsule globose in inferior part, conical in superior part, 14–16 × 8–10 mm. Seeds ellipsoid, ca. 1 mm. Fl. Jul–Sep, fr. Sep–Oct.

Meadows, grassy slopes, thickets; 3700–4600 m. SE Xizang (Cona) [Bhutan, Nepal].

## 2. *Codonopsis* subg. *Obconicapsula* D. Y. Hong, Acta Phytotax. Sin. 18: 245. 1980.

锥果党参亚属 *zhui guo dang shen ya shu*

Plants usually not fetid. Roots tuberous, ovoid or ellipsoid. Stems erect. Corolla epigynous, 5-lobed for less than 1/2 its length, campanulate. Fruit an obconic loculicidal capsule. Seed testa smooth or faintly striate.

One species: SW China, NE India, Nepal.

### 36. *Codonopsis dicentrifolia* (C. B. Clarke) W. W. Smith, Rec. Bot. Surv. India 4: 388. 1913.

珠峰党参 *zhu feng dang shen*

*Wahlenbergia dicentrifolia* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 430. 1881; *Campanopsis dicentrifolia* (C. B. Clarke) Kuntze.

Plants glabrous throughout. Roots tuberous, subovoid or ellipsoid, ca. 6 × 3 cm. Stems erect, 40–50 cm tall, branched at upper part. Leaves mostly alternate, those on branches subopposite; petiole 2–5 mm; blade ovate or ovate-oblong, up to 3 × 1.5 cm, base cuneate or rounded, margin entire or sinuous,

sometimes slightly recurved, apex acute or obtuse. Flowers solitary, terminal on main stems and branches; pedicels 0.5–3 cm. Calyx tube adnate to ovary up to top, obconical, 5–7 × 7–10 mm; lobes sublinear, 7–10 × ca. 1 mm, margin entire, apex acuminate; sinus between lobes broad and obtuse. Corolla pale blue, campanulate, 2.5–3.5 × 2.5–3.5 cm, 5-fid to 1/3; lobes ovate, apex acute. Filaments slightly dilated, slender above, 3–4 mm; anthers 7–8 mm. Capsule broadly conical above, obconical or obdeltoid-conical below, obscurely 10-ribbed. Seeds elliptic, strongly compressed. Fl. and fr. Aug–Oct.

Broad-leaved forests on rocks; 2700–3300 m. S Xizang (N-facing slopes of Qomolangma Feng) [NE India, Nepal].

## 3. *Codonopsis* subg. *Pseudocodonopsis* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 102. 1908.

幅冠党参亚属 *fu guan dang shen ya shu*

Plants usually not fetid. Roots tuberous, ovoid or ellipsoid. Stems erect or twining. Corolla epigynous, 5-fid for more than 3/4 its length, rotate. Fruit an obconic loculicidal capsule. Seed testa smooth or faintly striate.

Four species: Himalaya and the Hengduan Mountains; four species (three endemic) in China.

### 37. *Codonopsis rosulata* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 157. 1921.

莲座状党参 *lian zuo zhuang dang shen*

Plants glabrous throughout. Roots globose or ovoid, 0.5–2.2 × 0.5–2.5 cm. Stems erect or ± decumbent, 10–40 cm tall, simple or with 2 or 3 branches. Basal leaves rosulate; blade ovate or broadly elliptic, 0.5–7 × 0.4–5.8 cm, base cordate, margin doubly crenate, apex rounded or obtuse; petiole 1–30 mm; cauline leaves lanceolate or linear-lanceolate, 1–15 × 0.5–8 mm, base rounded or cuneate, margin sinuous-crenate or subentire, apex acute or acuminate. Flowers solitary and terminal on main stems and branches; pedicels 4–15 cm. Calyx tube obconic, 4–8 × 4–6 mm; lobes lanceolate or ovate-lanceolate, 3–8 mm, margin entire, apex acute; sinus between lobes acute. Corolla blue-purple, rotate, 5-fid to near base; lobes ovate or broadly ovate, 7–14 × 5–9 mm, apex acute or obtuse. Filaments dilated at base; anthers oblong, 2.5–3 mm. Capsule obconical below, slightly truncate-obtuse above, ca. 12 × 6 mm, persistent style acute at base. Seeds numerous, brown-yellow, elliptic, compressed, wingless. Fl. and fr. Sep–Oct.

• Grassy slopes, margins of *Pinus* forests; 2600–3600 m. SW Sichuan, NW Yunnan.

### 38. *Codonopsis hirsuta* (Handel-Mazzetti) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 546. 1992.

毛叶鸡蛋参 *mao ye ji dan shen*

*Codonopsis limprichtii* Lingelsheim & Borza var. *hirsuta* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl.

61: 169. 1924; *C. convolvulacea* Kurz var. *hirsuta* (Handel-Mazzetti) Nannfeldt.

Roots ovoid-globose, 1–2 cm in diam. Stems up to 1 m, decumbent below, twining only at upper part, hirsute at leafing section. Cauline leaves alternate, aggregated at lower part, sessile or with extremely short petiole ca. 2 mm; blade ovate or narrowly oblong, 1.5–5 × 0.3–1.6 cm, abaxially densely hirsute, adaxially glabrous, rarely sparsely hirsute, base cuneate or rounded, margin entire or sinuous-crenulate, often recurved toward lateral sides, apex acute or obtuse. Flowers solitary, terminal. Calyx glabrous; tube adnate to ovary up to top of ovary, obconical, 4–7 mm in diam.; lobes narrowly triangular-lanceolate, 6–18 × 2–6 mm, margin entire, apex acuminate or acute. Corolla pale blue or blue-purple, 5-divided to near base; lobes elliptic, 1–3.5 × 0.5–1.6 cm. Filaments dilated at base, villous on sides. Capsule broadly conical at superior part, obconical at inferior part. Seeds numerous, brown-yellow, smooth. Fl. Sep.

• Open thickets, sunny grassy slopes; 2400–3100 m. SW Sichuan (Huili, Muli, Yanyuan), NW Yunnan (Lijiang).

### 39. *Codonopsis convolvulacea* Kurz, J. Bot. 11: 195. 1873.

鸡蛋参 *ji dan shen*

Roots tuberous, ovoid-globose or ovoid, 2.5–5 × 1–1.5 cm. Stems twining, usually with a few branches, up to more than 1 m, glabrous. Leaves alternate or sometimes opposite, evenly distributed along stems; petiole absent or to 22 mm; blade linear-lanceolate to ovate or deltoid, 2–10 × 0.4–3.5 cm, base cuneate, rounded, truncate, or cordate, margin entire, sub-

entire, sinuous-crenate, or serrate, apex obtuse, acute, or acuminate. Flowers solitary, terminal on main stems and branches; pedicels 2–12 cm, glabrous. Calyx tube adnate to ovary up to top, obconical, 3–7 × 4–10 mm, glabrous, 10-ribbed; lobes narrowly triangular-lanceolate, 4–11 × 1–5 mm, glabrous, margin entire, apex acuminate or acute; sinus between lobes narrow, pointed or slightly obtuse. Corolla pale blue or blue-purple, rotate, 5-fid to near base; lobes elliptic, 1–3.5 × 0.6–1.2 cm, apex acute. Filaments slightly dilated and ciliate at base, 1–3 mm; anthers 4–5 mm. Superior part of capsule broadly conical, valves ca. 4 mm; inferior part obconical, 10–16 × ca. 8 mm. Seeds numerous, brown-yellow, oblong, ca. 1.5 mm, wingless. Fl. and fr. Jul–Oct.

Forests, open woods, forest margins, thickets, grassy slopes, pastures, meadows; 1000–4600 m. W Guizhou, SW Sichuan, S and SE Xizang, Yunnan [Bhutan, N Myanmar, Nepal].

Two of us (Lammers and Klein) do not agree with the broad treatment of *Codonopsis convolvulacea* adopted here, i.e., with *C. forrestii*, *C. grey-wilsonii*, and *C. vinciflora* treated as subspecies of *C. convolvulacea*, with *C. limprichtii*, *C. efilamentosa*, and *C. mairei* included in the synonymy of *C. convolvulacea* subsp. *forrestii*, and with *C. limprichtii* var. *pinifolia* included in the synonymy of *C. graminifolia*. Instead, based on our analysis of herbarium material including types, we recognize seven morphologically discrete entities. The nature of the differences distinguishing them suggests each is reproductively isolated from the others and so we treat them as species: *C. convolvulacea* (including *C. forrestii* var. *heterophylla*), *C. efilamentosa*, *C. forrestii* (including *C. forrestii* var. *hirsuta*), *C. grey-wilsonii*, *C. limprichtii* (including *C. graminifolia* and *C. limprichtii* var. *pinifolia*), *C. mairei* (including *C. retroserrata*), and *C. vinciflora*. We also recognize an eighth species, *C. macrophylla* Lammers & L. L. Klein, known only in cultivation but believed to be from Xizang. See Lammers and Klein (Bot. Stud. (Taipei) 51: 553–561. 2010). However, one of us (Hong) notes that the taxonomy of this complex has been extremely controversial in the past, with several different classifications having been proposed. Based on critical examination of all available specimens in BM, E, K, KUN, and PE and recent field observations in S and SE Xizang and NW Yunnan, the *C. convolvulacea* complex is found to be extremely variable, particularly in the length of the petioles and in the shape, texture, and margin of the leaf blades. Some characters, e.g., shape of leaf blade, are merely a polymorphism within populations, and the characters distinguishing *C. convolvulacea*, *C. forrestii*, *C. grey-wilsonii*, and *C. vinciflora* are variable within geographic regions but are not distinct.

- 1a. Leaf blade thinly membranous, margin usually serrate ..... 39c. subsp. *vinciflora*
- 1b. Leaf blade thickly papery, margin mostly entire, less often serrate.
  - 2a. Leaf blade mostly cordate (less often rounded) at base; corolla with a broad dark purple circle at base ..... 39d. subsp. *grey-wilsonii*
  - 2b. Leaf blade truncate to cuneate at base; corolla with a narrow dark purple circle at base or without a dark purple circle at base.
    - 3a. Leaf blade lanceolate to linear-lanceolate, base rounded to cuneate, margin entire; petiole no more than 3 mm ..... 39a. subsp. *convolvulacea*

- 3b. Leaf blade deltoid or ovate to linear-lanceolate, base cordate or truncate to cuneate, margin entire, subentire, sinuous-crenate, or serrate; petiole 3–22 mm ..... 39b. subsp. *forrestii*

### 39a. *Codonopsis convolvulacea* subsp. *convolvulacea*

鸡蛋参(原亚种) ji dan shen (yuan ya zhong)

Leaves subsessile or petiole no more than 3 mm; blade lanceolate to linear-lanceolate, 2–7 × 0.5–1.5 cm, papery, base rounded to cuneate, margin entire.

Thickets, grassy slopes; 1000–1800 m. S Yunnan [N Myanmar].

**39b. *Codonopsis convolvulacea* subsp. *forrestii*** (Diels) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 546. 1992.

珠子参 zhu zi shen

*Codonopsis forrestii* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 171. 1912; *C. convolvulacea* var. *efilamentosa* (W. W. Smith) L. T. Shen; *C. convolvulacea* var. *forrestii* (Diels) Ballard; *C. convolvulacea* var. *limprichtii* (Lingelsheim & Borza) J. Anthony; *C. efilamentosa* W. W. Smith; *C. forrestii* var. *hirsuta* P. C. Tsoong & L. T. Shen; *C. limprichtii* Lingelsheim & Borza; *C. mairei* H. Léveillé; *C. retroserrata* Z. T. Wang & G. J. Xu.

Leaves petiolate; petiole 3–22 mm; blade deltoid or ovate to linear-lanceolate, 2–10 × 0.4–3.5 cm, papery, base cordate or truncate to cuneate, margin entire, subentire, sinuous-crenate, or serrate.

Open woods, forest margins, thickets, meadows; 1800–3900 m. W Guizhou (Anshun), SW Sichuan, C and N Yunnan [N Myanmar].

**39c. *Codonopsis convolvulacea* subsp. *vinciflora*** (Komarov) D. Y. Hong, Fl. Xizang. 4: 582. 1985.

薄叶鸡蛋参 bao ye ji dan shen

*Codonopsis vinciflora* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 103. 1908; *C. forrestii* var. *heterophylla* C. Y. Wu; *C. convolvulacea* var. *vinciflora* (Komarov) L. T. Shen.

Leaves shortly petiolate; petiole 3–12 mm; blade ovate-lanceolate to linear-lanceolate, 2–10 × 0.4–3 cm, thinly membranous, base truncate to cuneate, margin mostly serrate, rarely entire.

• Forests, thickets; 1800–4600 m. SW Sichuan, SE Xizang, NW Yunnan (Dêqên).

**39d. *Codonopsis convolvulacea* subsp. *grey-wilsonii*** (J. M. H. Shaw) D. Y. Hong, Novon 20: 421. 2010.

喜马拉雅鸡蛋参 xi ma la ya ji dan shen

*Codonopsis grey-wilsonii* J. M. H. Shaw, New Plantsman 3(2): 93. 1996, based on *C. nepalensis* Grey-Wilson, Plantsman 12(2): 99. 1990, not H. Hara (1978).

Leaf blades mostly cordate (less often rounded) at base.

Corolla often with a broad dark purple circle at base. Calyx tube and capsule rounded or obconic at base.

Forests, thickets; 2100–4000 m. S Xizang (Gyirong, Nyalam) [Bhutan, Nepal].

**40. *Codonopsis graminifolia*** H. Léveillé, Cat. Pl. Yun-Nan, 24. 1916.

松叶鸡蛋参 song ye ji dan shen

*Codonopsis convolvulacea* Kurz var. *pinifolia* (Handel-Mazzetti) Nannfeldt; *C. limprichtii* Lingelsheim & Borza var. *pinifolia* Handel-Mazzetti.

Plants glabrous throughout. Roots ovoid or oblong, 0.8–1.5 cm in diam. Stems decumbent below, twining only at upper part, sometimes suberect, up to 1 m, simple or branched. Cauline leaves alternate, usually aggregated at lower part, sessile, linear to linear-lanceolate, 2–10.5 × 0.1–1 cm, base cuneate, margin entire, often recurved toward lateral sides, apex acuminate. Flowers solitary, terminal. Calyx tube adnate to ovary up to top of ovary, obconical; lobes narrowly triangular, 4–10 × 2–

3 mm, entire. Corolla blue or purple, divided to near base; lobes elliptic, 8–26 × 4–12 mm. Filaments dilated at base, densely white villous on sides; anthers ca. 3 mm. Capsule obconical and ca. 6 mm in diam. at inferior part, broadly conical at superior part. Seeds numerous, brown-yellow. Fl. Jul–Sep, fr. Sep–Oct.

• *Pinus* forests, thickets, open grassy slopes; 1500–3300 m. W Guizhou (Weining), SW Sichuan, N Yunnan.

Two of us (Lammers and Klein) regard *Codonopsis graminifolia* and *C. limprichtii* var. *pinifolia* as synonyms of *C. limprichtii* because we can discern no way to distinguish *C. limprichtii* from the other two entities; see Lammers and Klein (Bot. Stud. (Taipei) 51: 553–561. 2010). However, one of us (Hong) notes that the description in the protologue of *C. limprichtii* (Lingelsheim & Borza, Repert. Spec. Nov. Regni Veg. 13: 391–392. 1914; "... *Folia ... inferiora ovalia, parce obtuse dentata, ad 3 cm longa, 2 cm lata, superiora lanceolata, integerrima, ad 5 cm longa et 1 cm lata, ...*") and the isotype, *H. W. Limpricht 851* (WU), represent a broader-leaved entity rather than the narrow-leaved plant described here as *C. graminifolia*. Therefore, *C. graminifolia* and *C. limprichtii* cannot be conspecific, and the latter is instead treated here in the synonymy of *C. convolvulacea* subsp. *forrestii*.

#### 4. CAMPANUMOEAE Blume, Bijdr. 726. 1826.

金钱豹属 jin qian bao shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

Herbs, perennial. Roots thickened, carrot-shaped. Stems voluble. Leaves opposite or alternate. Flowers solitary, axillary or almost opposite to leaves, or in cymes of 3, pedicellate, 4–7-merous. Calyx tube (hypanthium) adnate to ovary to different extents, or free from ovary. Corolla epigynous; tube obvious; limb 5(or 6)-lobed. Stamens 5; filaments glabrous or hairy. Ovary completely inferior, or inferior only to corolla but inferior, semi-inferior, or superior to calyx, 3–6-locular; style glabrous or hairy; stigma 3–6-fid. Berry globose, apically flat. Seeds numerous.

Two species: Bhutan, China, NE India, Indonesia, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam; two species in China.

- 1a. Leaves opposite; calyx nearly completely hypogynous but corolla epigynous ..... 1. *C. javanica*  
1b. Leaves alternate; both calyx and corolla epigynous ..... 2. *C. inflata*

**1. *Campanumoea javanica*** Blume, Bijdr. 727. 1826.

金钱豹 jin qian bao

Roots thickened. Stems twining, multi-branched, glabrous. Leaves opposite, rarely alternate, long petiolate; blade cordate or cordate-ovate, sometimes becoming trilobate, 2.6–8 × 2–7.5 cm, glabrous or abaxially sometimes sparsely villous, margin dentate or crenate, or rarely entire. Flowers axillary, glabrous throughout. Calyx free from ovary, cleft nearly to base; lobes lanceolate or ovate, rarely narrowly triangular, 8–20 mm. Corolla epigynous, white or yellow-green, purple or reddish inside, campanulate, cleft to middle. Stigma 4- or 5-fid; ovary and berry 5-locular. Berry violet or greenish white suffused with red, globose, 7–26 mm. Seeds irregular in shape, surface reticulate. Fl. and fr. May–Nov.

S Anhui, Fujian, SE Gansu, Guangdong, Guangxi, N and SW Guizhou, Hainan, W Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NE India, Indonesia, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam].

- 1a. Corolla 15–30 mm; berry violet, 15–26 mm in diam. .... 1a. subsp. *javanica*

- 1b. Corolla 6–13 mm; berry greenish white suffused with red, 7–15 mm in diam. .... 1b. subsp. *japonica*

**1a. *Campanumoea javanica* subsp. *javanica***

金钱豹(原亚种) jin qian bao (yuan ya zhong)

*Campanula javanica* (Blume) D. Dietrich; *Campanumoea cordata* (Hasskarl) Miquel; *C. labordei* H. Léveillé; *Codonopsis cordata* Hasskarl; *C. cordifolia* Komarov; *C. javanica* (Blume) J. D. Hooker & Thomson.

Leaf blade 3.5–8 × 2.2–7.5 cm. Calyx lobes lanceolate, 10–20 mm. Corolla 15–30 mm. Berry violet, 15–26 mm in diam.

Guangdong, Guangxi, SW Guizhou, Hainan, Taiwan, Yunnan [Bhutan, NE India, Indonesia, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam].

**1b. *Campanumoea javanica* subsp. *japonica*** (Makino) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 71. 1983.

小花金钱豹 xiao hua jin qian bao

*Campanumoea javanica* var. *japonica* Makino, Bot. Mag. (Tokyo) 22: 155. 1908; *C. japonica* Maximowicz (1868), not Siebold ex E. Morren (1863); *C. maximowiczii* Honda; *Codonopsis javanica* subsp. *japonica* (Makino) Lammers.

Leaf blade 2.6–8 × 2.2–6.5 cm. Calyx lobes ovate or lanceolate, or rarely narrowly triangular, 8–12(–17) mm. Corolla 6–13 mm. Berry greenish white suffused with red, 7–15 mm in diam.

S Anhui, Fujian, SE Gansu (Wenxian), N Guangdong (Huaiji, Lianxian), Guangxi (Jiuwan Dashan), N Guizhou, W Hubei, Hunan, Jiangxi, Sichuan (E of Erlang Shan), Taiwan, Zhejiang [Japan].

**2. *Campanumoea inflata*** (J. D. Hooker & Thomson) C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 436. 1881.

藏南金钱豹 zang nan jin qian bao

*Codonopsis inflata* J. D. Hooker & Thomson, Ill. Himal. Pl. t. 16, C. 1855.

Plants voluble. Roots slightly thickened, branched. Stems almost glabrous. Leaves alternate; petiole 3–6 cm; blade ovate to ovate-lanceolate, 4–10 × 2–5 cm, abaxially glaucous, puberulent, adaxially glabrous or sparsely puberulent, base deeply cordate, margin entire or sinuate, apex acuminate. Flowers almost opposite to leaves, or in terminal and few-flowered cymes; pedicels 2–3 cm. Calyx adnate up to top of ovary; tube obdeltoid-conical, puberulent; lobes and corolla inserted at same position, ovate-triangular, ca. 1 cm, margin often recurved. Corolla pale yellow or pale green, but often purple at margin and veins, campanulate, 2.5–3 cm, cleft to 1/3. Filaments glabrous. Style glabrous; stigma 3-lobed; ovary 3-locular. Berry ?yellow-green, globose, 12–15 mm in diam. Seeds ovoid-globose, surface reticulate. Fl. and fr. Aug–Sep.

Broad-leaved forests, herb communities at forest margins; below 2500 m. SE Xizang (Médog) [Bhutan, NE India, E Nepal].

## 5. **CYCLOCODON** Griffith ex J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 17. 1857.

轮钟花属 lun zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Codonopsis* A. Candolle (1839), not Wallich (1824).

Herbs, (perennial or annual), erect or ascending. Stems mostly branched. Leaves opposite, rarely whorled. Flowers solitary, terminal or axillary, or in dichasium, perfect; bracteoles present, filiform or leaflike, or absent. Calyx partly adnate to or completely free from ovary, and thus epigynous or hypogynous for ovary; lobes 4–6, from subentire to branched. Corolla epigynous, tubular, 4–6-merous. Stamens 4–6; filaments dilated below, glabrous or ciliate at dilated part. Ovary inferior for corolla but from semi-inferior to superior for calyx, 3–6-locular; stigma 4–6-fid; ovules extremely numerous. Fruit a berry. Seeds extremely numerous, subglobose.

Three species: from the Himalaya to Japan (Ryukyu Islands), Philippines, and Papua New Guinea; three species in China.

- 1a. Flowers often 4-merous; calyx inserted on pedicel, distant from other floral parts by 1–4 mm, like involucrel bracts ..... 3. *C. parviflorus*  
 1b. Flowers usually 5- or 6-merous; calyx at least partly adnate to ovary.  
 2a. Flowers all terminal; bracteoles often absent, rarely present and then stalked and ± leaflike; calyx lobes denticulate to subentire; filaments glabrous; berry often white, less often yellow or pale red ..... 2. *C. celebicus*  
 2b. Flowers terminal and axillary; bracteoles present and filiform; calyx lobes branched; filaments hairy below; berry purple-black ..... 1. *C. lancifolius*

**1. *Cyclocodon lancifolius*** (Roxburgh) Kurz, Flora 55: 303. 1872.

轮钟花 lun zhong hua

*Campanula lancifolia* Roxburgh, Fl. Ind. 2: 96. 1824; *Campanumoea axillaris* Oliver; *C. lancifolia* (Roxburgh) Merrill; *C. truncata* (Wallich ex A. Candolle) Diels; *Codonopsis lancifolia* (Roxburgh) Moeliono; *C. truncata* Wallich ex A. Candolle; *Cyclocodon truncatus* (Wallich ex A. Candolle) J. D. Hooker & Thomson.

Herbs, (perennial or annual), erect or ascending, sometimes lignified at base, usually glabrous throughout. Stems up to 3 m tall, hollow; branches multiple, horizontal or pendulous. Leaves opposite, rarely in whorls of 3, shortly petiolate; blade ovate or ovate-lanceolate to lanceolate, 6–15 × 1–5 cm, margin serrate, dentate, or crenate, apex acuminate. Flowers usually solitary, terminal, or both terminal and axillary, sometimes in a cyme of 3; pedicels or peduncles 1–10 cm, with a pair of

filiform bracteoles at middle to top. Calyx adnate to ovary up to lower part of ovary; lobes (4 or)5(–7), filiform or linear, margins with ramiform teeth. Corolla white or pale red, tubular-campanulate, 7–12 mm, 5- or 6-cleft to middle; lobes ovate to ovate-triangular. Stamens 5 or 6; filaments equal to anthers in length, base dilated into lamellar part, margins villous-ciliate. Style glabrous or hairy; stigma (4 or)5- or 6-fid; ovary (4 or)5- or 6-locular. Berry purple-black when mature, globose, (4 or)5- or 6-locular, 5–10 mm in diam. Seeds extremely numerous, subglabrous. Fl. and fr. Jul–Nov.

Forests, thickets, grasslands; below 1500 m. Chongqing, S Fujian, Guangdong, Guangxi, Guizhou, Hainan, SW Hubei, S and W Hunan, S Jiangxi (Quannan), Sichuan, Taiwan, SE Yunnan [Bangladesh, Cambodia, NE India, Indonesia, Japan (including Ryukyu Islands), Laos, Philippines, Vietnam].

**2. *Cyclocodon celebicus*** (Blume) D. Y. Hong, Acta Phytotax. Sin. 36: 109. 1998.

小叶轮钟草 xiao ye lun zhong cao

*Campanumoea celebica* Blume, Bijdr. 727. 1826; *Campanula celebica* (Blume) D. Dietrich; *Codonopsis celebica* (Blume) Miquel; *C. lancifolia* (Roxburgh) Moeliono subsp. *celebica* (Blume) Moeliono; *Cyclocodon lancifolius* (Roxburgh) Kurz subsp. *celebicus* (Blume) K. E. Morris & Lammers.

Herbs, (perennial or annual?), without caudexes, nor rhizomes, erect, 1–2 m tall, sometimes lignified at base. Stems terete, branched, sparsely hispidulous or subglabrous. Leaves shortly petiolate; petiole up to 5 mm; blade ovate-lanceolate to lanceolate, 5–10 × 2–4 cm, those on branches smaller, glabrous or sparsely puberulent along veins on both surfaces, base usually rounded, margins serrate, teeth pointed at apex, blade apex acuminate. Flowers terminal, usually in a dichasium of 3; pedicels 8–20 mm, hispidulous, usually without bracteoles, rarely with stalked and ± leaflike bracteoles. Calyx adnate to ovary up to ca. 1/3 of ovary; tube glabrous; lobes mostly 5 or 6, linear to linear-elliptic, 3–10 × 1–3 mm, entire or with 2–4 pairs of serrate teeth. Corolla pale blue, campanulate, 7–10 mm, 5- or 6-lobed to middle. Stamens 5 or 6, glabrous; filaments slightly dilated below. Ovary globose; stigma 5- or 6-fid. Berry white, oblate, 5- or 6-locular, up to 8 × 12 mm. Seeds extremely numerous. Fl. and fr. Jul–Jan.

Grassy slopes, thickets, woodlands; 800–2600 m. SE Xizang (Bomi, Mêdog, Zayü), S and W Yunnan [Bangladesh, NE India (Darjeeling, Sikkim), Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam].

**3. *Cyclocodon parviflorus*** (Wallich ex A. Candolle) J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 18. 1857.

小花轮钟草 xiao hua lun zhong cao

*Codonopsis parviflora* Wallich ex A. Candolle, Monogr. Campan. 123. 1830; *Campanula punduana* D. Dietrich; *Campanumoea parviflora* (Wallich ex A. Candolle) Benth. ex C. B. Clarke.

Herbs, (perennial or annual?), erect, 1–2 m tall. Stems terete, branched, glabrous. Leaves shortly petiolate; petiole up to 6 mm; blade abaxially somewhat glaucous, lanceolate, 5–11 × 1.5–3 cm, those on branches smaller, both surfaces glabrous, base rounded or broadly cuneate, margin serrate, teeth apiculate at apex, blade apex acuminate. Flowers terminal, often in a dichasium of 3; pedicels 1–4 cm, glabrous, with or without a pair of leaflike or linear bracteoles. Calyx entirely free from ovary, and thus hypogynous, just below ovary or 1–4 mm distant from ovary, forming an anthophore; lobes usually 4, free from each other, linear, 3.5–8 mm, with 1–4 pairs of teeth. Corolla white, lobes equaling tube in length, 5–8 mm. Stamens 4; filaments subulate. Ovary globose or obovoid, 4-locular; stigma 4-fid. Fruit a globose berry, 4–6 mm. Seeds extremely numerous, light brown, orbicular or circular, compressed, reticulate. Fl. and fr. Sep–Jan.

Thickets, herb communities; below 1500 m. S and SW Yunnan [Bangladesh, Bhutan, NE India (Assam, Sikkim), Laos, Myanmar].

## 6. ECHINOCODON D. Y. Hong, Acta Phytotax. Sin. 22: 183. 1984.

刺萼参属 ci e shen shu

Hong Deyuan (洪德元); Thomas G. Lammers

Herbs, perennial. Roots slightly thickened, carrot-shaped. Leaves alternate, pinnatifid. Flowers solitary, terminal, or 2 or 3 in a cyme. Calyx 2–5 (often 4)-lobed; lobes with 2–4 spinose lobules. Corolla tubular, 3–5-cleft to middle. Stamens 3–5, mostly 4, free but connivent initially; filaments dilated at base, dilated part ciliate. Ovary almost entirely inferior, 3–5-locular; stigma lobes equal in number to ovary locules, linear, recurved; ovules numerous. Capsule globose, superior part conical, loculicidal, valves alternate with calyx lobes. Seeds numerous, ellipsoid, 3-ribbed, ribs obtuse.

• One species: China.

**1. *Echinocodon lobophyllus*** D. Y. Hong, Acta Phytotax. Sin. 22: 183. 1984.

刺萼参 ci e shen

Plants diffuse, glabrous throughout. Roots up to 5 mm in diam. Stems up to 40 cm, multi-branched. Leaves petiolate; petiole 5–10 mm; blade abaxially green-gray, adaxially green, elliptic, 5–20 × 3–15 mm, base narrowly cuneate, margin

pinnatifid nearly to middle vein or to middle, apex obtuse. Pedicels 1–5 cm. Calyx lobes ovate-lanceolate, 2–6 × 1–3 mm (lobules excluded). Corolla purple-blue, 3–4.5 mm. Stamens ca. 1.5 mm; anthers narrowly oblong, ca. 1 mm. Style ca. 1 mm; stigma segments linear, recurved. Capsule globose, 3–5 mm in diam., superior part conical, up to 2 mm. Seeds minute, ca. 0.3 mm. Fl. and fr. Jun–Jul. 2n = 16\*.

• Herb communities in stony places; ca. 300 m. Hubei (Yunxi).

## 7. PLATYCODON A. Candolle, Monogr. Campan. 125. 1830.

桔梗属 jie geng shu

Hong Deyuan (洪德元); Laura L. Klein, Thomas G. Lammers

Herbs, perennial. Taproot thickened, carrotlike. Stems erect. Leaves cauline, 3- or 4-verticillate, opposite, or alternate, sessile or shortly petiolate. Flowers large, terminal, solitary, pedicellate. Calyx lobes 5, shorter than hypanthium. Corolla bowl-shaped; lobes 5, shorter than or equaling tube. Stamens 5, free; filaments dilated into a triangular base, dilated part ciliate; anthers longer than fila-

ments. Disk absent. Ovary semi-inferior, 5-locular, locules opposite calyx lobes; stigma 5-fid. Capsule 5-loculicidal at apex, valves with septa, opposite to calyx lobes. Seeds numerous, black or dark brown, large, terete, ellipsoid or oblong, longitudinally keeled.

One species: E Asia; widely cultivated elsewhere.

**1. *Platycodon grandiflorus*** (Jacquin) A. Candolle, Monogr. Campan. 125. 1830 [*"grandiflorum"*].

桔梗 jie geng

*Campanula grandiflora* Jacquin, Hort. Bot. Vindob. 3: 4. 1776; *C. glauca* Thunberg; *Platycodon autumnalis* Decaisne; *P. chinensis* Lindley & Paxton; *P. glaucus* (Thunberg) Nakai; *P. sinensis* Lemaire.

Stems 20–120 cm tall, usually glabrous, rarely densely puberulent, simple, rarely branched above. Leaf blade adaxially green, ovate, elliptic, or lanceolate, 2–7 × 0.5–3.5 cm, abaxially glabrous (rarely puberulent along veins) and glaucous, adaxi-

ally glabrous, base broadly cuneate or rounded, margin serrate, apex acute or acuminate. Hypanthium hemispherical, obovoid, or obconic, rarely campanulate, glaucous. Calyx lobes triangular or narrowly triangular, sometimes toothlike. Corolla blue or purple (rarely pink or white), 1.5–4.5 cm. Capsule globose, obconic, or obovoid, 0.7–2.5 × 0.7–1.5 cm. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 18, 36$ .

Sunny herb communities, thickets, rarely in forests; below 2000 m. Anhui, Chongqing, Fujian, Guangdong, N Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, E Sichuan (west to Pingwu and Liangshan), SE Yunnan (Mengzi, Wenshan, Yanshan), Zhejiang [Japan, Korea, Russia (Far East, SE Siberia); widely cultivated elsewhere].

## 8. WAHLENBERGIA Schrader ex Roth, Nov. Pl. Sp. 399. 1821, nom. cons.

藍花參屬 lan hua shen shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Campanopsis* (R. Brown) Kuntze; *Campanula* sect. *Campanopsis* R. Brown; *Cephalostigma* A. Candolle; *Cervicina* Delile.

Herbs, perennial or annual, rarely subshrubs or shrubs. Leaves cauline and often basally rosulate, alternate or rarely opposite, usually sessile. Flowers small to medium-sized, sessile or pedicellate, terminal or axillary, solitary or in thyrses, panicles, or fascicles. Calyx lobes typically 5. Corolla blue or white, campanulate or funnelform, lobed, cleft, or divided; segments typically 5. Stamens typically 5; filaments free and distinct, dilated into a triangular base, dilated part ciliate; anthers coherent. Ovary inferior, 2- or 3(–5)-locular; stigma 2- or 3(–5)-fid, segments linear. Capsule loculicidal at apex. Seeds numerous or few.

About 260 species: mainly in S Hemisphere, particularly S Africa, extending north to W Europe, E and S Asia, and N South America; two species in China.

1a. Perennials; flowers solitary; pedicels 5–20 cm; corolla cleft for 2/3 its length; ovary and capsule 3-locular ..... 1. *W. marginata*

1b. Annuals; flowers numerous in a terminal panicle; pedicels 0.5–2 cm corolla divided nearly to base; ovary

and capsule 2-locular ..... 2. *W. hookeri*

**1. *Wahlenbergia marginata*** (Thunberg) A. Candolle, Monogr. Campan. 143. 1830.

藍花參 lan hua shen

*Campanula marginata* Thunberg in Murray, Syst. Veg., ed. 14, 211. 1784; *Adenophora microsperma* Y. Y. Qian; *Campanopsis marginata* (Thunberg) Kuntze; *Wahlenbergia gracilis* (G. Forster) A. Candolle var. *misera* Hemsley.

Herbs, perennial. Roots elongate, carrotlike. Stems erect or ascending, 10–40 cm, branched at base, glabrous or sparsely hirsute below. Leaves alternate, mostly on lower part of stem, lowermost sometimes caducous, sessile or with petiole up to 7 mm; blade spatulate, oblanceolate, elliptic, or linear, 10–40 × 2–8 mm, glabrous or sparsely hirsute, margin sinuate, sparsely serrulate, or entire. Pedicels erect, terminal and sometimes axillary, slender, up to 20 cm. Hypanthium obovoid or conic, glabrous. Calyx lobes triangular or subulate. Corolla blue, broadly campanulate, 3–12 mm, cleft for 1/3–2/3 its length; lobes obovate, oblong, or narrowly oblong. Capsule obconic, obovoid, or subglobose, 3–8 mm, 3-locular. Seeds yellow-brown or dark brown, oblong or ellipsoid, slightly compressed, 0.3–0.5 mm, smooth. Fl. and fr. Feb–May.  $2n = 36, 72$ .

Wastelands, fields, slopes, streams; lower elevations (to 2800 m in Yunnan). Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou,

Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan (including Ryukyu Islands), Korea, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Vietnam; naturalized in the Pacific islands (Hawaiian Islands) and North America].

**2. *Wahlenbergia hookeri*** (C. B. Clarke) Tuyn in Steenis, Fl. Males., Ser. 1, Spermat. 6: 114. 1960.

星花草 xing hua cao

*Cephalostigma hookeri* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 429. 1881.

Herbs, annual. Stems erect, 8–20 cm tall, sparsely villous, dichotomously branched. Leaves shortly petiolate; blade ovate or ovate-elliptic, ca. 2.5 × 1.2 cm, base and apex obtuse, margin denticulate. Cymes in large and lax panicles; bracts small; pedicels slender, up to 2 cm. Calyx ca. 1.5 mm; tube obconical; lobes triangular, ca. 0.5 mm. Corolla blue, 5-divided to near base; lobes spreading, starlike, linear-elliptic, 2–3 mm. Stamens ca. 1.5 mm. Style almost equal to corolla in length. Capsule subglobose, ca. 3 mm in diam., 2-locular. Seeds small, broadly ellipsoid, 3-ribbed. Fl. Nov.

Sunny slopes in moist ravines; 1300–1400 m. S Yunnan (Menghai) [E India, Indonesia (Java), N Thailand; Africa].

## 9. CAMPANULA Linnaeus, Sp. Pl. 1: 163. 1753.

风铃草属 feng ling cao shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

*Neocodon* Kolakovsky & Serdyukova.

Herbs, perennial, with long horizontal rhizomes or with short caudexes and thickened  $\pm$  fleshy roots; less often annual. Basal leaves sometimes rosulate; cauline leaves all alternate. Flowers solitary and terminal, or in cymes; cymes paniculate or capitellate, later subtended by an involucre. Calyx adnate to ovary; lobes 5, sometimes with an appendage between lobes. Corolla campanulate, tubular-campanulate, or funnelform, sometimes subrotate, 5-lobed. Filaments dilated; anthers coherent or rarely connate. Disk absent. Ovary inferior, 3–5-locular. Capsules dehiscent by lateral, upper or lower pores, crowned by persistent calyx lobes. Seeds numerous, ellipsoid, smooth.

About 420 species: throughout the Arctic and N temperate regions, most abundant from the Mediterranean to the Caucasus; 22 species (11 endemic) in China.

- 1a. Capsule poricidal above middle; flowers solitary, terminal, or several terminal on main stems and branches; cauline leaves mostly toward base, upper cauline leaves sessile or nearly so, usually linear if present; basal leaves persistent at anthesis (2. *C.* subg. *Rapunculus*).
  - 2a. Plants with horizontal rhizomes; stems simple; stems and leaves glabrous.
    - 3a. Hypanthium narrowly cylindrical; calyx lobes filiform, longer than corolla ..... 21. *C. aristata*
    - 3b. Hypanthium obovoid or obconic; calyx lobes subulate or narrowly triangular, shorter than corolla.
      - 4a. Plants 20–50 cm tall; middle cauline leaves longer than 2 cm; calyx lobes 5–9 mm; corolla 15–20 mm, cleft for ca. 1/2 its length ..... 16. *C. stevenii*
      - 4b. Plants 7–22 cm tall; middle cauline leaves shorter than 2 cm; calyx lobes 1.8–5 mm; corolla 4–11 mm, cleft for ca. 1/3 its length ..... 22. *C. immodesta*
  - 2b. Plants without horizontal rhizomes; stems simple or branched; stems and leaves variously pubescent.
    - 5a. Flowers pendent.
      - 6a. Plants 20–50 cm tall; calyx lobes 1–5.5 mm; corolla lobes as long as tube ..... 17. *C. delavayi*
      - 6b. Plants 6–33 cm tall; calyx lobes 3–12 mm; corolla lobes ca. 1/2 as long as tube ..... 18. *C. crenulata*
    - 5b. Flowers erect.
      - 7a. Basal leaves cordate-reniform; stems slender but not filiform, hairy, lower half with cordate to ovate-lanceolate leaves; capsule 4–8 mm ..... 19. *C. calcicola*
      - 7b. Basal leaves cordate; stems filiform, glabrous or subglabrous, with mostly linear leaves; capsule 9–19 mm ..... 20. *C. chrysosplenifolia*
- 1b. Capsule poricidal toward base; stems with numerous flowers, solitary or in various types of inflorescences; leaves many and evenly distributed on stems; basal leaves usually wilted at anthesis (1. *C.* subg. *Campanula*).
  - 8a. Appendages between calyx lobes present, reflexed, setose on margins.
    - 9a. Annuals, ca. 6 cm tall; corolla 6–8 mm, green ..... 3. *C. gansuensis*
    - 9b. Perennials, over 25 cm tall; corolla 9–65 mm, white, purple, or yellow.
      - 10a. Corolla large, 3–6.5 cm, punctate ..... 1. *C. punctata*
      - 10b. Corolla smaller, narrowly campanulate, less than 1.5 cm, not punctate ..... 2. *C. sibirica*
  - 8b. Appendages between calyx lobes absent.
    - 11a. Flowers in a head of 2 to several in axils of involucre bracts, several heads aggregated into a large compound head; leaf blades more than 4 cm, often up to 17 cm.
      - 12a. Corolla lobes linear-lanceolate, longer than tube; plants ca. 10 cm tall ..... 6. *C. austroxinjiangensis*
      - 12b. Corolla lobes ovate, shorter than tube; plants 14–130 cm tall.
        - 13a. Lower cauline leaves long petiolate; calyx lobes subulate ..... 4. *C. glomerata*
        - 13b. Lower cauline leaves shortly winged-petiolate; calyx lobes ligulate, rounded at apex ... 5. *C. glomeratoides*
    - 11b. Flowers solitary or in a lax inflorescence; leaves usually much smaller, up to 6 cm.
      - 14a. Leaves glabrous on both surfaces or hairy only on margins; corolla glabrous outside; calyx lobes linear or subulate, glabrous on both surfaces or sparsely ciliate.
        - 15a. Leaves and calyx lobes hispidulous on margins; blades of cauline leaves obovate-elliptic or elliptic ..... 7. *C. nakaoi*
        - 15b. Leaves and calyx lobes glabrous throughout; blades of cauline leaves linear ..... 8. *C. langsdorffiana*
      - 14b. Leaves hairy on both surfaces; corolla  $\pm$  hairy outside; calyx lobes hairy, narrowly triangular to subtriangular, rarely subulate-triangular (subulate only in *C. mekongensis*).
        - 16a. Annual herbs; rosulate basal leaves sometimes present at anthesis; each branch with compound cymes ..... 14. *C. dimorphantha*

- 16b. Perennial herbs; basal leaves often absent at anthesis; branches with a single cyme or solitary flower.
- 17a. Cauline leaves, at least lower ones, long petiolate; petiole 5–12 cm ..... 9. *C. omeiensis*
- 17b. Cauline leaves sessile or shortly winged-petiolate.
- 18a. Calyx tube hairy only along veins; lateral branches with several flowers; calyx lobes subulate, sinus between lobes truncate-obtuse ..... 15. *C. mekongensis*
- 18b. Calyx tube densely hairy; lateral branches with a solitary flower or single simple inflorescence; calyx lobes subulate-triangular to deltoid, overlapping, or sinus acute.
- 19a. Calyx lobes deltoid, with a pair of large teeth; stems long and prostrate; cauline leaves of lower half of stem wilted at anthesis, rest of leaves pannose abaxially, sessile, suborbicular ..... 13. *C. yunnanensis*
- 19b. Calyx lobes subulate-triangular, rarely subdeltoid, with or without teeth; stems erect or diffuse; lower cauline leaves often present at anthesis; leaves sparsely hispid or densely pannose abaxially, elliptic, rhombic, or linear-elliptic.
- 20a. Style strongly exerted; anthers completely or partially connivent; corolla cleft more than halfway ..... 12. *C. chinensis*
- 20b. Style included; anthers completely free; corolla cleft down to middle.
- 21a. Calyx lobes narrowly triangular to subdeltoid, toothed or not; leaves often hispid, less frequently pannose abaxially; stems single or several from one caudex, erect or ascending ..... 10. *C. pallida*
- 21b. Calyx lobes subulate-triangular to narrowly triangular, rarely toothed; leaves densely pannose abaxially; stems usually numerous from one caudex, often diffuse, less often ascending ..... 11. *C. cana*

### 1. *Campanula* subg. *Campanula*

风铃草亚属 feng ling cao ya shu

Basal leaves absent or wilted at anthesis; cauline leaves evenly distributed on stems, upper ones sessile or not, often relatively broad. Flowers numerous, in cymes aggregated into raceme-, spike-, or headlike inflorescences. Capsule poricidal toward base.

About 275 species: throughout the Arctic and N temperate regions of the Old World, extending south into Macronesia, tropical E Africa, the Arabian Peninsula, India, Indochina, and east into the Aleutian Islands; 15 species (seven endemic) in China.

#### 1. *Campanula punctata* Lamarck, Encycl. 1: 586. 1785.

刺毛风铃草 ci mao feng ling cao

紫斑风铃草 zi ban feng ling cao

*Campanula nobilis* Lindley.

Plants perennial, setose throughout or rarely subglabrous. Rhizomes long, horizontal. Stems erect, robust, 20–100 cm tall, usually branched above. Basal leaves long petiolate; blade cordate or ovate; cauline leaves ovate, lanceolate, or triangular, base rounded or truncate, margin irregularly dentate, apex acute or acuminate; lower leaves winged-petiolate, upper ones sessile. Flowers terminal on top of main stems and branches, pendent. Calyx lobes narrowly triangular; reflexed appendages elliptic, triangular, ovate, or lanceolate. Corolla white, yellow, or pink, commonly purple- or red punctate, tubular-campanulate, 3–6.5 cm. Capsule broadly campanulate or obconic. Seeds gray-brown, oblong or elliptic, slightly compressed, ca. 1 mm, smooth. Fl. Jun–Sep, fr. Sep–Oct.  $2n = 34$ .

Forests, thickets, meadows; below 2300 m. E Gansu, Hebei, Heilongjiang, W Henan, W Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, NE Sichuan [Japan, Korea, Russia (Far East, Siberia); widely cultivated].

Plants perennial. Roots thickened, carrot-shaped, sometimes lignified. Stems erect, purplish, cylindrical, 20–70 cm tall, multi-branched; branches upright, slender, white hirsute. Basal and lower cauline leaves 5–8 × 1–3 cm, white hirsute, with long winged petiole; blade oblong or elliptic, sparsely crenate; upper cauline leaves sessile, ± amplexicaul, linear-lanceolate, entire. Flowers pendent in narrow terminal panicles on main stems and branches; pedicels 2–8 mm, longer than linear bracts. Hypanthium glabrous, obconic; calyx lobes linear-subulate, 3–4 mm, nearly 1 mm wide at base, margin setose; reflexed appendages ovate-oblong or ovate-lanceolate, slightly shorter than hypanthium, margin setose. Corolla pale blue-purple, sometimes nearly white, narrowly campanulate, 9–12 mm, inside sparsely pubescent; lobes ovate-deltoid, 1/3–1/2 as long as tube. Style equal to or slightly shorter than corolla; stigma 3-fid. Capsule obconic, ca. 4 × 3 mm. Seeds elliptic, ca. 1 mm. Fl. May–Jul.  $2n = 34$ .

Dry forests or meadows. Xinjiang (Altay Shan, Tian Shan) [Kazakhstan, Russia (European part, W Siberia); SW Asia (Turkey), Europe].

#### 2. *Campanula sibirica* Linnaeus, Sp. Pl. 1: 236. 1753.

*Campanula sibirica* is divided into ten subspecies; the Chinese

plants are *C. sibirica* subsp. *sibirica*, which is also found in Kazakhstan, Russia, and Europe.

**3. *Campanula gansuensis* L. Z. Wang & D. Y. Hong, Bot. Bull. Acad. Sin. 41: 159. 2000.**

甘肃风铃草 gan su feng ling cao

Plants annual. Roots slender. Stems slender, 5–6 cm tall, simple,  $\pm$  hairy. Leaves 2 or 3, alternate; blade triangular-ovate or rhombic-ovate, ca.  $10 \times 5$ –6 mm, base attenuate, margin sparsely and irregularly serrate, apex obtuse; petiole winged, ca. 0.5 cm. Flowers solitary, terminal on branches, pendent. Calyx lobes narrowly triangular or linear-triangular; reflexed appendages ovate. Corolla green, tubular-campanulate, 6–8 mm; lobes ca.  $1/2$  as long as tube. Filaments free, dilated at base, hairy; anthers ca. 3 mm. Ovary hemispherical; style up to 4 mm. Fl. Jul.

• Thickets by streams; ca. 1100 m. Gansu (Huixian).

**4. *Campanula glomerata* Linnaeus, Sp. Pl. 1: 235. 1753.**

北疆风铃草 bei jiang feng ling cao

Plants perennial. Stems erect, 0.2–1.3 m tall. Basal leaves long petiolate; blade ovate-lanceolate or ovate,  $6$ – $15 \times 2$ –7 cm, base cordate, margin serrulate, apex acute; cauline leaf blade elliptic, narrowly ovate, or ovate-lanceolate,  $4$ – $10 \times 0.7$ –4 cm, base truncate, rounded, or cuneate, margin serrulate, apex acute or acuminate; lower ones long petiolate, upper ones sessile. Flowers sessile, aggregated into a terminal compound involucrate capitulum, sometimes with additional simple capitula sessile in upper and median leaf axils; involucre bracts ovate-deltoid, that of first-blooming central flower smallest. Hypanthium glabrous or puberulent; calyx lobes subulate or linear-triangular,  $7$ – $13 \times 2$ –3 mm. Corolla purple, blue-purple, or blue (rarely white), tubular-campanulate, 1.5–2.5 cm; lobes equaling tube. Capsule subglobose or obovoid-conical, ca. 4.5 mm. Seeds oblong, compressed, 1–1.5 mm. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 30, 34, 90$ .

Meadows, subalpine meadows, thickets, grassy slopes; below 2600 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang [Japan (Kyushu), Kazakhstan, Korea, Mongolia, Russia (European part, Far East, Siberia); SW Asia (Turkey), Europe; widely cultivated; naturalized in North America].

Fifteen subspecies are recognized, three of which occur in China.

- 1a. Simple capitula present in leaf axils in addition to terminal compound capitulum; leaf blade 1.7–7 cm wide ..... 4b. subsp. *speciosa*
- 1b. Simple capitula rarely present in leaf axils, most flowers in terminal compound capitulum; leaf blade 1–3.5 cm wide.
  - 2a. Plants 20–85 cm tall; leaves 4–13 cm; stems and leaves subglabrous to sparsely white hirsute ..... 4a. subsp. *glomerata*
  - 2b. Plants 14–50 cm tall; leaves 5–8(–11) cm; stems and leaves glabrous or hirsute along main veins ..... 4c. subsp. *daqingshanica*

**4a. *Campanula glomerata* subsp. *glomerata***

北疆风铃草(原亚种) bei jiang feng ling cao (yuan ya zhong)

Plants 20–85 cm tall. Stems simple, stems and leaves subglabrous to sparsely white hirsute. Leaves  $4$ – $13 \times 1.5$ –3.5 cm.

Meadows, subalpine meadows; 1300–2600 m. Xinjiang (Tian Shan and northward) [Kazakhstan, Russia (European part, Siberia); Europe; widely cultivated; naturalized in North America].

**4b. *Campanula glomerata* subsp. *speciosa* (Sprengel) Domin, Preslia 13: 222. 1936.**

聚花风铃草 ju hua feng ling cao

*Campanula glomerata* var. *speciosa* Sprengel, Syst. Veg. 1: 731. 1824, based on *C. speciosa* Hornemann, Hort. Bot. Hafn. 2: 957. 1815, not Gilibert (1782), nor Pourret (1788); *C. cephalotes* Fischer ex Schrank; *C. glomerata* subsp. *cephalotes* (Fischer ex Schrank) D. Y. Hong; *C. glomerata* var. *dahurica* Fischer ex Ker Gawler; *C. glomerata* var. *grandiflora* Herder (1872), nom. illeg. superfl., not Kuntze (1867); *C. glomerata* var. *salviifolia* Komarov; *C. glomerata* f. *speciosa* (Sprengel) Voss.

Plants 40–130 cm tall. Stems sometimes branched above; stems and leaves subglabrous or sparsely white hirsute, or densely white villous. Capitula numerous, many simple capitula present besides terminal compound capitula.

Meadows, thickets. Heilongjiang, Jilin, E Liaoning, NE Nei Mongol (Dong Ujimqin) [Japan (Kyushu), Korea, Mongolia, Russia (Far East, SE Siberia); widely cultivated].

**4c. *Campanula glomerata* subsp. *daqingshanica* D. Y. Hong & Y. Z. Zhao, Fl. Reipubl. Popularis Sin. 73(2): 184. 1983.**

大青山风铃草 da qing shan feng ling cao

Plants 14–50 cm tall. Stems subglabrous or sparsely hirsute only along ribs, rarely entirely sparsely hirsute. Leaves  $5$ – $8$ – $(11) \times 1$ –2.8 cm, hirsute only along main veins. Capitula several, often aggregated into terminal compound capitula, simple capitula rarely present.

• Grassy slopes; 1400–2000 m. SE Nei Mongol (Daqing Shan, Manhan Shan).

**5. *Campanula glomeratoides* D. Y. Hong, Acta Phytotax. Sin. 18: 247. 1980.**

头花风铃草 tou hua feng ling cao

Plants ?annual, white hispid throughout. Rhizomes unknown. Stems erect, robust, ca. 60 cm tall. Basal leaves shortly petiolate, caducous, blade lanceolate; lower cauline leaves winged-petiolate, blade oblanceolate or linear-oblong; middle and upper cauline leaves sessile, blade lanceolate or ovate-lanceolate, up to  $9 \times 1$  cm, margin dentate. Flowers sessile, 2 to several in sessile capitula aggregated into a terminal involucrate compound capitulum; involucre bracts ovate-lanceolate to orbicular, forming a series continuous with upper cauline leaves, 1 or 2 in capitula with several flowers, but absent in capitula with only 2 flowers. Hypanthium obovoid or obconic; lobes ligulate, ca. 4 mm, apex obtuse. Corolla blue,

tubular-campanulate, ca. 1.5 cm. Filaments ca. 3 mm; anthers ca. 4 mm. Style slightly longer than corolla. Fruit unknown. Fl. Jul.

- Meadows; ca. 2700 m. Xizang (Bomi).

**6. *Campanula austroxinjiangensis*** Y. K. Yang, J. K. Wu & J. Z. Li, *Acta Phytotax. Sin.* 30: 92. 1992.

南疆风铃草 *nan jiang feng ling cao*

Plants perennial, ca. 10 cm tall. Roots carrot-shaped. Stems single, simple, sparsely puberulent. Basal leaves rosulate, blade elliptic, petiole 1–1.2 cm, winged; cauline leaves shortly petiolate, blade ovate or elliptic, 1–2.2 × 1.1–1.5 cm, both surfaces ± puberulent, base slightly ovate or subrounded, margin obtusely serrate, apex obtuse or acute. Flowers sessile in terminal and axillary capitula of 3–5 (rarely 1 or 2), terminal ones sessile, axillary ones ± pedunculate, both bractless. Calyx lobes linear-lanceolate, 7–9 × 1–1.2 mm, with hooked hairs along midvein and margin. Corolla blue, tubular-campanulate, ca. 2.7 × 7 mm; lobes linear-lanceolate, 12–14 × 4–5 mm, equaling tube, acuminate at apex. Stamens 5 or rarely 4; filaments dilated at base, 1–1.5 × 1–1.5 mm; anthers 10–13 × 1–1.2 mm. Ovary ovoid, 1.5–2 mm in diam.; style ca. 1.5 cm, included. Fl. Jul.

- Grassy slopes; ca. 2300 m. Xinjiang (Hejing).

**7. *Campanula nakaoi*** Kitamura, *Acta Phytotax. Geobot.* 15: 108. 1954.

藏南风铃草 *zang nan feng ling cao*

Plants perennial. Rhizome slender and long. Stems ascending or erect, usually dark purple, less frequently straw-colored, up to 35 cm, angular when dry, subglabrous or sparsely retrorsely hispid, sometimes branched. Middle cauline leaves largest, obovate-elliptic or elliptic, 12–35 × 4–12 mm, apex obtuse; lower cauline leaves gradually attenuate into short petiole; upper cauline leaves sessile; all leaves sparsely serrate, hispidulous near margins or along veins. Flowers solitary, terminal, pendulous. Hypanthium obconic, densely hirsute or granulate-glandular; calyx lobes subulate, 5–7 × ca. 1.5 mm, both sides glabrous, margin serrate and hispidulous-ciliate. Corolla blue or blue-purple, broadly campanulate, 14–20 mm, glabrous; lobes equaling or slightly longer than tube. Style ca. 1 cm; stigma 3-lobed. Fl. Jul.

Margins of *Pinus griffithii* forests; 2800–3400 m. Xizang (Gyirong) [Nepal].

**8. *Campanula langsdorffiana*** (A. Candolle) Fischer ex Trautvetter & C. A. Meyer in Middendorff, *Reise Sibir.* 1 (2, Lfg. 3): 60. 1856.

石生风铃草 *shi sheng feng ling cao*

*Campanula linifolia* Linnaeus var. *langsdorffiana* A. Candolle, *Monogr. Campan.* 279. 1830; *C. chinganensis* A. I. Baranov; *C. rotundifolia* Linnaeus subsp. *langsdorffiana* (A. Candolle) Vodopianova; *C. rotundifolia* var. *langsdorffiana* (A. Candolle) Britton.

Plants perennial, 10–40 cm tall. Roots carrot-shaped or cylindrical, up to 2 cm in diam. Stems several to many from a

caudex, slender, branched or simple, glabrous or sometimes hirsutulous at base. Basal leaves (if present) ovate or elliptic, base cordate, petiolate; cauline leaves sessile, filiform or linear, 45–70 × 1–3 mm. Flowers solitary or several, terminal, ± pendent. Hypanthium glabrous (rarely hirsutulous), obconic, ribbed; calyx lobes linear or subulate, 4–10 mm, sometimes almost equal to corolla in length, reflexed after anthesis. Corolla pale blue, campanulate, 10–20 mm, glabrous; lobes ca. 1/2 as long to ± as long as tube. Style included. Capsule obconic or campanulate, 5–8 mm. Seeds brown, oblong or elliptic, slightly compressed, ca. 1 mm, smooth. Fl. Jun–Aug.  $2n = 34$ .

Usually on rocks in forests, also in alpine belts. Heilongjiang, Jilin, Liaoning [Russia (Far East, S Siberia)].

This species is vicarious with *Campanula rotundifolia* Linnaeus of Europe, from which it differs in having fewer flowers and longer reflexed calyx lobes.

**9. *Campanula omeiensis*** (Z. Y. Zhu) D. Y. Hong & Z. Yu Li in Z. Yu Li, *Pl. Mt. Emei*, 484. 2007.

峨眉风铃草 *e mei feng ling cao*

*Adenophora omeiensis* Z. Y. Zhu, *Bull. Sichuan School Medic. Mater.* 22(2): 29. 1990.

Plants perennial, 50–65 cm tall. Roots carrot-shaped, 5–15 mm in diam. Stems simple, sparsely hirsute. Basal and lower cauline leaves with petiole 5–12 cm; upper cauline leaves shortly petiolate to sessile, blade adaxially green, ovate-triangular or ovate-lanceolate, 2.5–3.5 × 1.2–1.8 cm, abaxially sparsely strigose or hispidulous, base subtruncate or cuneate, margin irregularly serrate, apex acuminate or acute. Panicles terminal, narrow, inflorescence branches reduced and sometimes with solitary flowers; bracts linear, strigose; pedicels slender, 5–15 mm, sparsely strigose. Hypanthium obovoid or obconic, sparsely strigose; calyx lobes lanceolate or linear-lanceolate, 5–8 × 1–1.8 mm, outside strigose, apex acuminate or acute. Corolla blue-purple or pale blue, campanulate, 1.5–2.3 cm, outside glabrous, inside white villous; lobes ovate-triangular, 6–8 × ca. 5 mm. Filaments white, base dilated; anthers linear. Style included; stigma 2- or 3-fid. Capsule subglobose, 3–5 mm. Seeds oblong or ovate-oblong, slightly compressed, ca. 1 mm. Fl. Jun–Jul, fr. Jul–Sep.

- About 600 m. Sichuan (Emei Shan).

**10. *Campanula pallida*** Wallich, *Asiat. Res.* 13: 375. 1820.

西南风铃草 *xi nan feng ling cao*

*Campanula colorata* Wallich; *C. colorata* var. *tibetica* J. D. Hooker & Thomson; *C. microcarpa* C. Y. Wu; *C. pallida* var. *tibetica* (J. D. Hooker & Thomson) H. Hara.

Plants perennial. Roots carrot-shaped, sometimes slightly thicker than stems. Stems single, sometimes 2 or rarely several from a single caudex, ascending or erect, up to 60 cm tall, hirsute. Lower leaves winged-petiolate, upper leaves sessile; blade elliptic, rhombic-elliptic, or oblong, 1–4 × 0.3–1.5 cm, abaxially densely hirsute or hispid only along veins, adaxially appressed hispid, margin denticulate or almost entire, apex acuminate, acute, or obtuse. Flowers pendent, terminal, sometimes

in cymes. Hypanthium obconic or campanulate, hispid; calyx lobes deltoid, narrowly triangular, or subulate, 2–8 mm, abaxially hispid (sometimes only along veins), margin entire or rarely serrulate. Corolla purple, blue-purple, or blue, tubular-campanulate, 4–15 mm; lobes ca. 1/2 as long to  $\pm$  as long as tube. Style less than 2/3 as long as corolla, included. Capsule obconic, obovoid, or globose. Seeds golden brown, oblong or elliptic, compressed. Fl. May–Sep.  $2n = 24, 28$ .

Grassy slopes, open woods; 1000–1400 m. W Guizhou, W Sichuan, S Xizang, Yunnan [Afghanistan, Bhutan, India, Laos, Myanmar, Nepal, Pakistan, Thailand].

Both chasmogamous and cleistogamous flowers are found in this species. In the latter, development of the corolla is arrested at an early stage; as a result, the calyx lobes are deltoid (vs. narrowly triangular or subulate) and much shorter than in the former. The capsules produced by cleistogamous flowers are globose (vs. obconic or obovoid) and much smaller than those from chasmogamous flowers. Individual plants may bear both types of flowers or, less commonly, only cleistogamous flowers; the type of *C. microcarpa* is a specimen of the latter.

**11. *Campanula cana*** Wallich in Roxburgh, Fl. Ind. 2: 101. 1824.

灰毛风铃草 hui mao feng ling cao

*Campanula aprica* Nannfeldt; *C. pasumensis* C. Marquand; *C. tortuosa* C. Y. Wu; *C. xylopoda* Jeffrey.

Plants perennial, densely white villous on all parts except corolla. Taproot thickened,  $\pm$  carrot-shaped, up to 8 mm in diam. Caudexes branched. Stems caespitose, usually diffuse, 15–30 cm. Leaves alternate, sessile or lower ones with petiole up to 5 mm; blade ovate, elliptic, oblanceolate, or linear-lanceolate, 4–25  $\times$  2–10 mm, base cuneate, margin subentire, crenulate, or serrate, apex obtuse or acute. Flowers several, in a terminal cyme; pedicels 0.5–3 cm, ebracteolate. Hypanthium obdeltoid to broadly obconical, 2–3  $\times$  2–3 mm at anthesis; calyx lobes subulate or narrowly triangular, 3–5  $\times$  1–2 mm, margin entire. Corolla blue, blue-purple, or violet, tubular-campanulate, 10–15 mm, outside villous; lobes 1/2–2/3 as long as tube. Stamens included. Style slightly exserted; stigma 3-fid. Capsule globose or obovoid-globose, 3–5  $\times$  3–4 mm, 10-ribbed, 3-poricidal at base. Seeds brownish yellow, shiny, elliptic, 0.5–0.6 mm, smooth. Fl. and fr. May–Nov.

Open rocky slopes, grassy slopes, thickets; 1000–3200 m. NW Guizhou (Xifeng), SW Sichuan, S Xizang, N Yunnan [Bhutan, N India, N Myanmar, Nepal].

**12. *Campanula chinensis*** D. Y. Hong, Acta Phytotax. Sin. 18: 247. 1980.

长柱风铃草 chang zhu feng ling cao

Plants perennial. Roots carrotlike. Stems caespitose, ascending, up to 35 cm, branched, hispid. Leaves winged-petiolate; blade elliptic or lanceolate, 1–3.5  $\times$  0.4–1.2 cm, abaxially densely villous, adaxially appressed hispid, base cuneate, margin entire or denticulate, apex obtuse, acute, or acuminate. Flowers terminal on main stems and branches, solitary or several in a cyme. Hypanthium obconic, densely villous; calyx lobes triangular, margin entire. Corolla blue or blue-purple, campanulate, 8–10 mm; lobes linear-oblong, slightly longer than

tube. Stamens exserted; anthers all connivent into a tube, or 2 and 3 respectively connivent into 2 groups. Style 13–15 mm, much exserted. Capsule globose, obovoid, or obconic. Seeds yellowish brown, oblong, ca. 0.5 mm. Fl. Jul–Sep, fr. Aug–Oct.

• Rocks, coniferous forests with dry and poor soil; 2400–3800 m. S Qinghai (Nangqên), SE Xizang (Markam), NW Yunnan (Dêqên, Gongshan).

**13. *Campanula yunnanensis*** D. Y. Hong, Fl. Reipubl. Popul. Sin. 73(2): 184. 1983.

云南风铃草 yun nan feng ling cao

Plants perennial. Roots  $\pm$  thickened, carrot-shaped, sometimes branched. Stems several from one caudex, almost entirely prostrate, 30–45 cm. Leaves withered during anthesis except uppermost, sessile; blade ovate to ovate-orbicular, 7–11 mm, abaxially densely tomentose, adaxially densely appressed hispid, margin crenate. Flowers terminal, erect or declined somewhat. Hypanthium gyroidal, densely hirsute; calyx lobes triangular, densely tomentose, margin with a pair of teeth. Corolla purple or blue-purple, tubular-campanulate, ca. 8 mm; lobes equaling tube. Style ca. 5 mm. Capsule obovoid-conical, 4–5  $\times$  3–4 mm. Seeds yellow-brown, elliptic, slightly compressed, ca. 0.5 mm, smooth. Fl. Oct–Dec.

• Rocks; 1900–2200 m. Yunnan.

**14. *Campanula dimorphantha*** Schweinfurth, Beitr. Fl. Aethiop. 140. 1867.

一年生风铃草 yi nian sheng feng ling cao

*Campanula benthamii* Wallich ex Kitamura; *C. canescens* Wallich ex A. Candolle (1830), not Roth (1827); *C. veronicifolia* Hance; *C. wallichii* Babu, nom. illeg. superfl.; *Cephalostigma spathulatum* Thwaites.

Plants annual. Stems erect, up to 45 cm tall, simple, or branched from base and thus caespitose, hispid. Basal leaves sometimes rosulate, shortly petiolate; blade spatulate or elliptic, withering early, base cuneate or attenuate, margin serrulate, apex acute. Cauline leaves winged-petiolate, 2–7 cm; blade spatulate, elliptic, or linear, base attenuate, margin serrulate or subentire, apex acute or acuminate. Cymes multiple, aggregated into a terminal panicle; pedicels unequal in length, those of upper flowers in a cyme longer. Hypanthium semiglobose to obconic, base acute; calyx lobes narrowly triangular, 3–5 mm. Corolla purple or blue-purple, campanulate, outside hispid, inside glabrous; lobes equaling tube. Style included. Capsules globose. Seeds yellow-brown, oblong or elliptic, compressed, ca. 0.3 mm, smooth. Fl. and fr. Mar–Apr.

Grassy slopes, roadsides; below 2000 m. Chongqing (Wushan), N Guangdong, Guizhou (Luodian), Shaanxi (Mianxian), Sichuan (Chengdu, Dujiangyan, Emei), Taiwan, Yunnan (Weishan) [Afghanistan, India, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Vietnam, Africa].

Cleistogamy may be the predominant reproductive strategy of this species, at least in China, as most specimens we examined had only cleistogamous flowers. The capsules produced by such flowers are of unequal size, with the apical flowers within a cyme producing larger capsules than the basal ones.

**15. *Campanula mekongensis*** Diels ex C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 58. 1965.

澜沧风铃草 lan cang feng ling cao

Plants perennial. Roots thickened, woody. Stems several from one caudex, ascending or erect, 20–30 cm tall, white villous. Leaves sessile; blade elliptic or spatulate, 1–3 × 0.5–1.2 cm, abaxially hirsute (sometimes only along veins), adaxially sparsely hirsute, base attenuate, margin entire, crenulate, or serrulate, apex obtuse. Flowers terminal, solitary or in cymes;

pedicels slender. Hypanthium obconic or campanulate, base cuneate, setose along veins; calyx lobes subulate, 2–4 mm, setose along veins, hirsute on margin; sinuses obtuse. Corolla blue or white, campanulate, ca. 8 mm; lobes somewhat longer than tube, outside sparsely villous. Style slightly shorter than corolla. Capsule obovoid or obovoid-obconic, 3–4 mm in diam. Seeds yellow, oblong, ca. 0.5 mm. Fl. Jan–Mar.

• Sandy herb communities, thickets by rivers, shaded rocks by streams; lower elevations. Guangxi (Tian'e), S Yunnan (Xishuangbanna).

**2. *Campanula* subg. *Rapunculus*** (Dumortier) Kharadze, Zametki Sist. Geogr. Rast. 32: 54. 1976.

基生叶风铃草亚属 ji sheng ye feng ling cao ya shu

*Campanula* sect. *Rapunculus* Dumortier, Fl. Belg. 58. 1827.

Basal leaves rosulate, persistent at anthesis; cauline leaves mostly toward base, upper ones sessile or nearly so, usually linear if present. Flowers solitary and terminal, or several terminal on main stems and branches. Capsule poricidal above middle.

About 140 species: throughout Arctic and N temperate regions, extending south into N Africa, Iran, India, China, N Mexico, and SE United States (Florida); seven species (four endemic) in China.

**16. *Campanula stevenii*** M. Bieberstein, Fl. Taur.-Caucas. 3: 138. 1819 [“*Steueni*”].

新疆风铃草 xin jiang feng ling cao

*Campanula simplex* Steven, Mém. Soc. Imp. Naturalistes Moscou 3: 255. 1812, not Lamarck ex Candolle (1805); *C. steveniana* Schultes; *Neocodon stevenii* (M. Bieberstein) Kola-kovsky & Serdyukova.

Plants perennial, glabrous throughout. Rhizomes elongated, exposed. Caudexes erect, often enveloped by remains of old leaves. Stems caespitose, erect, 20–50 cm tall. Basal leaves basally attenuate into a long petiole; blade spatulate or elliptic, margin sparsely denticulate; cauline leaves sessile, broadly linear, 2–6 cm. Flowers terminal, solitary or several. Calyx tube obconic, 3–7 mm; lobes subulate, 5–9 mm. Corolla purple, funnel-shaped, cleft to middle, 1.5–2 cm. Capsules narrowly obovoid, 12–16 × 6–10 mm. Seeds brown-yellow, elliptic, nearly 1 mm. Fl. Jun–Jul.

Shaded slopes, glades, dry grasslands; 1100–2500 m. N Xinjiang [Kyrgyzstan, Russia (European part, Far East, Siberia); SW Asia (Turkey), Europe].

Six subspecies are recognized; our plants are *Campanula stevenii* subsp. *albertii* (Trautvetter) Viktorov (Novosti Sist. Vyssh. Rast. 34: 231. 2002, “*albertii*”; *C. albertii* Trautvetter, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 83. 1879, “*albertii*”), endemic to N Xinjiang and Kyrgyzstan.

**17. *Campanula delavayi*** Franchet, J. Bot. (Morot) 9: 364. 1895.

丽江风铃草 li jiang feng ling cao

Plants perennial. Roots thickened, carrot-shaped, up to 1.8 cm in diam. Stems ascending, 20–50 cm tall, several from base, 2- to several branched, densely villous toward base. Basal leaves rosulate, long petiolate; blade ovate to orbicular, 1–4.8 × 0.6–3.8 cm, adaxially villous, base cordate, margin callose-

crenulate. Lower cauline leaves similar to basal. Middle and upper cauline leaves very small, often with a branch at axil; blade subulate. Flowers pendulous, terminal on main stems and branches, solitary or 2 or 3 in a cyme, glabrous. Hypanthium semi-ellipsoid or ovoid, base obtuse; calyx lobes subulate to narrowly triangular, 1–5.5 × ca. 1 mm, margin entire. Corolla blue or purple, broadly campanulate, 10–21 mm; lobes equaling tube. Style included. Capsule narrowly ovoid or ellipsoid, ca. 1 cm. Fl. Jul–Sep.

• Rocky slopes, *Pinus* forests; 3000–4000 m. NW Yunnan (Eryuan, Heqing, Lijiang).

**18. *Campanula crenulata*** Franchet, J. Bot. (Morot) 9: 365. 1895.

流石风铃草 liu shi feng ling cao

*Campanula nephrophylla* C. Y. Wu.

Plants perennial. Roots thickened, often carrotlike, ca. 5 mm in diam. Caudex enveloped by remains of old petioles. Stems 2–7, caespitose, ascending, 6–33 cm tall, simple or rarely branched, glabrous. Basal leaves several, often rosulate, long petiolate; blade orbicular, cordate, or ovate, 7–35 × 6–20 mm, usually glabrous, sometimes adaxially sparsely hispid, margin crenulate. Lower cauline leaves petiolate; blade spatulate, elliptic, or ovate, 1–3 cm, margin crenulate. Upper cauline leaves subsessile; blade linear, margin entire or callose-denticulate. Flowers solitary, terminal, pendent or horizontal, glabrous throughout. Hypanthium obconic or campanulate; calyx lobes subulate or narrowly triangular, 3–12 × 1–2 mm, margin callose-denticulate. Corolla blue, blue-purple, or dark purple-red, campanulate, 12–26 mm; lobes ca. 1/2 as long as tube. Style included. Capsule oblong to narrowly obovoid, 10–18 mm, ca. 5 mm in diam. Seeds yellowish brown, oblong to elliptic, slightly compressed. Fl. Jul–Sep.

• Rocks, grassy slopes; 2600–4200 m. SW Sichuan (Muli), NW Yunnan.

**19. *Campanula calcicola*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 12: 196. 1920.

灰岩风铃草 hui yan feng ling cao

Plants perennial. Roots thickened, carrot-shaped. Stems several, caespitose, ascending, 6–23 cm tall, villous, usually branched. Basal leaves long petiolate; blade ovate or orbicular, 5–24 × 6–27 mm, adaxially villous, base cordate or truncate, margin crenate or callose-denticulate, apex obtuse or rounded. Lower cauline leaves long petiolate; blade ovate or orbicular, 5–7 × 4–6 mm, base cordate or truncate, apex obtuse or rounded. Middle and upper cauline leaves petiolate or sessile; blade lanceolate or narrowly oblong, margin callose-dentate. Flowers terminal, often upright. Hypanthium obovoid or obconic, sparsely villous or sometimes glabrous, base rounded; lobes narrowly oblong to subulate-triangular, 2–6 mm, margin with 1–3 pairs of teeth. Corolla purple or blue-purple, broadly campanulate, 9–20 mm; lobes ca. 1/2 as long as tube. Capsule obovoid, ellipsoid, or subglobose, 4–8 mm. Seeds brown-yellow, oblong-elliptic, ca. 0.5 mm, 1-ribbed, smooth. Fl. and fr. Aug–Oct.

• Moist rocks; 2300–3900 m. SW Sichuan (Daocheng, Muli, Xiangcheng), NW Yunnan.

**20. *Campanula chrysosplenifolia*** Franchet, J. Bot. (Morot) 9: 364. 1895.

丝茎风铃草 si jing feng ling cao

*Campanula leucotricha* C. Y. Wu.

Plants perennial. Roots thickened, carrot-shaped. Stems caespitose, filiform but erect, 7–22 cm tall, often branched, glabrous. Basal leaves rosulate, long petiolate; blade ovate or orbicular, 6–17 × 5–15 mm, adaxially villous, base cordate, margin crenulate. Cauline leaves sessile or very shortly petiolate; blade ovate to linear, 5–15 × 0.2–1.5 mm, base cordate or truncate, margin crenate to serrate, sometimes callose-denticulate, apex acute or obtuse. Flowers mostly solitary (sometimes 2 or 3) and terminal, glabrous throughout. Hypanthium obovoid or narrowly obconic, base acute or obtuse; calyx lobes subulate or narrowly triangular, 4–9 × 0.5–1.5 mm, margin with 1–3 pairs of verrucose teeth or entire. Corolla blue, campanulate, 8–17 mm; lobes ovate, equaling to 1/2 as long as tube, apex acute to obtuse. Style included. Capsule narrowly obovoid, 9–19 mm. Seeds yellowish brown to brown, oblong, slightly compressed, ca. 1 mm, 1-ribbed. Fl. Sep.

• Rocks; 3000–4000 m. SW Sichuan (Muli, Yanyuan), NW Yunnan (Binchuan, Heqing).

**21. *Campanula aristata*** Wallich in Roxburgh, Fl. Ind. 2: 98. 1824.

钻裂风铃草 zuan lie feng ling cao

*Campanula aristata* var. *longisepala* C. Marquand; *C. cylindrica* (Pax & K. Hoffmann) Nannfeldt; *Wahlenbergia cylindrica* Pax & K. Hoffmann.

Plants perennial. Roots thickened, carrot-shaped. Stems usually caespitose, erect, 10–50 cm tall. Basal leaves long petiolate, glabrous; blade ovate or broadly elliptic. Lower and middle cauline leaves long petiolate, glabrous; blade lanceolate, elliptic, or linear. Middle and upper cauline leaves sessile, glabrous; blade linear, 1.5–7 cm, glabrous, margin entire or sparsely denticulate. Hypanthium very narrowly oblong, 0.5–1.5 cm; calyx lobes filiform, (3–)7–18(–25) mm, usually longer than corolla. Corolla blue or blue-purple, 7–15 mm; lobes ca. 1/2 as long as tube. Capsule clavate, attenuate at base, 20–40 mm. Seeds brown-yellow, elliptic, slightly compressed, ca. 0.7 mm, smooth. Fl. Jun–Aug, fr. Aug–Sep.

Alpine meadows or thickets; 3500–5000 m. S Gansu (Xiahe), E and S Qinghai, Shaanxi (Taibai Shan), NW and W Sichuan, Xizang (except NW), NW Yunnan (Dêqên) [Afghanistan, Bhutan, India, Nepal, Pakistan].

**22. *Campanula immodesta*** Lammers, Novon 8: 34. 1998.

藏滇风铃草 zang dian feng ling cao

*Campanula modesta* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 24. 1857, not Schott, Nyman & Kotschy (1854).

Plants perennial. Roots thickened, up to 7 mm in diam. Stems single or 2 to several and caespitose, erect or ascending, 7–22 cm. Basal leaves rosulate, long petiolate; blade orbicular or ovate, 5–15 × 4–8 mm, margin crenate or entire; petiole 5–45 mm. Lower cauline leaves long petiolate; blade linear or lanceolate. Middle and upper cauline leaves 1–3, sessile; blade linear or narrowly lanceolate, 5–20 mm, margin crenate. Flowers solitary, terminal, ± pendulous. Hypanthium obovoid, 2–10 mm, glabrous; calyx lobes subulate to narrowly triangular, 1.8–8 × 0.5–1 mm, usually shorter than corolla, entire. Corolla blue or purple-blue, campanulate, 4–11 mm; lobes deltoid, ca. 1/2 as long as tube. Capsule obovoid, 5.5–20 × 2.5–6 mm. Fl. Jul–Aug, fr. Aug–Sep.

Alpine meadows; 3400–4500 m. SW Sichuan (Muli), S Xizang, NW Yunnan (Dêqên, Weixi, Zhongdian) [Bhutan, N India, Nepal].

## 10. ADENOPHORA Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 165. 1823.

沙参属 sha shen shu

Hong Deyuan (洪德元), Ge Song (葛颂); Thomas G. Lammers, Laura L. Klein

Herbs, perennial. Roots usually thickened, various in shape, carrot-shaped, mostly fleshy. Caudexes often short, sometimes elongated and branched. Stems erect, less frequently ascending. Basal leaves often rosulate, usually long petiolate, cordate; cauline leaves mostly alternate, rarely opposite or verticillate. Flowers in a cyme; cymes sometimes reduced to a branch with 1 terminal flower and 1 to several bracts, sometimes glomerate into a panicle. Calyx epigynous, rarely semi-epigynous, tube various in shape; lobes 5, entire or dentate. Corolla always epigynous, campanulate, funnelform, or tubular, 5-lobed or 5-fid to middle. Stamens 5; filaments much dilated into a lamella at base; lamellae densely ciliate-villous, valvate, enveloping disk; anthers elongate. Disk usually

tubular, rarely annular. Ovary inferior, 3-locular; ovules numerous; style with pollen-receiving hairs; stigma 3-lobed, lobes narrow, recurved. Capsule 3-porcidal below persistent calyx lobes. Seeds numerous, ellipsoid, 1-angular.

Sixty-two species: E Asia, south to India and Vietnam, with one species extending into Europe and another endemic to Crimea; 38 species (23 endemic) in China.

- 1a. Cauline leaves all or mostly verticillate.
  - 2a. Corolla small, less than 11 mm; calyx lobes filiform ..... 38. *A. tetraphylla*
  - 2b. Corolla larger than 13 mm; calyx lobes lanceolate or subulate.
    - 3a. Calyx lobes toothed; corolla tubular-campanulate, 18–25 mm; style slightly shorter than corolla ..... 33. *A. wulingshanica*
    - 3b. Calyx lobes entire; corolla campanulate, 13–20 mm; style exserted or included.
      - 4a. Cauline leaves partially verticillate; inflorescence branches not verticillate; calyx lobes lanceolate, 3–6 mm ..... 31. *A. pereskiiifolia*
      - 4b. Cauline leaves all verticillate; inflorescence branches often verticillate; calyx lobes elliptic-lanceolate, 5–10 mm ..... 32. *A. divaricata*
- 1b. Cauline leaves all alternate.
  - 5a. Cauline leaves (at least lower ones) petiolate, very rarely subsessile.
    - 6a. Calyx lobes toothed.
      - 7a. Cauline leaves pinnatifid up to over half; capsule columnar, base rounded, only ca. 3 mm wide ..... 34. *A. lobophylla*
      - 7b. Cauline leaves toothed; capsule ellipsoid, base obtuse, more than 3 mm wide.
        - 8a. Cauline leaves with petioles 2–4 cm, cordate at base; disk ca. 0.7 mm high; style equal to corolla in length ..... 7. *A. cordifolia*
        - 8b. Cauline leaves with petioles less than 2.5 cm, cuneate or shallowly cordate at base; disk 1.5–2.5 mm; style  $\pm$  exserted.
          - 9a. Inflorescence a pseudoraceme or narrow panicle, without secondary branches; calyx lobes with verrucose teeth, or even entire; leaves glabrous adaxially ..... 8. *A. liliifolia*
          - 9b. Inflorescence a large panicle, with secondary branches; calyx lobes often with 1–4 pairs of long teeth, rarely verrucose teeth; leaves sparsely scaberulose adaxially ..... 20. *A. potaninii*
    - 6b. Calyx lobes entire, usually ovate to lanceolate, rarely linear-lanceolate, (1–)1.5–4 mm wide.
      - 10a. Cauline leaves all obviously petiolate, base cordate or rounded, not decurrent or shortly decurrent; calyx lobes obtuse at apex.
        - 11a. Cauline leaves all cordate, papery; calyx tube (hypanthium) obconic at least at anthesis ..... 1. *A. trachelioides*
        - 11b. Cauline leaves rounded or broadly cuneate, only some lower ones shallowly cordate, membranous; calyx tube obovoid or obovoid-conical ..... 2. *A. remotiflora*
      - 10b. Cauline leaves only lower ones petiolate, upper ones sessile or shortly cuneate-petiolate; calyx lobes acute or acuminate at apex.
        - 12a. Cauline leaves only 2, lower one cordate, upper one much smaller ..... 5. *A. brevidiscifera*
        - 12b. Cauline leaves many, not cordate.
          - 13a. Calyx tube globose, calyx lobes subulate-lanceolate, 8–14 mm; pedicels 1.5–3 cm ..... 6. *A. longipedicellata*
          - 13b. Calyx tube obovoid or obconical, calyx lobes usually shorter; pedicels shorter.
            - 14a. Corolla 1.5–2.7 cm, lobes 5–11 mm; calyx lobes ovate to linear-lanceolate, 1.5–4 mm wide ..... 3. *A. petiolata*
            - 14b. Corolla less than 1.8 cm, lobes less than 5 mm; calyx lobes linear-lanceolate or subulate, 1–2 mm wide.
              - 15a. Leaves usually sparsely hispidulous, 7–13  $\times$  1.5–3 cm; calyx mostly hairy, occasionally glabrous, lobes 1–2 mm wide; corolla ca. 17 mm ..... 4. *A. rupicola*
              - 15b. Leaves glabrous or hairy along veins, 3–8 cm; calyx glabrous, occasionally scaberulose; corolla 13–15 mm.
                - 16a. Leaves often hairy on margins and along veins; calyx tube obovoid or obconic; inflorescence a narrow panicle or pseudoraceme ..... 8. *A. liliifolia*
                - 16b. Leaves glabrous throughout; calyx tube usually globose, rarely obovoid-globose; inflorescence a panicle ..... 11. *A. sinensis*
    - 5b. Cauline leaves sessile, only some individuals of some species (e.g., *A. stricta*) with lower cauline leaves very shortly winged-petiolate.
      - 17a. Corolla small, less than 17 mm, constricted at throat and thus corolla urceolate; style strongly exserted, more than 1.5  $\times$  as long as corolla; disk narrowly tubular, 2–7 mm, less than 1 mm wide.
        - 18a. Calyx lobes filiform, 3–20 mm, sometimes with 1 or 2 pairs of verrucose teeth at lower part ..... 37. *A. capillaris*
        - 18b. Calyx lobes subulate, entire.
          - 19a. Stems and leaves densely scaberulose; corolla 10–17 mm ..... 35. *A. stenanthina*
          - 19b. Stems and leaves glabrous or villous; corolla 8–12 mm ..... 36. *A. liliifolioides*
      - 17b. Corolla usually larger, campanulate; style slightly exserted or included, less than 1.5  $\times$  as long as corolla; disk not much longer than broad.

- 20a. Calyx lobes entire.
- 21a. Calyx scaberrulose; calyx lobes subulate, broadest at base, 6–8 mm; style nearly as long as corolla ..... 10. *A. stricta*
- 21b. Calyx mostly glabrous, if hairy then corolla  $\pm$  constricted at throat; calyx lobes triangular-lanceolate to linear-lanceolate, 2–6 mm, if more than 6 mm then calyx tube never globose and glabrous; style obviously exserted or not.
- 22a. Calyx lobes very short, shorter than 2.5 mm.
- 23a. Cauline leaf blade linear, ca. 5 cm  $\times$  0.8 mm; corolla 18–19 mm ..... 14. *A. pinifolia*
- 23b. Cauline leaf blade linear to oblong, 1.5–4  $\times$  0.3–1 cm; corolla 12–14 mm ..... 15. *A. micrantha*
- 22b. Calyx lobes longer than 3 mm, broadest at middle.
- 24a. Calyx variously hairy; corolla shallowly lobed,  $\pm$  constricted at throat, lobes less than 1/4 as long as total length, often reflexed.
- 25a. Corolla throat slightly constricted, 9–15 mm wide; corolla lobes 4–6 mm ..... 12. *A. polyantha*
- 25b. Corolla throat strongly constricted, 4–7 mm wide; corolla lobes up to 3 mm ..... 13. *A. contracta*
- 24b. Calyx glabrous; corolla more deeply lobed, not constricted at throat, lobes more than 1/4 as long as total length.
- 26a. Calyx lobes elliptic, ca. 2 mm wide, middle part broadest, nearly 2  $\times$  as broad as base ..... 16. *A. palustris*
- 26b. Calyx lobes linear-lanceolate or subulate, base broadest or middle part broadest but not 2  $\times$  as broad as base.
- 27a. Calyx lobes subulate, base broadest.
- 28a. Disk broadly tubular, 3–8 mm, up to 3 mm wide; calyx lobes 5–10 mm; inflorescence a pseudoraceme ..... 17. *A. himalayana*
- 28b. Disk less than 1.5 mm; calyx lobes 3–5 mm; inflorescence a panicle, rarely a pseudoraceme.
- 29a. Cauline leaves ovate to lanceolate, 5–25 mm wide; corolla 12–21 mm ..... 18. *A. amurica*
- 29b. Cauline leaves mostly linear to linear-elliptic, less than 5 mm wide; corolla 10–13 mm ..... 23. *A. stenophylla*
- 27b. Calyx lobes linear-lanceolate, middle part broadest, or at least broadest part not at base.
- 30a. Corolla 16–28 mm, lobes 6–8 mm; leaves entire or sparsely serrate, 2–13 mm wide; style usually shorter than or nearly as long as corolla ..... 19. *A. gmelinii*
- 30b. Corolla 13–22 mm, lobes 4–6 mm; leaves always crenulate, 5–40 mm wide; calyx lobes 3–6 mm; style exserted or not.
- 31a. Style included or as long as corolla; leaves 2.5–7 cm; corolla lobes 4–6 mm ..... 9. *A. lamarckii*
- 31b. Style exserted; leaves 6–13 cm; corolla lobes ca. 4 mm ..... 31. *A. pereskiiifolia*
- 20b. Calyx lobes toothed.
- 32a. Calyx lobes ovate-triangular, overlapping at lower part, recurved toward lateral side; capsule subglobose; style included ..... 21. *A. tricuspidata*
- 32b. Calyx lobes narrower, never overlapping, not recurved; capsule subglobose or not; style exserted or included.
- 33a. Cauline leaves aggregated at middle part of stems, glabrous, lanceolate or linear-elliptic ..... 22. *A. wilsonii*
- 33b. Cauline leaves evenly distributed or aggregated at lower part of stems, glabrous or hairy.
- 34a. Cauline leaves linear or linear-elliptic, less than 5 mm wide; calyx lobes subulate, 3–4 mm; corolla 10–13 mm ..... 23. *A. stenophylla*
- 34b. Cauline leaves wider; calyx lobes mostly larger; corolla mostly longer.
- 35a. Flowers solitary and terminal, or several in a pseudoraceme, very occasionally in a narrow panicle; corolla 2–3.4 cm, narrowly campanulate ..... 24. *A. elata*
- 35b. Flowers several to numerous, in a pseudoraceme or panicle; corolla rarely (except in *A. morrisonensis*) more than 2.4 cm, campanulate or broadly campanulate.
- 36a. Leaves mostly glabrous; stems mostly glabrous, or puberulent.
- 37a. Calyx lobes narrowly subulate, ca. 0.5 mm wide; style exserted 4–7 mm above corolla ..... 28. *A. hubeiensis*
- 37b. Calyx lobes 1–2 mm wide; style included, or slightly exserted, less than 4 mm above corolla.
- 38a. Corolla 28–35 mm; disk less than 1 mm ..... 29. *A. morrisonensis*
- 38b. Corolla much shorter; disk longer.
- 39a. Capsule ellipsoid or oblong, more than 3 mm in diam.; calyx lobes 5–7 mm ..... 8. *A. liliifolia*
- 39b. Capsule narrowly ellipsoid, ca. 3 mm in diam.; calyx lobes 2–4(–6) mm ..... 30. *A. ningxianica*
- 36b. Leaves  $\pm$  hairy; stems usually hairy.
- 40a. Leaves mostly aggregated at lower half of stems, upper ones absent or much smaller; calyx lobes 5–20 mm, obviously toothed.
- 41a. Calyx lobes 5–8(–10) mm, often gray; corolla lobed to middle or near middle; disk 0.5–1 mm ..... 26. *A. jasionifolia*
- 41b. Calyx lobes 8–20 mm, green; corolla lobed to 1/3; disk 1.2–3.5 mm ..... 27. *A. coelestis*

- 40b. Leaves evenly distributed; calyx lobes 3–7 mm.  
 42a. Cauline leaves with 2 to several large teeth on each side, puberulent on both surfaces; disk 1.5–3 mm ..... 20. *A. potaninii*  
 42b. Cauline leaves with numerous teeth, adaxially sparsely scaberulose, hispidulous, or glabrous, abaxially hirsute or hispidulous; disk less than 1.4 mm.  
 43a. Cauline leaves narrowly elliptic or lanceolate, 0.5–2.5 cm; style mostly as long as corolla ..... 18. *A. amurica*  
 43b. Cauline leaves ovate, 1.5–6.5 cm; style  $\pm$  exserted ..... 25. *A. khasiana*

**1. *Adenophora tracheloides*** Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 186. 1859.

茅茛 ji ni

Stems single, 40–120 cm tall, up to 1 cm in diam., often  $\pm$  zigzag-twisted, sometimes branched. Cauline leaves alternate; blade ovate or elliptic, 3–13  $\times$  2–8.5 cm, base cordate, truncate, obtuse, or cuneate, margin serrate or doubly serrate, apex obtuse to shortly acuminate; petiole 1–6 cm, sometimes winged. Inflorescence branches mostly long and horizontally spreading, forming a large panicle, less frequently short, forming a narrow panicle. Hypanthium broadly obconic; calyx lobes elliptic or lanceolate 4–13  $\times$  2–4 mm, margin entire (rarely ciliate). Corolla blue, blue-purple, or white, campanulate, 2–2.5 cm; lobes broadly elliptic, 5–7 mm wide, apex acute. Disk tubular, 2–3 mm. Style as long as corolla. Capsule ovoid-conical, ca. 7  $\times$  5 mm. Seeds yellow-brown, black at both ends, narrowly oblong, slightly compressed, 0.8–1.5 mm. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 34^*$ ,  $36^*$ .

• Mountain and hill slopes, grasslands, forest margins; below 2400 m. Anhui, Hebei, Jiangsu, Liaoning, Nei Mongol, Shandong, Zhejiang.

- 1a. Stems, leaves, calyx, and disk all glabrous ..... 1a. subsp. *tracheloides*  
 1b. Stems, leaves, calyx, and disk nearly always hairy ..... 1b. subsp. *giangsuensis*

**1a. *Adenophora tracheloides* subsp. *tracheloides***

茅茛(原亚种) ji ni (yuan ya zhong)

*Adenophora isabellae* Hemsley; *A. remotiflora* (Siebold & Zuccarini) Miquel var. *cordatifolia* (Debeaux) Zahlbruckner; *A. tracheloides* var. *cordatifolia* Debeaux; *A. tracheloides* f. *puberula* A. I. Baranov.

Stems, calyx, and disk always glabrous. Leaves occasionally sparsely hispidulous along veins.

• Mountain slopes, grasslands, forest margins; below 2400 m. Anhui (Huang Shan), Hebei, N Jiangsu, Liaoning, Nei Mongol (Ongniud Qi), Shandong, Zhejiang (Hangzhou, Tianmu Shan).

**1b. *Adenophora tracheloides* subsp. *giangsuensis*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

苏南茅茛 su nan ji ni

Stems and leaves usually densely white hirsute. Leaves often whitish green abaxially. Calyx and disk typically white hairy. Corolla pale purple.

• Hill slopes; lower elevations. S Jiangsu (Nanjing, Taihu, Zhenjiang).

**2. *Adenophora remotiflora*** (Siebold & Zuccarini) Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 193. 1866.

薄叶茅茛 bao ye ji ni

*Campanula remotiflora* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 180. 1846; *Adenophora remotiflora* f. *cordata* Komarov; *A. remotiflora* f. *longifolia* Komarov.

Stems single, 40–100 cm tall, glabrous, usually simple. Cauline leaves long petiolate; blade typically ovate to ovate-lanceolate, rarely ovate-orbicular, 5–13  $\times$  2–7 cm, membranous, glabrous, base mostly truncate, rounded, or obtuse, rarely cordate, margin serrate or doubly serrate, apex usually acuminate; petiole up to 3 cm. Flowers often solitary on pedicels, less frequently in several-flowered cymes, forming a pseudoraceme or narrow panicle. Hypanthium obovoid or obovoid-obconic, glabrous; calyx lobes lanceolate, 7–12  $\times$  1.5–2 mm, margin entire. Corolla blue, campanulate, 2–3.5 cm; lobes 7–12 mm. Disk cylindrical, 2.5–3 mm, ca. 1 mm in diam. Capsule obovoid, 5–8  $\times$  4–7 mm. Seeds narrowly oblong, slightly curved, ca. 1 mm. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 34$ ,  $36$ .

Forest margins, forests, meadows; below 1700 m. Heilongjiang (Ning'an, Shangzhi), Jilin (E of Fusong and Jiaohe), SE Liaoning (Benxi, Huanren, Kuandian) [Japan, Korea, Russia (Far East)].

**3. *Adenophora petiolata*** Pax & K. Hoffmann, Repert. Spec. Nov. Regni Veg. Beih. 12: 499. 1922.

秦岭沙参 qin ling sha shen

Stems 60–120 cm tall, simple, glabrous or sparsely white hispidulous. Cauline leaves usually long petiolate, very rarely almost sessile; blade ovate, 3–15  $\times$  2–5 cm, abaxially glabrous or hispidulous along veins, adaxially sparsely puberulent or glabrous, base broadly cuneate or subtruncate, margin serrate, apex acute to acuminate; petiole winged, up to 8 cm. Inflorescence branches long and horizontally spreading, forming a large panicle, or extremely short, with only 2 or 3 flowers or even a single flower, and thus forming an extremely narrow panicle or even a pseudoraceme; inflorescence rachises and all floral parts glabrous, scaberulose, or puberulent. Hypanthium obconic or obovoid; calyx lobes ovate, ovate-lanceolate, or linear-lanceolate, 4–9  $\times$  1.5–4 mm, overlapping at base or not. Corolla blue, pale blue, purple, or white, campanulate, 15–27 mm; lobes ovate-deltoid, 4–11  $\times$  7–9 mm. Disk shortly tubular, (0.5–)1–2.5 mm, glabrous or hairy at apex. Style nearly as long as corolla. Capsule ovoid-ellipsoid or obovoid, 5–8  $\times$  4–6 mm. Seeds yellow-brown, oblong, slightly compressed, 1–1.5 mm, 1-ribbed. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 34^*$ ,  $34+1B^*$ .

• Grassy slopes, mountain slopes, grasslands, forest margins, forests or roadsides on mountains; below 2300 m. S Anhui, Chongqing, W Fujian, Gansu, Guangdong, Guangxi, Guizhou, S Hebei, W Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan, Zhejiang.

- 1a. Calyx lobes ovate-lanceolate to linear-lanceolate, 1–2(–3) mm wide, never overlapping; disk glabrous; corolla 2–2.7 cm, lobes deltoid, 8–11 mm ..... 3a. subsp. *petiolata*
- 1b. Calyx lobes ovate to ovate-lanceolate, 1.5–4 mm wide, broadest at middle-lower part, usually  $\pm$  overlapping; disk  $\pm$  hairy, rarely glabrous; corolla 1.5–2 cm, lobes deltoid-ovate, 5–7 mm.
- 2a. Cauline leaves petiolate, at least lower ones obviously petiolate, petiole up to 2.5 cm; calyx lobes 2–4 mm wide; disk 1.5–2.5 mm, mostly hairy ..... 3b. subsp. *hunanensis*
- 2b. Cauline leaves subsessile or only lower ones shortly petiolate, petiole rarely up to 1.5 cm; calyx lobes 1.5–2.5 mm wide; disk (0.5–)1–1.5(–2) mm, mostly glabrous ..... 3c. subsp. *huadungensis*

### 3a. *Adenophora petiolata* subsp. *petiolata*

秦岭沙参(原亚种) qin ling sha shen (yuan ya zhong)

Cauline leaves all long petiolate. Inflorescence rachises and all floral parts glabrous. Calyx lobes 1.5–2(–3) mm wide, never overlapping. Corolla 2–2.7 cm; lobes deltoid, 8–11 mm.

• Forests or roadsides on mountains; (1000–)1700–2300 m. Gansu (Chengxian, Huating, Wenxian), W Henan (Lushi, Songxian), Shaanxi (Qin Ling), Shanxi (Puxian, Qinxian, Ruicheng).

### 3b. *Adenophora petiolata* subsp. *hunanensis* (Nannfeldt) D. Y. Hong & S. Ge, Novon 20: 427. 2010.

杏叶沙参 xing ye sha shen

*Adenophora hunanensis* Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1070. 1936.

Cauline leaves mostly petiolate, or at least lower ones petiolate, rarely subsessile. Inflorescence rachises and floral parts often scaberrulose. Calyx lobes 2–4 mm wide,  $\pm$  overlapping at base. Disk 1.5–2.5 mm, mostly hairy. Corolla 1.5–2 cm; lobes 4–7 mm.

• Mountain slopes, grasslands, forest margins; below 2000 m. Chongqing, Guangdong (Liannan, Renhua, Ruyuan), Guangxi (Lingchuan, Xing'an, Yangshuo), Guizhou (Kaili), S Hebei (Cixian), W Henan, Hubei, Hunan, W Jiangxi, Shaanxi (S of Tongchuan), S Shanxi (Jincheng, Lingchuan, Yangcheng), Sichuan.

### 3c. *Adenophora petiolata* subsp. *huadungensis* (D. Y. Hong), D. Y. Hong & S. Ge, Novon 20: 427. 2010.

华东杏叶沙参 hua dong xing ye sha shen

*Adenophora hunanensis* subsp. *huadungensis* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

Cauline leaves subsessile, only lower ones shortly petiolate; petiole rarely up to 1.5 cm. Calyx lobes 1–2.5 mm wide, never overlapping. Disk (0.5–)1–1.5(–2) mm, mostly glabrous.

• Grassy slopes, forests; below 1900 m. S Anhui, W Fujian (Liancheng, Yong'an), Jiangsu (Liyang, Nanjing), E Jiangxi (including Lu Shan), Zhejiang (Longquan, Tianmu Shan).

### 4. *Adenophora rupincola* Hemsley, J. Linn. Soc., Bot. 26: 13. 1889.

多毛沙参 duo mao sha shen

*Adenophora pubescens* Hemsley.

Stems 70–150 cm tall, simple or with branches slender and upright, usually scaberrulose, less often subglabrous. Lower cauline leaves petiolate, upper ones sessile; blade ovate-lanceolate to elliptic, 6–13  $\times$  1.5–3 cm, both surfaces usually sparsely hispidulous, rarely almost glabrous, base attenuate, margin serrate, apex acuminate; petiole winged. Inflorescences with branches forming a panicle; inflorescence rachises, pedicels, and calyx rather densely puberulent or hispidulous, occasionally glabrous; pedicels short and stout, ca. 5 mm, or rarely elongate. Hypanthium obovoid or obconic; calyx lobes lanceolate to linear-lanceolate, 5–8  $\times$  1–2 mm, very rarely reflexed. Corolla blue-purple or purple, campanulate, ca. 17 mm; lobes deltoid, ca. 5 mm. Disk annular to shortly tubular, 0.5–1.5 mm, glabrous. Style 2–2.2 cm, obviously exerted. Fl. Sep.

• Ravines, grassy slopes; below 1500 m. W Hubei, NW Hunan (Cili), Jiangxi, Sichuan.

### 5. *Adenophora brevidiscifera* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 184. 1983.

短花盘沙参 duan hua pan sha shen

Stems ascending, slender, ca. 35 cm tall, simple, densely hirsute below, glabrous above. Basal leaves long petiolate, hirsute; blade ovate, ca. 3 cm wide, abaxially sparsely hirsute along veins, adaxially hirsute, base cordate with sinus up to 4 cm deep, margin sinuate-crenate or serrate; petiole ca. 3 cm. Lowermost cauline leaf similar to basal leaves but slightly smaller; petiole ca. 2 cm. Upper cauline leaves only 2–4, less than 1 cm, linear, sessile. Cymes 2 or 3, lax, with only terminal flower; bracts filiform, minute; pedicels slender. Hypanthium obovoid, glabrous; calyx lobes subulate, 2–3  $\times$  ca. 0.5 mm, margin entire. Corolla narrowly campanulate, ca. 1.8 cm; lobes narrowly ovate-elliptic, equaling tube, ca. 4 mm wide, apex acute. Disk annular, less than 0.5 mm high. Style ca. 12 mm. Capsule oblong or obovoid, 5–7  $\times$  3–4 mm. Fl. Aug–Sep, fr. Sep.

• Forests of *Pinus yunnanensis*; 2700–3000 m. SW Sichuan (Yanyuan).

*Adenophora brevidiscifera* resembles *A. jasionifolia*, from which it differs in having calyx lobes entire, the lower cauline leaves long petiolate and cordate, and disk shorter.

### 6. *Adenophora longipedicellata* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

湖北沙参 hu bei sha shen

Stems 1–3 m tall, simple or with slender branches up to 70 cm, glabrous. Basal leaves ovate, base cordate. Cauline leaves (at least lower ones) petiolate; blade ovate-elliptic or lanceolate, 7–12  $\times$  2–5 cm, papery, glabrous or abaxially sparsely hispid along veins, base cuneate or obtuse, margin serrate or doubly serrate, apex acuminate. Inflorescences with slender and long branches, forming a large lax panicle, glabrous or puberulent; pedicels slender, 1–3 cm. Hypanthium subglobose or obovoid,

glabrous; calyx lobes subulate-lanceolate, 8–14 mm. Corolla white, purple, or pale blue, funnelform, 1.9–2.1 cm; lobes deltoid, 5–6 mm. Disk annular, ca. 1 mm or shorter, glabrous. Style ca. 2.1 cm, almost as long as or slightly longer than corolla. Fl. Aug–Oct.

• Meadows, scrub, cliffs; below 2400 m. Chongqing (Fengjie, Nanchuan), Guizhou (Xishui), W Hubei (Laifeng), WC Sichuan.

**7. *Adenophora cordifolia*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

心叶沙参 xin ye sha shen

Caudexes with horizontal branches and alternate membranous scales. Stems 1 or 2, erect, ca. 50 cm tall, simple, glabrous or retrorsely hirsute. Basal leaves unknown. Cauline leaf blade orbicular or ovate, 3–7 × 2–6 cm, both surfaces sparsely hispidulous or abaxially glabrous, base cordate with sinus 3–5 mm deep; petiole 2–4 cm, upper ones often shorter and sometimes ± decurrent. Inflorescences with short branches, forming a narrow panicle; pedicels less than 5 mm. Hypanthium obovoid, glabrous; calyx lobes linear-lanceolate, 3–7 × 1–1.5 mm, with 2 or 3 pairs of denticles up to 1 mm. Corolla purple, campanulate, 13–15 mm; lobes ovate-deltoid, ca. 1/2 as long as tube. Disk annular, 0.5–0.7 mm, glabrous. Style as long as corolla. Fl. Jul–Aug.

• Shaded and moist rock crevices; ca. 2100 m. Henan (Songxian, Tongbai, Yichuan).

**8. *Adenophora liliifolia*** (Linnaeus) A. Candolle, Monogr. Campan. 358. 1830.

新疆沙参 xin jiang sha shen

*Campanula liliifolia* Linnaeus, Sp. Pl. 1: 165. 1753; *C. alpini* Linnaeus.

Roots carrot-shaped, 8–10 × 1–2 cm. Stems 50–150 cm tall, simple or branched, glabrous. Cauline leaves sessile or shortly petiolate; blade lanceolate or ovate, 5–13 × 1–5 cm, both surfaces glabrous, rarely sparsely white hirsute abaxially, margin serrate, apex acute to shortly acuminate; petiole (if present) up to 6 mm. Inflorescence a narrow panicle with branches with up to 7 flowers, or rarely only several flowers forming a pseudoraceme; pedicels slender, up to 2.5 cm. Hypanthium obovoid or obconic, glabrous; lobes lanceolate, 5–7 × 1–1.5 mm, mostly reflexed from anthesis, margin usually with a pair of denticles or rarely entire. Corolla blue or pale blue, campanulate, 1.2–2.2 cm; lobes ovate, ca. 1/2 as long as tube, apex acute. Disk shortly tubular, 1.5–2.5 mm, glabrous. Style as long as corolla or slightly exserted. Fl. Jul–Aug.  $2n = 34$ , 102.

Forests, scrub. NW Xinjiang (Burqin, Korgas, Toli) [Kazakhstan, Russia (European part); Europe].

**9. *Adenophora lamarckii*** Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 168. 1823.

天山沙参 tian shan sha shen

*Adenophora liliifolia* (Linnaeus) A. Candolle var. *lamarckii* (Fischer) Krylov; *Campanula lamarckii* (Fischer) D. Dietrich.

Roots carrot-shaped, up to 2.5 cm in diam. Stems simple, 30–100 cm tall, glabrous, rarely white pubescent. Cauline leaves sessile; blade ovate-lanceolate, 2.5–7 × 0.5–3 cm, both surfaces glabrous, sometimes hispidulous abaxially, base cuneate, margin serrate, apex acute or acuminate. Flowers several in a pseudoraceme or inflorescences with short branches of 2–4 flowers, forming a narrow panicle; pedicels less than 1 cm. Hypanthium obovoid or obconic, glabrous; calyx lobes linear-lanceolate or subulate, 3–5 × 1–1.2 mm, widest at base or at lower part, margin usually entire. Corolla blue, funnelform-campanulate, 1.5–2.2 cm; lobes ovate, ca. 1/2 as long as tube, apex acute. Disk shortly tubular, 1–2.5 mm, glabrous. Style nearly as long as or slightly longer than corolla. Fl. Jul–Aug.  $2n = 34$ , 102.

Forests, forest margins. N Xinjiang (Fukang, Toli, Wenquan) [Kazakhstan, Korea, N Mongolia, Russia (Siberia)].

**10. *Adenophora stricta*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 192. 1866.

沙参 sha shen

Stems 40–80 cm tall, simple, often hispidulous or villous, rarely glabrous. Basal leaves ovate, base cordate. Cauline leaves sessile (lower ones sometimes with extremely short, winged petiole); blade elliptic or narrowly ovate, 3–11 × 1.5–5 cm, sparsely hispidulous, hirsute, or subglabrous, base cuneate, apex acute or shortly acuminate. Flowers often in a pseudoraceme, or inflorescences with short branches and thus in an extremely narrow panicle, very occasionally with long branches and panicle ample; pedicels less than 5 mm. Hypanthium obovoid or obconic, puberulent, verrucose-hairy, or less often glabrous; calyx lobes typically subulate, less often linear-lanceolate, 6–8 × 1–1.5 mm, margin entire. Corolla blue or purple, broadly campanulate, 1.5–2.5 cm, glabrous or hirsute at least along veins outside; lobes deltoid-ovate, ca. 1/2 as long as tube. Disk shortly tubular, 1–2.5 mm, glabrous. Style usually slightly longer (rarely shorter) than corolla. Capsule ellipsoid-globose (very rarely ellipsoid), 6–10 mm. Seeds brown-yellow, slightly compressed, ca. 1.5 mm. Fl. Aug–Oct.  $2n = 34$ .

Meadows, forest margins, scrub, open mountain slopes, forests, among grasses, in rock crevices; below 3300 m. Anhui, Chongqing, Fujian, SE Gansu, Guangxi, Guizhou, SE and W Henan, W Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, NW and S Sichuan, Yunnan, Zhejiang [Korea; naturalized in Japan].

The diagnostic characters of the present species are cauline leaves sessile; inflorescences pseudoracemose or narrowly paniculate; pedicels short; calyx mostly hairy, and calyx lobes subulate and entire.

- 1a. Leaves glabrous or sparsely villous;  
stems hispidulous ..... 10c. subsp. *confusa*
- 1b. Leaves hispidulous; stems hispidulous,  
less frequently hirsute, rarely glabrous.
  - 2a. Corolla 2–2.5 cm; disk 1.8–2.5 mm  
..... 10d. subsp. *aurita*
  - 2b. Corolla 1.5–2.3 cm; disk 1–1.8 mm.
    - 3a. Corolla nearly always hirsute,  
very rarely subglabrous outside  
..... 10a. subsp. *stricta*

- 3b. Corolla glabrous or with a few hairs along veins at top outside ..... 10b. subsp. *sessilifolia*

**10a. *Adenophora stricta* subsp. *stricta***

沙参(原亚种) sha shen (yuan ya zhong)

*Adenophora argyi* H. Léveillé; *A. axilliflora* (Borbás) Borbás ex Prain; *A. rotundifolia* H. Léveillé; *A. sinensis* A. Candolle var. *pilosa* A. Candolle; *A. stricta* var. *nanjingensis* P. F. Tu & G. J. Xu; *A. stricta* var. *qinglongshanica* P. F. Tu & G. J. Xu; *Campanula axilliflora* Borbás.

Stems and leaves hispidulous. Calyx always and often densely hispidulous. Corolla densely or sparsely hirsute, rarely glabrous outside.  $2n = 34$ .

Among grasses, in rock crevices; lower to middle elevations. Anhui, Fujian (Chong'an), SE Henan (Xinxian), Hunan (Changsha, Yizhang), Jiangsu (Jurong, Nanjing), Jiangxi, Zhejiang (Cixi, Kaihua, Lin'an) [Korea; naturalized in Japan].

**10b. *Adenophora stricta* subsp. *sessilifolia*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

无柄沙参 wu bing sha shen

*Adenophora stricta* subsp. *henanica* P. F. Tu & G. J. Xu.

Stems and leaves hispidulous. Calyx mostly hispidulous or scaberrulose, less frequently glabrous. Corolla usually glabrous or only with a few hairs along veins outside.

• Meadows or grassy places at forest margins; 600–2000 m. Chongqing, SE Gansu, Guangxi (Longsheng), Guizhou, W Henan, W Hubei (Shennongjia, Xingshan), W Hunan, S Shaanxi (S of Qin Ling), S Sichuan, NE Yunnan (Zhenxiang).

**10c. *Adenophora stricta* subsp. *confusa*** (Nannfeldt) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 105. 1983.

昆明沙参 kun ming sha shen

*Adenophora confusa* Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1068. 1936.

Stems and leaves glabrous or sparsely hirsute. Calyx usually glabrous.

• Open mountain slopes, forests; 1000–3200 m. Yunnan.

**10d. *Adenophora stricta* subsp. *aurita*** (Franchet) D. Y. Hong & S. Ge, Novon 20: 428. 2010.

川西沙参 chuan xi sha shen

*Adenophora aurita* Franchet, J. Bot. (Morot) 9: 366. 1895.

Calyx lobes 1–1.8 mm wide. Corolla 2–2.5 cm. Disk 1.8–2.5 mm.

• Meadows, forest margins, scrub; 2100–3300 m. NW Sichuan.

**11. *Adenophora sinensis*** A. Candolle, Monogr. Campan. 354. 1830.

中华沙参 zhong hua sha shen

*Adenophora polymorpha* Ledebour var. *sinensis* (A. Can-

dolle) Pampanini; *A. sinensis* var. *glabra* A. Candolle; *Campanula sinensis* (A. Candolle) D. Dietrich.

Stems single or several from one root, 20–100 cm tall, simple, glabrous or sparsely scaberrulose. Basal leaves ovate-orbicular, base rounded. Cauline leaves petiolate, at least toward base; blade narrowly elliptic or narrowly lanceolate, 3–8 × 0.5–2 cm, both surfaces glabrous, base cuneate, margin serrate, apex obtuse to acuminate. Inflorescence branches often slender, forming a narrow panicle; pedicels slender, up to 3 cm. Hypanthium globose or obovoid, usually glabrous, less often sparsely scaberrulose; calyx lobes linear-lanceolate, 5–7 × ca. 1 mm. Corolla purple or purple-blue, campanulate, 1.3–1.5 cm. Disk shortly cylindrical, 1–1.5 mm. Style 2–4 mm longer than corolla. Capsule broadly ellipsoid or globose, 6–7 × ca. 5 mm. Seeds brown-yellow, ellipsoid, ca. 1.8 mm. Fl. and fr. Aug–Oct.

• Grassy places or scrub by rivers or streams; below 1200 m. S Anhui (Qimen), Fujian (Jianning), N Guangdong (Liannan), Hunan (Xiangyin Shan), Jiangxi.

**12. *Adenophora polyantha*** Nakai, Bot. Mag. (Tokyo) 23: 188. 1909.

石沙参 shi sha shen

Stems single or several from one root, 20–100 cm tall, often simple, glabrous or hispidulous. Basal leaves reniform, base cordate, margin irregularly serrate. Cauline leaves sessile; blade ovate, lanceolate, or elliptic, occasionally linear-lanceolate, 2–10 × 0.5–2.5 cm, glabrous or hispidulous, margin serrate with teeth distant. Cymes with solitary flowers forming a pseudoraceme, or in a narrow panicle with short inflorescence branches; pedicels usually less than 1 cm. Hypanthium obconic, usually pubescent, rarely glabrous; calyx lobes triangular-lanceolate, 3.5–7 × 1–2 mm, margin entire. Corolla purple or dark blue, campanulate, slightly constricted at throat, 1.4–2.2 cm; lobes often reflexed, short, up to 1/4 as long as whole corolla. Disk tubular, (2–)2.5–4 mm, often sparsely puberulent. Style usually slightly exerted or sometimes as long as corolla. Capsule ovoid-ellipsoid, 5–12 × 4–7 mm. Seeds yellow-brown, ovoid-ellipsoid, slightly compressed, ca. 1.2 mm. Fl. Aug–Oct.  $2n = 34, 68$ .

Sunny grassy places; below 2000 m. Anhui, Gansu, Hebei, W Henan, Jiangsu, Liaoning, SE Nei Mongol, S Ningxia, Shaanxi, Shandong, Shanxi [NW Korea].

- 1a. Calyx lobes glabrous or sparsely hispidulous; capsule 5–7 mm; stems and leaves glabrous or puberulent ..... 12a. subsp. *polyantha*  
1b. Calyx lobes hispidulous, rarely glabrous; capsule 6–12 mm; stems and leaves ± hispidulous ..... 12b. subsp. *scabricalyx*

**12a. *Adenophora polyantha* subsp. *polyantha***

石沙参(原亚种) shi sha shen (yuan ya zhong)

*Adenophora obovata* Kitamura; *A. polyantha* f. *densipila* Kitagawa; *A. polyantha* f. *eriocaulis* Kitagawa; *A. polyantha* var. *glabricalyx* Kitagawa.

Stems and leaves glabrous or puberulent. Calyx lobes

mostly glabrous or sparsely hispidulous. Capsule 5–7 mm.  $2n = 34$ . Fl. and fr. Aug–Oct.

Sunny grassy slopes; below 2000 m. E Liaoning [NW Korea].

**12b. *Adenophora polyantha* subsp. *scabricalyx*** (Kitagawa) J. Z. Qiu & D. Y. Hong, *Acta Phytotax. Sin.* 31: 39. 1993.

毛萼石沙参 mao e shi sha shen

*Adenophora polyantha* var. *scabricalyx* Kitagawa in S. Tokunaga, Rep. First Sci. Exped. Manchoukuo 4(2): 112. 1935; *A. chanetii* (H. Léveillé) D. F. Chamberlain; *A. polyantha* var. *media* Nakai & Kitagawa; *A. scabridula* Nannfeldt; *A. scabridula* var. *viscida* P. C. Tsoong; *Campanula chanetii* H. Léveillé.

Stems and leaves ± hispidulous. Calyx lobes hispidulous, rarely glabrous. Capsule 6–12 mm. Fl. and fr. Aug–Oct.  $2n = 68^*$ .

• Sunny grasslands; below 1500 m. Anhui (Lu'an, Tongcheng), Gansu (Xifeng, Zhenyuan), Hebei, W Henan, Jiangsu (Changzhou, Xuyi), W Liaoning (Lingyuan), SE Nei Mongol, S Ningxia (Guyuan), Shaanxi (Huanglong Shan, Yijun), Shandong, Shanxi.

**13. *Adenophora contracta*** (Kitagawa) J. Z. Qiu & D. Y. Hong, *Acta Phytotax. Sin.* 28: 399. 1990.

缢花沙参 yi hua sha shen

*Adenophora polyantha* var. *contracta* Kitagawa in S. Tokunaga, Rep. First Sci. Exped. Manchoukuo 4(2): 112. 1935; *A. kulunensis* Y. Z. Zhao; *A. urcèolata* Y. Z. Zhao (2002), not C. Y. Wu (1965).

Stems 1–3 from a rootstock, 15–100 cm tall, glabrous to densely hispidulous. Basal leaves petiolate; blade reniform, base cordate, margin irregularly serrate. Cauline leaves sessile; blade ovate or lanceolate, sometimes linear-lanceolate, 1.5–8 × 0.5–3 cm, glabrous or sparsely hispidulous, margin serrate with teeth remote. Flowers in a pseudoraceme or with short branches forming a narrow panicle; pedicels usually less than 1 cm. Hypanthium obconic, densely or sparsely hispidulous, sometimes papillose, rarely glabrous; calyx lobes triangular-lanceolate, margin entire. Corolla purple or dark blue, campanulate, 1.2–2.2 cm, strongly constricted at throat (ratio of greatest in diam. to throat in diam. = 1.36); lobes only ca. 1/6 as long as tube, erect at first but later reflexed. Disk tubular, 2–4 mm, often puberulent. Style commonly exerted somewhat, less often equaling or shorter than corolla. Capsule obovoid, ca. 7 × 5 mm. Seeds ovoid-ellipsoid, ca. 1 mm. Fl. and fr. Aug–Oct.  $2n = 34^*$ .

• Open grassy slopes. W Liaoning, Nei Mongol.

**14. *Adenophora pinifolia*** Kitagawa in S. Tokunaga, Rep. First Sci. Exped. Manchoukuo 4(2): 110. 1935.

松叶沙参 song ye sha shen

Roots columnar. Stems erect, densely leafy. Cauline leaves sessile; blade linear, ca. 5 cm × 0.8 mm, slightly fleshy, margin entire, apex acute. Inflorescence a panicle. Hypanthium obconic, ca. 2.5 mm, glabrous; calyx lobes subulate, 1.5–2 mm, margin entire. Corolla campanulate, 18–19 mm; lobes 2–4 × 6–7 mm. Disk ca. 4.5 mm, glabrous. Style as long as corolla. Capsule obconic. Fl. Aug–Sep.  $2n = 34^*$ .

• Open grassy slopes. Liaoning (Dafangshen, Dalian, Heishan).

**15. *Adenophora micrantha*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

小花沙参 xiao hua sha shen

*Adenophora suolunensis* P. F. Tu & X. F. Zhao.

Stems few to several dozen from a single caudex, erect, 30–40 cm tall, often simple, densely retrorsely hispidulous. Cauline leaves sessile; blade linear to oblong, 1.5–4 × 0.3–1 cm, both surfaces sparsely scaberulose or subglabrous. Cymes with only a terminal flower or with several flowers, forming a narrow panicle; pedicels less than 1 cm. Hypanthium obconic, 1.5–2 mm, glabrous; calyx lobes narrowly triangular, 2–2.5 × 0.7–0.9 mm, margin entire. Corolla blue, tubular-campanulate, 12–14 mm; lobes ovate-deltoid, 3.5–4 mm. Stamens much shorter than corolla. Disk large tubular, 2.5–3 mm, sparsely villous at apex. Style ca. 16 mm, obviously exerted. Capsule ovoid-globose, ca. 4 × 3.5 mm. Fl. Jul–Aug.

• Grassy or stony slopes. E Nei Mongol.

**16. *Adenophora palustris*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 426. 1901.

沼沙参 zhao sha shen

Stems erect, ca. 1 m tall, simple, glabrous. Cauline leaves sessile; blade oblong or ovate-orbicular, 5–7 × 1.5–3 cm, papery, lucid, glabrous, base rounded or obtuse, margin crenate or irregularly serrate, apex acute or rounded. Flowers several in a compact pseudoraceme. Hypanthium glabrous; calyx lobes ovate-lanceolate, ca. 5.5 × 2 mm, nearly 2 × as broad at middle as at base, distinctly reticulate veined, margin entire, apex obtuse or acute. Corolla broadly campanulate, ca. 2 cm in diam. Disk ca. 4 × 1.5 mm, glabrous. Style slightly longer than corolla. Capsule obovoid, 7–8 × 4–6 mm. Fl. and fr. Aug.  $2n = 102$ .

E Jilin [Japan, N Korea].

**17. *Adenophora himalayana*** Feer, Bot. Jahrb. Syst. 14: 618. 1890.

喜马拉雅沙参 xi ma la ya sha shen

Roots often thickened, up to 1 cm in diam. Stems often several from one root, 15–60 cm tall, simple, glabrous, less often retrorsely hispidulous or sparsely retrorsely hirsute. Basal leaves petiolate; blade deltoid or ovate. Cauline leaves sessile or lower ones shortly petiolate; blade ovate, lanceolate, narrowly elliptic, or linear, 3–14 × 0.1–2.5 cm, glabrous, very rarely hairy, margin entire or sparsely serrate. Flowers solitary, or several in a pseudoraceme, never in a panicle. Hypanthium obconic or obovoid, glabrous; calyx lobes subulate, 5–10 × 1–1.5(–2) mm. Corolla blue or blue-purple, campanulate, 1.7–2.2 cm; lobes ovate-deltoid, 4–7 mm. Disk broadly tubular, 3–8 × 2–3 mm. Style nearly as long as or slightly longer than corolla. Capsule obovoid-oblong, 5–10 × 4–7 mm. Fl. Jul–Sep, fr. Aug–Sep.

Meadows or grassy places at forest margins, alpine meadows or scrub; (1200–)2500–4700 m. C and SE Gansu, E and S Qinghai, Shaanxi, NW Sichuan, Xinjiang, Xizang [N India, E Kazakhstan, Kyrgyzstan, Nepal, Tajikistan].

- 1a. Calyx lobes entire, very occasionally margin with verrucose denticles; leaves usually broadly linear, less often narrowly elliptic to ovate-lanceolate ..... 17a. subsp. *himalayana*
- 1b. Calyx lobes rarely entire, usually margin with verrucose denticles; leaves mostly ovate to ovate-lanceolate, up to 2.5 cm wide, rarely broadly linear ..... 17b. subsp. *alpina*

**17a. *Adenophora himalayana* subsp. *himalayana***

喜马拉雅沙参(原亚种) *xi ma la ya sha shen* (yuan ya zhong)

*Adenophora smithii* Nannfeldt; *A. smithii* f. *crispa* Nannfeldt.

Leaves usually broadly linear, rarely narrowly elliptic to ovate-lanceolate. Calyx lobes entire, very occasionally with verrucose denticles on margins. Disk 2–3 mm in diam. Style usually slightly exserted.

Alpine meadows or scrub; 3000–4700 m (1200–3000 m in Xinjiang). C Gansu, E and S Qinghai, NW Sichuan, Xinjiang (Tian Shan, Wugia, Yecheng), Xizang [N India, E Kazakhstan, Kyrgyzstan, Nepal, Tajikistan].

**17b. *Adenophora himalayana* subsp. *alpina* (Nannfeldt) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 132. 1983.**

高山沙参 *gao shan sha shen*

*Adenophora alpina* Nannfeldt, Acta Horti Gothob. 5: 14. 1930; *A. tsinlingensis* Pax & K. Hoffmann.

Leaves mostly ovate to ovate-lanceolate, up to 2.5 cm wide, less often broadly linear, abaxially often sparsely hispidulous. Calyx lobes often with verrucose denticles on margins, occasionally entire. Disk 1.5–2.5 mm in diam. Style often included.

Meadows or grassy places at forest margins; 2500–4200 m. SE Gansu (Lintao: Lianhua Shan), Shaanxi (Qin Ling), NW Sichuan (Pingwu, Shuajingsi, Songpan) [N India].

**18. *Adenophora amurica* C. X. Fu & M. Y. Liu, Bull. Bot. Res. North-East. Forest. Inst. 6: 159. 1986.**

阿穆尔沙参 *a mu er sha shen*

Stems 1–3 from a single root, erect, 35–105 cm tall, simple, densely retrorsely hirsute. Basal leaves long petiolate; blade ovate, base cordate. Cauline leaves sessile; blade narrowly ovate, lanceolate, or elliptic, 4–8 × 0.5–2.5 cm, abaxially densely retrorsely hirsute, adaxially glabrous or hispidulous along veins, margin serrate. Cymes with 1–5 flowers, in a narrow panicle or pseudoraceme; pedicels ca. 3 mm. Hypanthium ellipsoid, glabrous or hispidulous; calyx lobes narrowly lanceolate, 5–6 × 0.7–1.5 mm, margin entire or with 1 or 2 sometimes verrucose denticles. Corolla blue or blue-purple, campanulate, 1.2–2.1 cm; lobes broadly ovate-deltoid. Disk shortly tubular, 0.4–1.4 mm. Style as long as corolla. Capsule ellipsoid, 6–10 × 4–5.5 mm. Seeds brown-red, ellipsoid, slightly compressed, 1.4–1.9 mm. Fl. Jul–Aug, fr. Sep.  $2n = 68^*$ .

• Stony slopes. Heilongjiang (Da Hinggan Ling; Jingtao).

**19. *Adenophora gmelinii* (Biehler) Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 167. 1823.**

狭叶沙参 *xia ye sha shen*

Roots up to 40 cm. Stems single or several from one root, up to 80 cm tall, simple, usually glabrous, sometimes hispidulous. Basal leaf blade deltoid or rhombic-ovate, base shallowly cordate, margin crenate. Cauline leaves sessile; blade linear or less often lanceolate, 4–9 × 0.2–1.3 cm, glabrous, margin entire or serrate. Cymes single flowered, forming a pseudoraceme, or lower cymes several flowered, forming a very narrow panicle, or rarely with a solitary terminal flower. Hypanthium obovoid-oblong, glabrous or rarely scaberrulose; calyx lobes linear-lanceolate, 4–10 × 1.5–2 mm. Corolla blue or pale purple, broadly campanulate, 1.6–2.8 cm; lobes ovate-triangular, 6–8 mm, less often deltoid and only ca. 4 mm. Disk cylindrical, 1.3–3.5 mm, glabrous or sparsely hairy. Style slightly shorter than, rarely as long as corolla. Capsule ellipsoid, 8–13 × 4–7 mm. Seeds yellow-brown, ellipsoid, ca. 1.8 mm. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 34, 68$ .

Forests, thickets, communities of tall herbs, meadows, grassy slopes; below 2600 m. Hebei, Heilongjiang, W Jilin, Liaoning, E, N, and SE Nei Mongol, C and N Shanxi [Korea, E Mongolia, Russia (Far East, SE Siberia)].

- 1a. Plants (incl. hypanthium) often hispidulous; leaf blade broadly linear to ovate-lanceolate, adaxially scabrous, margin serrate; stems often single; flowers usually several ..... 19c. subsp. *nystroemii*
- 1b. Plants (incl. hypanthium) glabrous, sometimes stems hispidulous at base; leaf blade narrowly linear, narrowly ovate, deltoid-oblongate, or obovate, adaxially smooth, margin entire or serrate; stems several; flowers more numerous.
- 2a. Plants mostly more than 1 m tall, commonly puberulent only on lower part of stems and lower leaves; leaf blade mostly broadly linear to narrowly ovate, serrate; calyx lobes 5–12 × 1.3–3 mm ..... 19b. subsp. *hailinensis*
- 2b. Plants mostly less than 1 m tall, glabrous or sparsely puberulent at base of stems; leaf blade commonly narrowly linear and entire; calyx lobes 4.5–6 × 1–1.6 mm ..... 19a. subsp. *gmelinii*

**19a. *Adenophora gmelinii* subsp. *gmelinii***

狭叶沙参(原亚种) *xia ye sha shen* (yuan ya zhong)

*Campanula gmelinii* Biehler, Pl. Nov. Herb. Spreng. 14. 1807; *Adenophora biloba* Y. Z. Zhao; *A. borealis* D. Y. Hong & Y. Z. Zhao; *A. borealis* var. *oreophila* Y. Z. Zhao; *A. communis* Fischer var. *coronopifolia* (Fischer ex Schultes) Trautvetter; *A. communis* var. *gmelinii* (Biehler) Trautvetter; *A. coronopifolia*

(Fischer ex Schultes) Fischer; *A. coronopifolia* var. *erysimoides* (Vest ex Schultes) Steudel; *A. erysimoides* (Vest ex Schultes) Kitagawa; *A. gmelinii* var. *coronopifolia* (Fischer ex Schultes) Y. Z. Zhao; *A. gmelinii* var. *pachyphylla* (Kitagawa) Y. Z. Zhao; *A. gmelinii* var. *stylosa* A. Candolle; *A. pachyphylla* Kitagawa; *A. polyantha* Nakai var. *rhombica* Y. Z. Zhao; *A. polymorpha* Ledebour var. *coronopifolia* (Fischer ex Schultes) Trautvetter ex Herder; *A. polymorpha* var. *gmelinii* (Biehler) Trautvetter ex Herder; *A. wulingshanica* D. Y. Hong var. *alterna* Y. Z. Zhao; *Campanula coronopifolia* Fischer ex Schultes; *C. erysimoides* Vest ex Schultes; *C. fischeriana* Sprengel, nom. illeg. superfl.

Plants mostly less than 1 m tall, glabrous, sometimes sparsely puberulent at base of stems. Leaves usually linear and entire, less frequently lanceolate or lanceolate-ovate and serrate. Calyx lobes  $4.5\text{--}6 \times 1\text{--}1.6$  mm. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 34^*$ , 68.

Meadows; below 1800 m. Hebei (Kangbao, Weichang, Zhangbei), Heilongjiang (Anda), W Jilin (W of Fuyu, Qian'an), Liaoning (Zhangwu), E, N, and SE Nei Mongol [Korea, E Mongolia, Russia (SE Siberia)].

**19b. *Adenophora gmelinii* subsp. *hailinensis*** J. Z. Qiu & D. Y. Hong, Acta Phytotax. Sin. 31: 38. 1993.

海林沙参 hai lin sha shen

Plants mostly more than 1 m tall. Stems sometimes puberulent at base. Leaves often puberulent, mostly broadly linear to narrowly ovate, margin serrate. Calyx lobes  $5\text{--}12 \times 1.3\text{--}3$  mm. Fl. and fr. Sep.  $2n = 68$ .

Communities of tall herbs, thickets, forests. Heilongjiang (Hailin, Huanan, Jiamusi) [Russia (Far East)].

**19c. *Adenophora gmelinii* subsp. *nystroemii*** J. Z. Qiu & D. Y. Hong, Acta Phytotax. Sin. 31: 38. 1993.

山西沙参 shan xi sha shen

Plants (including hypanthium) often hispidulous. Stems often single. Leaves broadly linear or ovate-lanceolate, adaxially scabrous, margin serrate. Flowers usually several. Fl. Jul–Sep, fr. Aug–Sep.  $2n = 34^*$ , 68\*.

• Grassy slopes, thickets; below 2600 m. Hebei (Neiqiu), SE Nei Mongol (Zhuozi), C and N Shanxi.

**20. *Adenophora potaninii*** Korshinsky, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 42(2): 39. 1894 [*“potanini”*].

泡沙参 pao sha shen

Stems often single, 30–100 cm tall, simple, usually densely, less often sparsely retrorsely hispidulous, very rarely subglabrous. Cauline leaves sessile or shortly petiolate; blade obovate, ovate-elliptic, or oblong (occasionally linear-elliptic or linear),  $2\text{--}7 \times 0.5\text{--}4$  cm, both surfaces hispidulous, base obtuse or cuneate, margin with 2 to several large teeth, apex obtuse, acute, or shortly acuminate. Inflorescences usually with branches at base, forming a panicle, sometimes with only several flowers glomerate into a pseudoraceme; pedicels less than 1 cm. Hypanthium obovoid or globose-obovoid, glabrous, base rounded or  $\pm$  obtuse; calyx lobes triangular-subulate, 3–9 mm, margin with 1 or 2 pairs of long denticles. Corolla purple, blue,

or blue-purple, rarely white, campanulate, 1.5–2.5 cm; lobes ovate-deltoid, 5–8 mm. Disk tubular, 2–2.6(–3) mm, hairy at least at apex. Style nearly as long as or slightly longer than corolla. Capsule globose-ellipsoid or ellipsoid,  $7\text{--}11 \times 4\text{--}6$  mm. Seeds brown-yellow, ellipsoid, ca. 1.4 mm, 1-ribbed. Fl. Jul–Oct, fr. Oct–Nov.  $2n = 34^*$ , 102\*.

• Sunny grassy slopes, among grasses on shaded slopes, scrub, sparse woods, stony places or rock crevices, less often forests; below 3100 m. Gansu, Hebei, Henan, SW Liaoning, SE Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shanxi, W Sichuan.

1a. Cauline leaves sessile, lower ones rarely shortly petiolate ..... 20a. subsp. *potaninii*

1b. Cauline leaves usually petiolate, though sometimes very shortly so ..... 20b. subsp. *wawreana*

**20a. *Adenophora potaninii* subsp. *potaninii***

泡沙参(原亚种) pao sha shen (yuan ya zhong)

*Adenophora bockiana* Diels; *A. polydentata* P. F. Tu & G. J. Xu; *A. potaninii* var. *bockiana* (Diels) S. W. Liu.

Cauline leaves sessile, lower ones rarely shortly petiolate.

• Sunny grassy slopes, less often scrub or forests; 1000–3100 m. Gansu (E of Yongchang), Ningxia (Guyuan, Jingyuan), E Qinghai (Menyuan, Tongren, Xining), Shaanxi (Lüeyang, Mianxian, N part of province), SW Shanxi (W of Wuzhai, Xiaoyi, Yuncheng), W Sichuan.

**20b. *Adenophora potaninii* subsp. *wawreana*** (Zahlbruckner) S. Ge & D. Y. Hong, J. Syst. Evol. 48: 452. 2010.

多歧沙参 duo qi sha shen

*Adenophora wawreana* Zahlbruckner, Ann. K. K. Naturhist. Hofmus. 10 (Notizen): 56. 1895; *A. biformifolia* Y. Z. Zhao; *A. wawreana* f. *foliosa* Zahlbruckner; *A. wawreana* var. *lanceifolia* Y. Z. Zhao; *A. wawreana* f. *oligotricha* Kitagawa; *A. wawreana* f. *polytricha* Kitagawa.

Cauline leaves usually petiolate, though sometimes petiole very short; blades varying greatly, from linear to ovate, even on same individual.

• Among grasses on shaded slopes, scrub, sparse woods, mostly in stony places or rock crevices; below 2000 m. Hebei (N to Weichang), Henan (Song Shan), SW Liaoning, SE Nei Mongol (Hohhot, Liangcheng, Zhuozi), Shanxi (E of Jiaocheng, Wuzhai, Yuncheng).

**21. *Adenophora tricuspidata*** (Fischer ex Schultes) A. Candolle, Monogr. Campan. 355. 1830.

锯齿沙参 ju chi sha shen

*Campanula tricuspidata* Fischer ex Schultes, Syst. Veg. 5: 158. 1819; *Adenophora communis* Fischer var. *denticulata* (Fischer) Trautvetter; *A. denticulata* Fischer; *A. polymorpha* Ledebour var. *denticulata* (Fischer) Trautvetter ex Herder; *C. denticulata* (Fischer) Sprengel (1824), not Burchell (1822).

Stems single or sometimes 2 from one root, 70–100 cm tall, simple, glabrous. Cauline leaves sessile, glabrous; blade narrowly elliptic or ovate-elliptic,  $2.5\text{--}8 \times 0.6\text{--}2$  cm, base ob-

tuse or cuneate, margin serrate, apex acute. Inflorescence branches (cymes) extremely short, only 2–3 cm, with 2 to several flowers, several forming a narrow panicle; pedicels very short. Hypanthium globose-ovoid or globose-obconic, glabrous; calyx lobes often reflexed, ovate-deltoid,  $3-6 \times 1-2$  mm, overlapping at base, margin with 2 or rarely 3 or 4 pairs of long denticles, apex acuminate. Corolla blue or purple-blue, broadly campanulate, 1–2 cm; lobes broadly ovate-deltoid, ca.  $1/2$  as long as tube, apex obtuse. Disk shortly tubular, 1–2 mm, glabrous. Style shorter than corolla. Capsule subglobose. Fl. Jul–Sep.  $2n = 34$ .

Wet meadows, forests of *Betula*, sunny grassy slopes. Heilongjiang (Luobei, Nenjiang, Yichun), N Nei Mongol (Xilin Gol Meng: Xi Ujimqin Qi) [Russia (Far East, S Siberia)].

**22. *Adenophora wilsonii*** Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1075. 1936.

聚叶沙参 ju ye sha shen

Stems often 2 to several from one root, erect, 25–80 cm tall, simple or branched above, glabrous, densely leafy at middle during anthesis but basal leaves withered. Leaves shortly petiolate; blade linear-elliptic or lanceolate,  $4-10 \times 0.5-1.2$  cm, thickly papery, both surfaces glabrous, base attenuate into petiole, margin serrate or crenate. Inflorescence a panicle with long or short branches; pedicels up to 1 cm. Hypanthium obovoid or obconic, sometimes subglobose, glabrous; calyx lobes subulate or linear-lanceolate,  $5-7 \times$  ca. 1 mm, with 1 or 2 pairs of verrucose denticles. Corolla purple or blue-purple, funnellform-campanulate, 1.5–2 cm; lobes ovate-deltoid, ca.  $1/2$  as long as tube. Disk annular or shortly tubular, less than 1.2 mm, glabrous. Style 2–2.5 mm, ca. 5 mm longer than corolla. Capsule globose-ellipsoid,  $7-8 \times 4-5$  mm. Fl. Aug–Oct, fr. Sep–Oct.

• Thickets, rocks by streams; below 1600 m. Chongqing (Chengkou), Gansu (Kangxian, Wenxian), Guizhou (Renhuai), W Hubei (Hefeng, Shennongjia), Shaanxi (Nanzheng), Sichuan (Emei Shan, Jiange, Tianquan).

**23. *Adenophora stenophylla*** Hemsley, J. Linn. Soc., Bot. 26: 10. 1889.

扫帚沙参 sao zhou sha shen

*Adenophora mongolica* A. I. Baranov; *A. stenophylla* var. *denudata* Kitagawa.

Stems numerous from one root, 25–50 cm tall, often with slender branches, densely hispidulous or glabrous. Basal leaf blade ovate-orbicular, base rounded. Cauline leaves sessile; blade needlelike to linear-oblong, up to  $6 \times 0.5$  cm, glabrous or hispidulous, margin entire or sparsely serrate. Inflorescence branches slender, erect, forming a narrow panicle, rarely only several flowers in a pseudoraceme; pedicels slender. Hypanthium obovoid-oblong, glabrous; calyx lobes subulate, 3–4 mm, margin entire or with 1 or 2 pairs of verrucose denticles. Corolla blue or purple-blue, campanulate, 8–13 mm; lobes ovate-triangular, 3–3.5 mm. Disk tubular, 1–1.5 mm, glabrous or sparsely puberulent. Style slightly shorter than corolla. Capsule ellipsoid,  $4-8 \times 2.3-5$  mm. Seeds brown-yellow, ellipsoid, slightly compressed, ca. 1 mm. Fl. Jul–Sep, fr. Sep.  $2n = 34^*$ .

Dry grasslands. Heilongjiang (Anda), W Jilin, Nei Mongol (Jarud Qi) [Mongolia].

**24. *Adenophora elata*** Nannfeldt, Acta Horti Gothob. 5: 16. 1930.

狭长花沙参 xia chang hua sha shen

*Adenophora wutaiensis* Hurusawa.

Root carrotlike,  $8-18 \times 1.4-2.4$  cm. Stems single, 20–120 cm tall, simple, glabrous or sometimes puberulent. Cauline leaves very rarely opposite, sessile or lower leaves sometimes with short winged petiole; blade broadly elliptic, elliptic, narrowly elliptic, lanceolate, or oblanceolate,  $2-8 \times 0.5-2.5$  cm, glabrous, base rounded, obtuse, or cuneate, margin crenate or serrate, apex acute or less often acuminate. Flowers usually several in a pseudoraceme, sometimes solitary and terminal, or very rarely with short branches, forming a narrow panicle; pedicels usually less than 1 cm. Hypanthium narrowly obovoid or obconic, glabrous; calyx lobes narrowly triangular,  $5-10 \times 1-1.5$  mm, margin with 1 or 2 pairs of denticles or entire. Corolla blue or purple-blue, narrowly campanulate or tubular-campanulate, less often campanulate, 2–3.5 cm; lobes deltoid, 5–10 mm. Disk tubular, 1.6–2.8 mm, glabrous. Style shorter than corolla. Capsule ellipsoid or oblong,  $10-14 \times 5-7$  mm. Seeds yellow-brown, ellipsoid, ca. 1.5 mm. Fl. Jul–Sep, fr. Sep.  $2n = 68^*$ .

• Grassy slopes; 1700–3000 m. W Hebei, SE Nei Mongol (Zhuzi), Shanxi (Wutai Shan).

**25. *Adenophora khasiana*** (J. D. Hooker & Thomson) Oliver ex Collett & Hemsley, J. Linn. Soc., Bot. 28: 80. 1890.

云南沙参 yun nan sha shen

*Campanula khasiana* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 25. 1857; *Adenophora albescens* C. Y. Wu; *A. bulleyana* Diels; *A. bulleyana* var. *angustifolia* C. Y. Wu; *A. chionantha* C. Y. Wu; *A. dimorphophylla* C. Y. Wu; *A. diploidonta* Diels; *A. likiangensis* C. Y. Wu; *A. roseiflora* C. Y. Wu.

Root carrotlike,  $7-8 \times 1.5-1.6$  cm. Stems often single or sometimes 2 from one root, up to 1 m tall, simple, usually hirsute. Cauline leaves sessile or shortly petiolate; blade ovate-orbicular, ovate, obovate, or elliptic,  $3-9 \times 1.5-6.5$  cm, abaxially rather densely hirsute (sometimes only along veins), adaxially scaberulose, base cuneate, margin serrate or irregularly biserrate, apex acute or acuminate; petiole if present up to 2 cm. Inflorescence a narrow panicle with short branches or a pseudoraceme of several flowers; pedicels short. Hypanthium campanulate, glabrous or rather densely hispidulous; calyx lobes narrowly triangular,  $5-7 \times 1-1.5$  mm, margin with 1–4 pairs of denticles. Corolla blue or pale blue, funnellform-campanulate, 1–2.4 cm; lobes ca.  $1/2$  as long as tube. Disk shortly tubular, less than 1 mm. Style slightly longer than corolla to obviously exerted. Fl. Aug–Oct.  $2n = 34$ .

Forests, scrub, grassy places; 1000–2800 m. SW Sichuan (Butuo, Muli, Puge), SE Xizang (Cona), Yunnan [Bhutan, NE India, N Myanmar].

**26. *Adenophora jasionifolia*** Franchet, J. Bot. (Morot) 9: 365. 1895.

甘孜沙参 gan zi sha shen

*Adenophora atuntzensis* C. Y. Wu; *A. forrestii* Diels; *A. forrestii* var. *handeliana* Nannfeldt; *A. forrestii* var. *intercedens* Pax & K. Hoffmann; *A. microcodon* C. Y. Wu; *A. pumila* P. C. Tsoong.

Root to 1 cm in diam. Caudexes sometimes with horizontal branches. Stems (1 or) 2 to several, leafy mostly in lower half, sparsely villous or rarely glabrous. Cauline leaves sessile or shortly winged-petiolate; blade ovate-orbicular, elliptic, lanceolate, or linear-lanceolate, 2–8 × 0.2–1.8 cm, both surfaces usually puberulent or rarely glabrous, base cuneate or attenuate, margin entire, crenulate, or serrate, apex acute or acuminate. Flowers terminal and solitary, or several in a pseudoraceme; pedicels short. Hypanthium obconic, base acute or sometimes obtuse, glabrous; calyx lobes narrowly triangular, 5–10 × 1.5–1.7 mm, margin with several verrucose denticles and sometimes sparsely ciliate. Corolla blue or purple-blue, bowl-shaped, 1.3–2.2 cm; lobes deltoid-orbicular, 1/2–2/3 as long as tube. Disk annular, 0.5–1 mm high. Style 13–15 mm, shorter or sometimes longer than corolla. Capsule ellipsoid, 8–11 × 5–6.5 mm. Seeds yellow-brown, ca. 1 mm. Fl. Jul–Sep, fr. Sep.  $2n = 34^*$ .

• Meadows, grassy places at forest margins; 3000–4700 m. W Sichuan, E Xizang (Gonjo, Jomda), NW Yunnan (Dêqên, Zhongdian).

**27. *Adenophora coelestis*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 173. 1912.

天蓝沙参 tian lan sha shen

*Adenophora bulleyana* Diels var. *alba* C. Y. Wu; *A. coelestis* var. *stenophylla* Diels ex C. Y. Wu; *A. huangiae* C. Y. Wu; *A. megalantha* Diels; *A. ornata* Diels; *A. ornata* var. *alba* C. Y. Wu; *A. pachyrhiza* Diels; *A. raphanorrhiza* C. Y. Wu.

Caudexes sometimes with horizontal branches. Stems 1 or 2 from a rootstock, usually 50–80 cm tall, simple, usually densely leafy in lower half, glabrous to rather densely hispid. Cauline leaves sessile or sometimes lower ones shortly petiolate; blade ovate-rhombic, obovate, ovate, or linear-lanceolate, 2–10 × 0.5–3 cm, abaxially often hispidulous along veins, adaxially sparsely hispidulous, margin irregularly serrate. Flowers in a pseudoraceme, or sometimes inflorescence with branches of 1 to several flowers at top; pedicels short. Hypanthium globose-obovoid or obovoid-obconic, glabrous; calyx lobes narrowly triangular, 8–20 × 1–1.5(–2) mm, margin with 1 to several pairs of denticles. Corolla blue or blue-purple, campanulate, 1.5–4 cm; lobes ovate-deltoid, 6–11 mm, ca. 1/2 as long as tube. Disk (1.2–)2–3(–3.5) mm, glabrous or sometimes hairy. Style shorter than corolla. Fl. Aug–Oct.  $2n = 102^*$ .

• Forests, forest margins, glades; 1200–4000 m. SW Sichuan, Yunnan.

**28. *Adenophora hubeiensis*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

鄂西沙参 e xi sha shen

Stems single, erect, 50–120 cm tall, simple, glabrous or

puberulent. Cauline leaves sessile or shortly petiolate; blade lanceolate or elliptic-lanceolate, 5–12 × 1.5–3 cm, both surfaces ± puberulent or sometimes glabrous, base cuneate or obtuse, margin serrate, apex acuminate. Inflorescence branches ascending, long, slender, forming a panicle; pedicels slender, up to 1.5 cm. Hypanthium obovoid or obovoid-ellipsoid, glabrous; calyx lobes subulate, 4–8 × ca. 0.5 mm, margin with 2 or 3 pairs of denticles. Corolla blue-purple or pale blue, campanulate, 13–18 mm; lobes ovate-deltoid, 4–5 mm. Disk tubular, 1.8–3.2 mm, glabrous. Style 20–22 mm, exerted by 4–7 mm. Capsule ellipsoid, 7–8 × 3–4 mm. Fl. Aug–Sep, fr. Sep–Oct.

• Grassy slopes, scrub, rocks in forests; 1900–2600 m. W Hubei (Shennongjia).

**29. *Adenophora morrisonensis*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 165. 1911.

台湾沙参 tai wan sha shen

Caudexes with horizontal branches bearing alternate membranous scales. Stems 1 to several from one root, 10–30 cm tall, simple, sometimes branched at middle, glabrous or sparsely hirsute. Basal leaf blade ovate-deltoid, base subtruncate. Cauline leaves sessile, lower ones with petiole up to 1 cm; blade linear-lanceolate or elliptic, 3–8 × 0.4–2.5 cm, both surfaces glabrous or sparsely puberulent, base cuneate, margin crenate or dentate, apex acuminate. Flowers 1 or 2 and terminal or more in a pseudoraceme, or several pseudoracemes forming a narrow panicle; pedicels elongate, 1.5–3 cm. Hypanthium obovoid or obconic, glabrous; calyx lobes subulate, 10–15 × 1–1.5 mm, margin with several pairs of denticles. Corolla blue-purple or light purple, campanulate, 2.8–3.5 cm; lobes deltoid, ca. 1/2 as long as tube. Disk annular, less than 1 mm high. Style shorter than corolla. Capsule ellipsoid, 10–16 × 6–7 mm. Seeds yellow-brown, ellipsoid, 1.2–1.5 mm, 1-ribbed. Fl. Jul–Nov, fr. Sep–Nov.  $2n = 34^*$ .

• Forest or thicket margins, shaded scree; 700–3500 m. Taiwan.

- 1a. Plants glabrous or sparsely pubescent; flowers in a pseudoraceme ..... 29a. subsp. *morrisonensis*
- 1b. Plants hirsute; flowers only  
1 or 2 ..... 29b. subsp. *uehatae*

**29a. *Adenophora morrisonensis* subsp. *morrisonensis***

台湾沙参(原亚种) tai wan sha shen (yuan ya zhong)

Plants glabrous or sparsely pubescent. Flowers several to many, in a pseudoraceme or narrow panicle.

• Forest or thicket margins; 700–3000 m. Taiwan.

**29b. *Adenophora morrisonensis* subsp. *uehatae*** (Yamamoto) Lammers, Bot. Bull. Acad. Sin. 33: 285. 1992.

玉山沙参 yu shan sha shen

*Adenophora uehatae* Yamamoto, J. Trop. Agric. Soc. Formosa 4: 484. 1932; *A. coelestis* Diels var. *uehatae* (Yamamoto) Masamune.

Plants hirsute. Flowers 1 or 2, terminal.

• Shaded scree; 3000–3500 m. Taiwan.

**30. *Adenophora ningxianica*** D. Y. Hong ex S. Ge & D. Y. Hong, *Novon* 9: 46. 1999.

宁夏沙参 *ning xia sha shen*

Stems several from one root, erect, 30–50 cm tall, simple, glabrous or less often scaberrulose. Basal leaves cordate or obovate; cauline leaves alternate, sessile or with petiole extremely short and cuneate; blade usually lanceolate, less often ovate-lanceolate or linear,  $2\text{--}5 \times 0.2\text{--}1.8$  cm, both surfaces glabrous, margin dentate or irregularly serrate. Flowers several in a pseudoraceme, or numerous in a large panicle due to having long inflorescence branches; pedicels slender, 0.5–1.5 cm. Calyx glabrous; tube obovoid or obovoid-conical; lobes subulate or subulate-lanceolate,  $2\text{--}6 \times ca. 1$  mm, margin mostly with 1 pair of verrucose denticles, very rarely entire. Corolla blue or blue-purple, narrowly campanulate, 1.4–1.6 cm; lobes ovate-deltoid, ca. 3.5 mm. Disk tubular, 2–2.5 mm, glabrous. Style 1.6–1.8 cm, slightly longer than corolla. Capsule narrowly ellipsoid, ca.  $8 \times 3$  mm. Seeds yellow, ellipsoid, ca. 2 mm. Fl. Jul–Aug, fr. Sep.

• Shaded slopes, scrub in ravines, rock crevices; 1600–2400 m. Gansu (?Lanzhou), Nei Mongol (Ih Ju Meng: Qianli Shan), Ningxia (Helan Shan).

**31. *Adenophora pereskiaefolia*** (Fischer ex Schultes) Fischer ex G. Don in Loudon, *Hort. Brit.* 75. 1830 [*“pereskiaefolia”*].

长白沙参 *chang bai sha shen*

*Campanula pereskiaefolia* Fischer ex Schultes, *Syst. Veg.* 5: 116. 1819 [*“pereskiaefolia”*]; *Adenophora communis* Fischer var. *latifolia* (Fischer) Trautvetter; *A. curvidens* Nakai; *A. latifolia* Fischer; *A. pereskiaefolia* subsp. *alternifolia* (P. Y. Fu ex Y. Z. Zhao) C. X. Fu & M. Y. Liu; *A. pereskiaefolia* var. *alternifolia* P. Y. Fu ex Y. Z. Zhao; *A. pereskiaefolia* var. *angustifolia* Y. Z. Zhao; *A. pereskiaefolia* var. *curvidens* (Nakai) Kitagawa; *A. pereskiaefolia* f. *puberula* Kitagawa; *A. pereskiaefolia* subsp. *subalpina* A. I. Baranov; *A. polyantha* Nakai subsp. *subalpina* (A. I. Baranov) Kitagawa; *A. polymorpha* Ledebour var. *latifolia* (Fischer) Trautvetter; *A. polymorpha* var. *pereskiaefolia* (Fischer ex Schultes) Makino.

Root carrot-shaped,  $6\text{--}9 \times 1.5\text{--}1.9$  cm. Stems single, up to 1 m, simple, glabrous, less often retrorsely hispidulous. Cauline leaves (all or some) 3–5-verticillate or -subverticillate, rarely all alternate or nearly so, sessile or shortly petiolate; blade elliptic, ovate, lanceolate, or narrowly lanceolate,  $3.5\text{--}16 \times 0.6\text{--}4.2$  cm, both surfaces glabrous, base cuneate or obtuse, margin coarsely serrate, apex acute or acuminate. Inflorescence pyramidal, with cymes alternate, short, and suberect, or flowers sometimes relatively few, forming a pseudoraceme. Hypanthium obovoid, obconic, or ellipsoid, glabrous or verrucose; calyx lobes lanceolate or narrowly triangular,  $3\text{--}6 \times 0.8\text{--}2$  mm. Corolla blue-purple or blue, funnelform-campanulate, 1.3–2 cm; lobes deltoid or depressed triangular,  $3\text{--}8 \times 6\text{--}7.5$  mm. Disk annular to shortly tubular, 0.5–1.5 mm. Style 1.5–2.4 cm,  $\pm$  exserted. Capsule obovoid, ellipsoid, or subglobose,  $6\text{--}8 \times 4\text{--}5$  mm. Seeds dark brown, glossy, ellipsoid, slightly compressed, 1.8–2 mm, smooth. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 34, 68, 72$ .

Meadows, forest margins, grassy places in forests; below 1000 m. Heilongjiang, Jilin [Japan, Korea, E Mongolia, Russia (Far East, SE Siberia)].

**32. *Adenophora divaricata*** Franchet & Savatier, *Enum. Pl. Jap.* 2: 423. 1879.

展枝沙参 *zhan zhi sha shen*

*Adenophora divaricata* f. *angustifolia* A. I. Baranov; *A. divaricata* f. *manshurica* (Nakai) Kitagawa; *A. divaricata* var. *manshurica* (Nakai) Kitagawa; *A. manshurica* Nakai; *A. polymorpha* Ledebour var. *divaricata* (Franchet & Savatier) Makino.

Roots 1.5–3.5 cm in diam. Stems single, up to 1 m tall, simple,  $\pm$  white villous, rarely glabrous. Cauline leaves 3–5-verticillate, sessile; blade rhombic, broadly elliptic, elliptic, elliptic-lanceolate, or lanceolate,  $3.5\text{--}11 \times 1.5\text{--}6$  cm, both surfaces glabrous or hispidulous along veins, base obtuse or cuneate, margin coarsely serrate, apex obtuse, acute, or acuminate. Inflorescence branches (each with 1 to several cymes) usually verticillate, or sometimes some (rarely all) alternate, forming a large panicle; peduncles of inflorescence branches 2–10 cm; pedicels 0.5–1 cm, glabrous. Hypanthium obconic or obovoid-obconic, glabrous; calyx lobes lanceolate, elliptic-lanceolate, or linear-lanceolate,  $5\text{--}10 \times 1\text{--}2.5$  mm, margin entire. Corolla blue or light purple, campanulate, 15–22 mm; lobes deltoid-orbicular,  $1/3\text{--}2/3$  as long as tube, both surfaces glabrous. Disk tubular, 1.8–2.5 mm. Style as long as corolla or slightly exserted. Capsule obovoid or broadly ellipsoid,  $5\text{--}7 \times 3\text{--}6$  mm. Seeds golden brown, ellipsoid, 2–2.5 mm, 1-ribbed. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 34$ .

Forests, shrublands, grassy slopes; 400–1800 m. Hebei (Beijing, N of Yixian), Heilongjiang (E of Heihe), Jilin (E of Changchun, Jiutai), Liaoning, Shandong (Kunyu Shan), Shanxi (Wutai Shan) [Japan, Korea, Russia (Far East)].

**33. *Adenophora wulingshanica*** D. Y. Hong, *Fl. Reipubl. Popularis Sin.* 73(2): 187. 1983.

雾灵沙参 *wu ling sha shen*

*Adenophora elata* Nannfeldt f. *verticillata* Kitagawa.

Stems 1 or 2 from one root, 50–120 m tall, simple, glabrous or very sparsely hispidulous. Cauline leaves 3- or 4-verticillate or -subverticillate, shortly petiolate; blade ovate, elliptic, or elliptic-linear,  $5\text{--}13 \times 0.4\text{--}4.5$  cm, both surfaces glabrous or sparsely hispidulous along veins, margin regularly or irregularly dentate or serrate. Inflorescence a panicle of cymes, branches sometimes almost verticillate; pedicels usually less than 1 cm. Hypanthium ellipsoid or obovoid-obconic, glabrous; calyx lobes filiform-subulate,  $5\text{--}10 \times$  less than 1 mm, margin with 1 or 2 pairs of denticles. Corolla blue or purple-blue, funnelform, 1.8–2.5 cm; lobes ovate-deltoid, 5–6 mm. Disk shortly tubular, 0.8–1.5 mm, glabrous. Style slightly shorter than corolla. Capsule oblong, ca.  $10 \times 4\text{--}5$  mm. Seeds orange-yellow, ellipsoid, ca. 1.5 mm. Fl. Aug–Sep, fr. Sep–Oct.  $2n = 34^*$ .

• Thickets, grassy slopes, less often roadsides in forests, on limestone; 1200–1700 m. NE Beijing (Miyun).

**34. *Adenophora lobophylla*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

裂叶沙参 lie ye sha shen

Stems erect, 20–100 cm tall, simple, sparsely retrorsely hirsute. Cauline leaves all or only lower and middle leaves petiolate; blade ovate or ovate-lanceolate, 2–5 × 1–2 cm, abaxially hirsute along veins, adaxially sparsely puberulent, margin pinnatifid or rarely only dentate-lobed; petiole 0.5–2.5 cm. Inflorescence with slender and ascending branches, forming a panicle, or several flowers in a pseudoraceme, rarely flowers solitary and terminal; pedicels slender, 5–20 mm. Hypanthium oblong or obovoid, base obtuse or rounded, glabrous; calyx lobes subulate, 3–4 × less than 1 mm, margin with 1 or 2 pairs of verrucose denticles, rarely ciliate. Corolla blue or purple-blue, campanulate, 11–17 mm; lobes ovate-deltoid, 4–6 mm. Disk tubular, 2–3 mm, sparsely puberulent above. Style nearly as long as or slightly longer than corolla. Capsule cylindrical, base rounded, 6–8 × ca. 3 mm. Seeds yellow, ellipsoid, ca. 0.8 mm. Fl. Jul–Oct, fr. Aug–Oct.  $2n = 34^*$ ,  $34+2B^*$ .

• Thickets, open woods, forest margins; 2000–3400 m. NW Sichuan (Barkam, Danba, Jinchuan).

**35. *Adenophora stenanthina*** (Ledebour) Kitagawa, Lin. Fl. Manshur. 418. 1939.

长柱沙参 chang zhu sha shen

Root carrotlike, up to 10 × 0.7–0.8 cm. Stems several, caespitose, 40–120 cm, sometimes branched above, usually finely scaberulose. Basal leaves petiolate; blade cordate or truncate at base, margin deeply and irregularly serrate. Cauline leaves sessile; blade filiform, linear, elliptic, lanceolate, or ovate, 2–10 × 0.1–2 cm, both surfaces scaberulose or subglabrous, margin entire or sparsely serrulate. Inflorescence a pseudoraceme or a panicle. Hypanthium obovoid, ellipsoid, or campanulate, glabrous; calyx lobes subulate or narrowly triangular, 1.5–5(–7) mm, margin entire or denticulate. Corolla pale to dark blue, blue-purple, or purple, subtubular or tubular-campanulate, 10–17 × 5–8 mm. Disk narrowly tubular, 4–7 mm, glabrous or villous. Style 1.8–2.2 cm. Capsule ellipsoid, 7–9 × 3–6 mm. Fl. Jul–Sep, fr. Aug–Sep.  $2n = 34$ .

Conifer forests, scrub, grasslands, grassy slopes, sandy places; below 4000 m. Gansu, Hebei, W Jilin, Nei Mongol, Ningxia, NE Qinghai, N Shaanxi, Shanxi [Mongolia, Russia (Far East, S Siberia)].

- 1a. Calyx lobes 1.5–3(–4) mm; corolla 10–13 mm, subtubular, lobes 1.5–3 mm; style 6–10 mm longer than corolla ..... 35a. subsp. *stenanthina*  
 1b. Calyx lobes 3–5(–7) mm; corolla 12–17 mm, tubular-campanulate, lobes 3–4.5 mm; style 3–7 mm longer than corolla ..... 35b. subsp. *sylvatica*

**35a. *Adenophora stenanthina*** subsp. *stenanthina*

长柱沙参(原亚种) chang zhu sha shen (yuan ya zhong)

*Campanula stenanthina* Ledebour, Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad. 5: 525. 1814; *Adenophora collina*

Kitagawa; *A. collina* f. *latifolia* Kitagawa; *A. coronata* (Ker Gawler) A. Candolle; *A. crispata* (Turczaninow ex Kitagawa) Kitagawa; *A. marsupiiiflora* (Schultes) Fischer; *A. marsupiiiflora* var. *crispata* Turczaninow ex Kitagawa; *A. marsupiiiflora* var. *jaluensis* Komarov; *A. polymorpha* Ledebour var. *marsupiiiflora* (Schultes) Franchet; *A. pratensis* Y. Z. Zhao; *A. stenanthina* var. *angustilanceifolia* Y. Z. Zhao; *A. stenanthina* var. *collina* (Kitagawa) Y. Z. Zhao; *A. stenanthina* f. *crispata* (Turczaninow ex Kitagawa) Kitagawa; *A. stenanthina* var. *crispata* (Turczaninow ex Kitagawa) Y. Z. Zhao; *A. verticillata* Pallas ex Fischer var. *marsupiiiflora* (Schultes) Trautvetter; *C. coronata* Ker Gawler; *C. marsupiiiflora* Schultes.

Leaves up to 12 mm wide. Calyx lobes 1.5–3 mm. Corolla subtubular, 10–13 mm, ± constricted at throat; lobes 1.5–3 mm. Style 6–10 mm longer than corolla. Disk glabrous or hairy. Capsule narrowly ellipsoid.

Grassy slopes, sandy places; below 1800 m. Gansu (Huining), Hebei (Kangbao, Longguan, Zhangbei), W Jilin (Zhenlai), Nei Mongol, Ningxia (Guyuan, Yanchi), N Shaanxi, Shanxi (N of Taigu) [Mongolia, Russia (Far East, S Siberia)].

**35b. *Adenophora stenanthina*** subsp. *sylvatica* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 187. 1983.

林沙参 lin sha shen

Leaves linear to ovate or oblong, up to 2 cm wide, entire or sparsely serrulate. Calyx lobes 3–5(–7) mm. Corolla tubular-campanulate, 12–17 mm; lobes 3–4.5 mm. Style only 3–7 mm longer than corolla. Disk all hairy. Capsule ellipsoid.

• Conifer forests, scrub, also among grasses; 2500–4000 m. Gansu (Qilian Shan, Tao He basin), NE Qinghai.

**36. *Adenophora liliifolioides*** Pax & K. Hoffmann, Repert. Spec. Nov. Regni Veg. Beih. 12: 499. 1922.

川藏沙参 chuan zang sha shen

*Adenophora gracilis* Nannfeldt.

Stems often single, 30–100 cm tall, simple, usually hirsute, less often glabrous. Basal leaves long petiolate; blade ovate, base cordate, margin coarsely serrate. Cauline leaves sessile; blade ovate, lanceolate, elliptic, or linear, 2–11 × 0.4–3 cm, abaxially hispidulous but hirsute along major veins (or less often glabrous throughout), adaxially glabrous or hispidulous, base cuneate or attenuate, margin entire or sparsely serrate, apex acuminate. Inflorescence a narrow panicle with short branches, sometimes only several flowers in a pseudoraceme. Hypanthium ellipsoid, glabrous; calyx lobes narrowly triangular, 2–6 × 0.6–1 mm, margin entire or very rarely with verrucose denticles. Corolla blue, purple-blue, or pale purple, rarely white, subtubular or tubular-campanulate, 8–12 mm. Disk narrowly tubular, 3–6.5 mm, usually glabrous. Style 1.5–2 cm, remarkably exerted. Capsule ovoid or ellipsoid, 6–9 × 3–4 mm. Seeds brownish yellow, ellipsoid, 1.2–1.5 mm, finely striate, 1-ribbed. Fl. Jul–Sep, fr. Sep–Oct.

• Meadows, scrub, among debris; 2400–4600 m. SE Gansu (Lintao, Xiahe), Shaanxi (Qin Ling), NW Sichuan, NE Xizang.

**37. *Adenophora capillaris*** Hemsley, J. Linn. Soc., Bot. 26: 10. 1889.

丝裂沙参 si lie sha shen

Stems single, 0.5–1 m tall, glabrous or hirsute. Cauline leaves usually sessile; blade ovate-lanceolate, elliptic-lanceolate, or sometimes linear, 3–19 × 0.2–5 cm, glabrous or hirsute, margin entire or serrate (denticulate when narrow), apex acuminate. Inflorescence with long branches, forming a large and lax panicle, sometimes with short branches, forming a narrow panicle, less frequently only several flowers in a pseudoraceme; main axis and branches filiform. Hypanthium ellipsoid or sometimes ovoid; calyx lobes spreading or reflexed, filiform, (3–)6–14(–20) mm, margin entire or sometimes with 1 to several verrucose denticles below. Corolla pale blue, pale purple, or white, subtubular, tubular-funnelform, or urceolate, 10–18 mm; lobes narrowly triangular, 3–4 mm. Disk narrowly tubular, 2–5 mm, often glabrous. Style 15–25 mm, strongly exserted. Capsule globose, ellipsoid, or ovoid, 4–9 × 4–5 mm. Seeds brown, ellipsoid, 1–1.6 mm, 1-ribbed.

• Forests, forest margins, grasslands, grassy slopes; 1100–3600 m. Chongqing, Guizhou, Hebei, W Henan, W Hubei, SE Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, W Yunnan.

- 1a. Calyx lobes (2–)3–5(–7) mm, margin entire; capsule ovoid to ovoid-oblong ..... 37c. subsp. *paniculata*
- 1b. Calyx lobes (3–)6–14(–20) mm, margin sometimes lower part with 1 or 2 pairs of verrucose denticles; capsule globose, less often ovoid.
  - 2a. Calyx lobes (3–)6–9 mm, rarely up to 20 mm, margin usually entire; corolla 10–14 mm, very rarely up to 17 mm; stems and leaves mostly glabrous ..... 37a. subsp. *capillaris*
  - 2b. Calyx lobes (4–)9–14 mm, mostly with denticles; corolla 13–18 mm; stems and leaves mostly ± hirsute ..... 37b. subsp. *leptosepala*

**37a. *Adenophora capillaris* subsp. *capillaris***

丝裂沙参(原亚种) si lie sha shen (yuan ya zhong)

*Adenophora capillaris* var. *tenuifolia* Diels; *A. longisepala* P. C. Tsoong.

Stems and leaves usually glabrous. Inflorescence branches up to 27 cm. Calyx lobes usually (3–)6–9(–20) mm. Corolla 10–14(–17) mm. Capsule globose, ellipsoid, or ovoid. Fl. Jul–Oct, fr. Aug–Oct.

• Forests, forest margins, grasslands; 1400–2800 m. Chongqing, Guizhou (Bijie, Nayong), W Hubei, Shaanxi (S of Qin Ling), Sichuan (Butuo, E of Kangding, Yuexi).

**37b. *Adenophora capillaris* subsp. *leptosepala*** (Diels) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 136. 1983.

细萼沙参 xi e sha shen

*Adenophora leptosepala* Diels, Notes Roy. Bot. Gard.

Edinburgh 5: 175. 1912; *A. leptosepala* var. *linearifolia* C. Y. Wu; *A. urceolata* C. Y. Wu (1965), not Y. Z. Zhao (2002).

Stems and leaves usually hirsute. Calyx lobes (4–)9–14 mm, margin usually toothed. Corolla 13–18 mm. Capsule globose or ovoid. Fl. Jul–Oct, fr. Sep–Oct.

• Forests, forest margins, grasslands; 2000–3600 m. SW Sichuan (Muli), W Yunnan.

**37c. *Adenophora capillaris* subsp. *paniculata*** (Nannfeldt) D. Y. Hong & S. Ge, Novon 20: 426. 2010.

细叶沙参 xi ye sha shen

*Adenophora paniculata* Nannfeldt, Acta Horti Gothob. 5: 19. 1930; *A. paniculata* var. *dentata* Y. Z. Zhao; *A. paniculata* var. *petiolata* Y. Z. Zhao; *A. paniculata* var. *pilosa* Kitagawa; *A. paniculata* var. *psilosa* Kitagawa.

Stems glabrous or hirsute. Leaves from linear, lanceolate, or broadly elliptic, 0.2–7.5 cm wide, glabrous, sometimes adaxially sparsely hispidulous, abaxially sparsely hirsute. Calyx lobes (2–)3–5(–7) mm, margin entire. Corolla 10–14 mm. Capsule narrowly obovoid, ellipsoid, or oblong, 7–11 × 3–5 mm. Seeds 1.4–1.6 mm. Fl. Jun–Sep, fr. Aug–Oct.

• Grassy slopes; 1100–2800 m. Hebei (S of Longguan, Wuling Shan), W Henan, SE Nei Mongol (Daqing Shan, Tumd Qi, Xinghe), Shaanxi (Qin Ling), Shanxi.

**38. *Adenophora tetraphylla*** (Thunberg) Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 169. 1823.

轮叶沙参 lun ye sha shen

*Campanula tetraphylla* Thunberg in Murray, Syst. Veg., ed. 14, 211. 1784; *Adenophora obtusifolia* Merrill; *A. polymorpha* Ledebour var. *rhombifolia* H. Léveillé; *A. polymorpha* var. *verticillata* Franchet & Savatier; *A. radiatifolia* Nakai, nom. illeg. superfl.; *A. radiatifolia* var. *abbreviata* (H. Léveillé) Nakai; *A. radiatifolia* var. *rhombifolia* (H. Léveillé) Nakai; *A. tetraphylla* var. *integrifolia* Y. Z. Zhao; *A. triphylla* (Thunberg) A. Candolle; *A. triphylla* f. *linearis* (Hayata) Kitamura; *A. triphylla* var. *tetraphylla* (Thunberg) Makino; *A. verticillata* Fischer; *A. verticillata* var. *abbreviata* H. Léveillé; *A. verticillata* f. *linearis* (Hayata) Matsumura; *A. verticillata* var. *linearis* Hayata; *A. verticillata* f. *triphylla* (Thunberg) Makino; *A. verticillata* var. *triphylla* (Thunberg) Regel; *Campanula triphylla* Thunberg; *C. verticillata* Pallas (1773), not Hill (1765).

Root carrotlike, 7–16 × 1.5–1.8 cm. Stems up to 1.5 m tall, simple, glabrous, less often white hispidulous. Cauline leaves 3–6-verticillate, sessile or subsessile; blade broadly to narrowly elliptic, linear-lanceolate, or linear, 1.8–10 × 0.2–3.2 cm, both surfaces sparsely puberulent or glabrous, base cuneate or attenuate, margin serrate or serrulate, apex acuminate, acute, or obtuse. Inflorescence a narrow panicle with branches (cymes) mostly verticillate. Hypanthium obconic or campanulate, glabrous; calyx lobes subulate, linear, or linear-triangular, 1.5–4 mm, margin entire. Corolla blue to purple, tubular or narrowly funnelform, sometimes slightly constricted at throat, 7–10 mm; tube 2.5–7 mm in diam.; lobes deltoid, 1–2 mm. Disk narrowly tubular, 2–4 mm. Style 14–20 mm, strongly exserted. Capsule

obovoid or broadly obovoid, 5–8 × 3–6 mm. Seeds yellow-brown, oblong, slightly compressed, 1–1.5 mm. Fl. (Feb–)Mar–Nov, fr. May–Nov.  $2n = 34, 34+2B^*$ .

Grassy places, scrub; low elevations but up to 2000 m in south.

Anhui, Fujian, N Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan (Lushi, Xinyang), Hunan (Xinning, Yizhang), Jiangsu, Jiangxi, Jilin, Liaoning, E Nei Mongol, Shandong (Muping), Shanxi (Lingkong Shan), Sichuan (Ebian, Emei Shan), Taiwan, Yunnan (Yanshan), Zhejiang [Japan (including Ryukyu Islands), Korea, Laos, Russia (Far East, E Siberia), N Vietnam].

## 11. PERACARPA J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 26. 1857.

袋果草属 dai guo cao shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Perocarpa* Feer.

Plants perennial. Rhizomes elongate, with scales and buds. Leaves alternate. Flowers usually solitary, axillary, pedicellate. Calyx 5-lobed. Corolla funnelform-campanulate, 5-lobed to middle or slightly beyond. Stamens 5, free from corolla; filaments ciliate. Ovary inferior, 3-locular; style villous above; stigma 3-lobed, lobes recurved. Fruit a 2- or 3-locular irregularly dehiscent capsule. Seeds relatively few, ellipsoid, large, smooth.

One species: Bhutan, China, India, Japan, Korea, Myanmar, Nepal, Papua New Guinea, Philippines, Russia (Sakhalin), Thailand.

**1. *Peracarpa carnos*** (Wallich) J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 26. 1857.

袋果草 dai guo cao

*Campanula carnos* Wallich in Roxburgh, Fl. Ind. 2: 102. 1824; *C. circaeoides* F. Schmidt; *C. ovata* (D. Don) Sprengel; *Peracarpa carnos* var. *circaeoides* (F. Schmidt) Makino; *P. carnos* var. *formosana* H. Hara; *P. circaeoides* (F. Schmidt) Feer; *Wahlenbergia ovata* D. Don.

Plants delicate. Rhizomes creeping, prostrate, slender, branched. Stems erect or reclining, rarely prostrate, 4–25 cm tall, slender, fleshy, glabrous, unbranched or rarely few branched at base, sometimes rooting at nodes. Leaves crowded toward apex of stem, those toward base distant and smaller; blade abaxially green, sometimes suffused with purple, adaxially green, ovate to orbicular, 3–38 × 3–28 mm, membranous or papery, abaxially glabrous or rarely pubescent, adaxially glabrous or sparsely appressed hispidulous, base truncate, subcordate, or cordate, margin flat, crenulate, serrate, serrulate, sometimes cili-

ate, with gland at each sinus, apex rounded, obtuse, or acute, often mucronate; petiole 2–17 mm. Flowers solitary and axillary, rarely 2–4(–17) in a fascicle. Pedicels slender, ebracteolate, 2–70 mm. Hypanthium obconic or obovoid, glabrous; calyx lobes subulate, narrowly triangular, or triangular. Corolla white, blue-purple, or sometimes pale blue, funnelform-campanulate, 3–10 mm; lobes linear to elliptic. Capsule pendent, obovoid or broadly obovoid, rarely ellipsoid, 2.5–5.5 × 1.5–5 mm; pericarp thin, membranous, prominently veined, distended by mature seeds, eventually ruptured irregularly, mostly at base. Seeds 10–16 per capsule, brown, finely striate, oblong, narrowly oblong, ellipsoid, or fusiform, ca. 1.7 mm. Fl. Mar–May, fr. Apr–Nov.  $2n = 30$ . \*

Forests or moist rocks by streams; 1300–3800 m. Anhui (Jinzhai), Chongqing (Jinfo Shan), Guizhou (Kaili), Hubei (Shennongjia), S Jiangsu, Sichuan (Baoping, Ebian, Emei), Taiwan, S Xizang (Yadong), W Yunnan, Zhejiang (Hangzhou) [Bhutan, NE India, Japan, Korea (Cheju Do), N Myanmar, Nepal, Papua New Guinea, Philippines, Russia (Sakhalin), N Thailand].

## 12. HOMOCODON D. Y. Hong, Acta Phytotax. Sin. 18: 473. 1980.

同钟花属 tong zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers

Plants annual, prostrate. Stems longitudinally 3-winged. Leaves alternate. Flowers 1–3 on extremely short branches, sessile or shortly pedicellate. Calyx epigynous, 5-lobed, lobes dentate. Corolla epigynous, tubular-campanulate, 5-lobed. Stamens 5, free from corolla and free from each other; filaments slightly dilated and sparsely ciliate at base. Ovary inferior, 3-locular; stigma 3-fid; lobes linear, recurved. Fruit dry, irregularly dehiscent or irregularly poricidal in lower part. Seeds ellipsoid, not angular, shallowly reticulate.

Two species: Bhutan, China; two species (one endemic) in China.

These species have been included in *Heterocodon* Nuttall, but their flowers are on short branches, not solitary and opposite to leaves on main stems; and their seeds are terete and reticulate, not angular and smooth.

- 1a. Pedicels absent; corolla smaller, ca. 3.5 mm; style as long as corolla ..... 1. *H. brevipes*  
1b. Pedicels ca. 6 mm; corolla 7–9 mm; style exserted ..... 2. *H. pedicellatus*

**1. *Homocodon brevipes*** (Hemsley) D. Y. Hong, *Acta Phytotax. Sin.* 18: 474. 1980.

同钟花 tong zhong hua

*Wahlenbergia brevipes* Hemsley, Hooker's Icon. Pl. 28: t. 2768. 1903; *Heterocodon brevipes* (Hemsley) Handel-Mazzetti & Nannfeldt; *W. monantha* H. J. P. Winkler ex H. Limpricht.

Stems up to 50 cm, slender, glabrous, longitudinally 3-winged, branches extremely short, with several leaves appearing in a fascicle. Petiole 2–9 mm; leaf blade paler green abaxially, deltoid, orbicular, or ovate, 7–12 × 7–12 mm, glabrous or appressed hispidulous, base truncate or rounded, sometimes cordate, margin serrate, teeth mucronate, blade apex acute. Flowers sessile, ca. 5 mm, single or 2 inserted at apex of short lateral branches. Hypanthium campanulate, 1–2 mm; calyx lobes narrowly triangular or subulate, 1–2 mm, with a pair of teeth. Corolla white, pale blue, or pale purple, 3–4 mm; lobes cleft to slightly over half its length, linear or oblong. Filaments ca. 1 mm; anthers elongate or lanceolate; style ciliate, exerted or equal to length of corolla. Fruit ovoid to globose, ca. 2.5 mm, pericarp thin. Seeds several, brown, ellipsoid, ca. 0.7 mm. Fl. and fr. Apr–Aug.

Forests, thickets, among grasses on slopes; 1000–2900 m. SW Guizhou, W Sichuan, Yunnan [Bhutan].

This species was recorded from Bhutan in Fl. Bhutan (2(3): 1380. 2001).

**2. *Homocodon pedicellatus*** D. Y. Hong & L. M. Ma, *Acta Phytotax. Sin.* 29: 268. 1991.

长梗同钟花 chang geng tong zhong hua

Stems slender, glabrous or retrorsely hispidulous, longitudinally 3-winged, almost all axils on main stem with a short branch, branches with several smaller leaves. Petiole 2–4 mm; leaf blade fan-shaped, 4–9 × 3–12 mm, glabrous or hispidulous, base truncate, margin dentate, teeth mucronate. Flowers solitary in axils of leaves on branches, 1–3 on each branch, glabrous throughout; pedicels up to 8 mm. Hypanthium obconical, 1.5–3 mm; calyx lobes triangular, ca. 2 mm, with a pair of teeth. Corolla blue, 7–9 mm; lobes linear or oblong, equaling length of tube. Filaments ca. 4.5 mm; anthers terete, ca. 2 mm. Style exerted; stigma 3-fid; lobes linear, recurved at anthesis. Fl. Jul.

• Ravines; 1400–1600 m. Sichuan (Luding: Hailuogou).

### 13. **TRIODANIS** Rafinesque, *New Fl. N. Amer.* 4: 67. 1838.

异檐花属 yi yan hua shu

Hong Deyuan (洪德元); Thomas G. Lammers

Herbs, annual. Roots fibrous. Stems erect or ascending, simple or branched below, ribbed. Leaves alternate, sessile, ovate, elliptic, lanceolate, or linear, entire or dentate. Flowers 1–3(–8) in an axillary cyme, sessile or subsessile; cleistogamous flowers in axils of lower leaves; normal flowers in axils of middle to upper leaves. Calyx 3- or 4(–6)-lobed, with lobes shorter in cleistogamous flowers, 5(or 6)-lobed in normal flowers. Corolla blue-purple or pale purple, rarely white, rotate, 5(or 6)-fid nearly to base; lobes lanceolate, apex acute or acuminate. Stamens 5(or 6), free; filaments dilated at base; anthers elongate, longer than filaments. Ovary inferior, (2 or)3-locular; ovules numerous; style upright, but reduced in cleistogamous flowers; stigma (2 or)3-fid, densely puberulent. Capsule subcylindrical or clavate, (2 or)3-poricidal at inferior part. Seeds numerous, globose to broadly ellipsoid, slightly compressed.

Six species: the Americas; one species (introduced) in China.

**1. *Triodanis perfoliata*** (Linnaeus) Nieuwland, *Amer. Midl. Naturalist* 3: 192. 1914.

穿叶异檐花 chuan ye yi yan hua

Stems erect or ascending, 15–60 cm tall, simple or branched, ribbed, glabrous or scabrous mostly on ribs. Leaves ovate, suborbicular, or elliptic, sometimes lanceolate toward apex, 0.6–2 cm, glabrous or shortly hispid on veins and margins, base clasping cordate, obtuse, broadly cuneate, or rounded, margin shallowly entire, crenate, serrate, or dentate, apex rounded, obtuse, or acute, sometimes acuminate. Flowers 1–3 in axil, sessile. Hypanthium campanulate, oblong, or obconic; calyx lobes of upper flowers (later ones) 5, rarely 4, rigid, triangular to lanceolate; lower flowers (earlier ones) smaller, with lobes 3 or 4, narrowly triangular, triangular, or lanceolate. Corolla bluish purple or rose-purple, rarely white, rotate, 8–10 mm; earlier flowers rudimentary. Capsule oblong, 4–10 mm, opening by lateral valves. Seeds light brown to brown, smooth. Fl. and fr. Apr–Jul.  $2n = 28, 56$ .

Naturalized on mountain slopes, by streams, among grasses, and

in cracks of concrete; 100–1000 m. Anhui, Fujian, Taiwan, Zhejiang [native to North and South America].

- 1a. Leaves ovate to orbicular, base cordate or amplexicaul, margins crenate or dentate; bracts as long as broad; capsule poricidal below middle ..... 1a. subsp. *perfoliata*
- 1b. Leaves ovate to elliptic, base usually rounded, slightly cordate or obtuse, not amplexicaul, margins subentire or shallowly crenate; bracts longer than wide; capsule poricidal above middle .... 1b. subsp. *biflora*

#### **1a. *Triodanis perfoliata* subsp. *perfoliata***

穿叶异檐花(原亚种) chuan ye yi yan hua (yuan ya zhong)

*Campanula perfoliata* Linnaeus, Sp. Pl. 1: 164. 1753; *Dysmicodon perfoliatus* (Linnaeus) Nuttall; *Legousia perfoliata* (Linnaeus) Britton; *Pentagonia perfoliata* (Linnaeus) Kuntze; *Prismatocarpus perfoliatus* (Linnaeus) Sweet; *Specularia perfoliata* (Linnaeus) A. Candolle.

Stems rather stiffly erect, 15–60 cm tall, simple or branched, sometimes especially on angles with spreading, bristlelike hairs of uneven length. Leaves broadly ovate to sub-orbicular, 1–2 cm, shortly hispid on veins and margins, base strongly cordate-clasping, margin rather shallowly crenate-dentate or sometimes entire, apex subacute or rounded. Flowers 1–3 in axil, sessile. Calyx lobes of upper flowers (later ones) 5, rarely 4, rigid, triangular-lanceolate, acuminate; lower flowers (earlier ones) smaller, with 3 or 4 shorter calyx lobes. Corolla blue or white, rotate, 8–20 mm wide; corolla on earlier flowers rudimentary. Capsule oblong to narrowly turbinate, 4–6 mm, tardily opening near middle. Seeds lenticular. Fl. and fr. Apr–Jul.  $2n = 56$ .

Naturalized on mountain slopes and by streams; 100–1000 m. Fujian (Chong'an, Jianning) [native to North America].

**1b. *Triodanis perfoliata* subsp. *biflora*** (Ruiz & Pavon) Lammers, Novon 16: 72. 2006.

异檐花 *yi yan hua*

*Campanula biflora* Ruiz & Pavon, Fl. Peruv. 2: 55. 1799; *Asyneuma anhuiense* B. A. Shen; *Legousia biflora* (Ruiz & Pavon) Britton; *Pentagonia biflora* (Ruiz & Pavon) Kuntze; *Specularia biflora* (Ruiz & Pavon) Fischer & C. A. Meyer; *Triodanis biflora* (Ruiz & Pavon) Greene; *T. perfoliata* var. *biflora* (Ruiz & Pavon) T. R. Bradley.

Plants glabrous or nearly so throughout except for scabrous angles of stems. Stems simple or branched, slender and often weak, 15–60 cm tall. Leaves ovate to ovate-elliptic or obovate-lanceolate, 6–20 mm, margin entire, or inconspicuously crenate-serrate with very short and broad teeth, base usually rounded, not amplexicaul. Earlier flowers with 3 or 4 ovate to lanceolate calyx lobes; later ones with 4 or 5 longer, lanceolate-subulate calyx lobes. Capsule oblong-cylindric, 6–10 mm, opening by valves close under calyx lobes. Fl. and fr. Apr–Jul.  $2n = 28, 56$ .

Naturalized among grasses and in cracks of concrete; 100–600 m. Anhui (Anqing), Fujian (Jiangle), Taiwan (Xinzhu), Zhejiang (Putuo) [native to North and South America].

## 14. *ASYNEUMA* Grisebach & Schenk, Arch. Naturgesch. 18: 335. 1852.

牧根草属 *mu gen cao shu*

Hong Deyuan (洪德元); Thomas G. Lammers

*Phyteuma* Linnaeus sect. *Podanthum* G. Don; *Podanthum* (G. Don) Boissier, nom. superfl.; *Trachanthelium* Kitaibel ex Schur.

Herbs, perennial. Roots carrot-shaped. Leaves alternate. Inflorescence elongate, spikelike or racemelike, comprising several axillary cymes, each composed of (1 or) 2–4 flowers and subtended by a bract; pedicels short, with a pair of linear bracteoles at base. Calyx 5-lobed; lobes linear (at least in Chinese species). Corolla 5-divided to base; lobes almost free, linear. Stamens 5; filaments dilated at base, margin densely ciliate. Ovary inferior, 3-locular; style nearly as long as corolla, hairy above; stigma 3-fid, segments linear, recurved. Capsule 3-poricidal above middle, 10-ribbed. Seeds ovoid, ellipsoid, or oblong, sometimes angular.

Thirty-three species: N Africa, temperate Asia, Europe; three species (one endemic) in China.

- 1a. Stems hirsute throughout; leaves white hirsute on both surfaces; calyx lobes often recurved after anthesis ..... 3. *A. chinense*  
 1b. Stems glabrous or sometimes sparsely hirsute only below; leaves glabrous or rarely sparsely hirsute along veins; calyx lobes not recurved.  
 2a. Style longer than corolla; capsule globose ..... 1. *A. japonicum*  
 2b. Style shorter than corolla; capsule obovoid-conical, base acute or acuminate ..... 2. *A. fulgens*

**1. *Asyneuma japonicum*** (Miquel) Briquet, Candollea 4: 335. 1931.

牧根草 *mu gen cao*

*Phyteuma japonicum* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 192. 1866; *Campanula japonica* (Miquel) Vatke.

Roots fleshy, up to 20 cm, up to 1.5 cm in diam., branched or not. Stems single, erect, more than 60 cm tall, simple or branched above, glabrous or very rarely sparsely hirsute toward base. Lower cauline leaves with petiole up to 4 cm; upper cauline leaves almost sessile; blade ovate, lanceolate, or elliptic from below toward apex, 3–12 × 1.4–5.5 cm, abaxially glabrous, adaxially sparsely puberulent, base cuneate or obtuse, margin serrate, apex acute to acuminate. Flowers glabrous except on filaments and style. Calyx tube globose or campanulate; lobes linear, 4–8 mm. Corolla purple-blue or blue-purple; lobes 8–14 mm. Style 9–15 mm. Capsule globose, base truncate or concave, ca. 5 mm in diam. Seeds yellow to brown, ovoid, ellipsoid, or oblong, ca. 1 mm. Fl. Jul–Aug, fr. Sep.  $2n = 28$ .

Forests, rarely meadows. Heilongjiang (Huachuan), Jilin (E of Jingyu), Liaoning [Japan, Korea, Russia (Far East)].

**2. *Asyneuma fulgens*** (Wallich) Briquet, Candollea 4: 334. 1931.

长果牧根草 *chang guo mu gen cao*

*Campanula fulgens* Wallich in Roxburgh, Fl. Ind. 2: 99. 1824.

Roots fleshy. Stems often single, erect, 30–100 cm tall, usually simple, branching rarely or more in response to damage, usually glabrous, sometimes sparsely hirsute below. Leaves all subsessile, or lower leaves with petiole up to 2 cm; blade ovate, lanceolate, or elliptic, 3.5–7 × 1–3 cm, abaxially usually glabrous, sometimes sparsely hispidulous along veins, adaxially glabrous or sparsely hispidulous. Cymes distantly separated from each other, sometimes gaps up to 10 cm. Calyx glabrous; tube obovoid to obconic, longer than broad; lobes 5–10 mm. Corolla blue or purple; lobes equal to calyx lobes in length or slightly longer. Style much shorter than corolla. Young capsule narrowly obovoid, 7–10 × 3–5 mm. Fl. Jul.

Grassy slopes, forest margins in ravines; 1800–3000 m. S Xizang (Gyirong, Yadong, Zayü) [Bhutan, India, Myanmar, Nepal, Sri Lanka].

**3. *Asyneuma chinense*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 188. 1983.

球果牧根草 *qiu guo mu gen cao*

Roots fleshy. Stems single, erect, 20–100 cm tall, usually simple, ± hirsute. Leaves all subsessile, or lower cauline leaves with petiole up to 3.5 cm; blade ovate, lanceolate, or elliptic, 2–8 × 0.5–4 cm, both surfaces ± white hirsute, margin serrate or crenate, rarely callose-denticulate. Spikes with bract subtending

1–4 flowers; bract sometimes pubescent or rarely callose-denticulate. Calyx usually glabrous, less frequently hispidulous; tube globose or campanulate; lobes 7–10 mm, slightly longer than corolla, recurved after anthesis, rarely callose-denticulate. Corolla purple or blue. Style slightly shorter than corolla. Capsule globose, with 3 broad pores, 4–6 × 4–5 mm, base truncate or concave. Seeds brown-yellow, ovoid to oblong, slightly compressed, ca. 0.5 mm, with 1 rib. Fl. and fr. Jun–Sep (capsule mature in Apr in Guangxi).

• Grassy slopes, forest margins, forests; below 3000 m. Guangxi (Yangshuo), Guizhou, W Hubei, SW Sichuan, Yunnan.

## 15. *LOBELIA* Linnaeus, Sp. Pl. 2: 929. 1753.

半边莲属 *ban bian lian shu*

Hong Deyuan (洪德元); Thomas G. Lammers

*Cardinalis* Fabricius; *Dortmanna* Hill; *Laurentia* Adanson; *Rapuntium* Miller.

Herbs, but some species lignified at base, and even some species in Africa and Hawaiian Islands trees and shrubs. Leaves alternate, in 2 rows or spiral. Flowers solitary and axillary, or in terminal racemes, or in panicles of racemes, bisexual [some Australian species dioecious]; bracteoles present or absent. Flowers pedicellate, solitary and axillary or in terminal racemes (rarely secund or corymbose) or panicles. Calyx lobes entire or serrate, persistent, rarely auriculate. Corolla zygomorphic, rarely with a narrow nectar spur; dorsal side typically divided longitudinally to base or nearly so, sometimes laterally fenestrate; limb commonly bilabiate, dorsal lip 2-lobed, ventral lip 3-lobed, or rarely ventrally unilabiate. Stamens connate, enveloping style, exerted from corolla dorsally; all 5 anthers or just ventral pair barbate at apex (rarely all nude). Ovary inferior or semi-inferior, very rarely almost superior, 2-locular; stigma 2-fid; ovules numerous. Fruit an apically 2-valved capsule or a berry. Seeds numerous, oblong or 3-angled, sometimes winged, smooth, foveolate, striate, or verrucose.

About 414 species: mainly in tropics and subtropics, particularly tropical Africa and America, with a few species extending to temperate regions; 23 species (six endemic) in China.

Doubtful species: *Lobelia cavaleriei* H. Léveillé (Repert. Spec. Nov. Regni Veg. 9: 455. 1911). Type: Guizhou, *Cavalerie* 2989 (isotype, E). See Lammers (World Checkl. Bibliogr. Campanulaceae, Kew, 2007).

- 1a. Plants 0.02–0.5(–2) m tall; stems slender or rarely somewhat robust, herbaceous or rarely subshrubby toward base or throughout; flowers commonly entomophilous; corolla 1–20(–46) mm, commonly bilabiate or sub-bilabiate (if unilabiate then no more than 15 mm), lobes dimorphic or monomorphic; seed coat striate or reticulate.
- 2a. Plants low, stems commonly prostrate and seldom over 40 cm tall; corolla various shades of blue, purple, pink, or white, sub-bilabiate or unilabiate, lobes monomorphic; anther tube with a single elongate bristle or awn at apex of each ventral anther (sometimes also bearded with tufts of shorter filiform hairs, very rarely nude); seed coat commonly reticulate (1. *L. sect. Hypsela*).
- 3a. Leaves ovate or broadly ovate, commonly petiolate; corolla sub-bilabiate; fruit a berry ..... 1. *L. nummularia*
- 3b. Leaves elliptic-lanceolate to linear; corolla unilabiate; fruit a capsule ..... 2. *L. chinensis*
- 2b. Plants taller, stems erect, ascending, or decumbent, commonly over 40 cm (sometimes as much as 2 m) tall; corolla distinctly bilabiate, lobes dimorphic, dorsal pair much smaller and narrower than ventral 3 (that commonly form a trifold lip); anther tube bearded with tufts of filiform hairs at apex of at least ventral pair (rarely all nude); seed coat striate.
- 4a. Pedicels typically bibracteolate at base; corolla tube commonly fenestrate laterally; seeds terete or irregularly angular (2. *L. sect. Stenotium*).
- 5a. Stems winged; leaves adaxially sparsely puberulent; corolla small, only 3–5 mm ..... 3. *L. heyneana*
- 5b. Stems terete or angular, not winged; leaves glabrous or villous; corolla larger or also small ..... 4. *L. hainanensis*
- 4b. Pedicels typically bibracteolate at or below middle; corolla tube almost always entire laterally; seeds trigonous or compressed (3. *L. sect. Delostemon*).
- 6a. Stems prostrate, rooted at nodes; leaves 1–4 × 0.8–3 cm; petiole 3–12 mm ..... 5. *L. zeylanica*
- 6b. Stems erect, not rooted or rooted only at basal nodes; leaves smaller, subsessile.
- 7a. Stems and leaves glabrous; bracteoles linear-lanceolate ..... 6. *L. alsinoides*
- 7b. Stems and leaves villous; bracteoles absent or minute ..... 7. *L. terminalis*
- 1b. Plants (0.2–)1–9 m tall; stems robust and sometimes pachycaul, herbaceous, subshrubby, or woody; flowers often ornithophilous; corolla unilabiate or sub-bilabiate, rarely bilabiate, (12–)20–60(–103) mm, lobes monomorphic; seed coat reticulate or striate-reticulate, less often striate.

- 8a. Flowers solitary in upper leaf axils (rarely supplemented by a terminal raceme); corolla tube straight or nearly so; fruit a berry; seeds cuboidal or quadrate, subterete to slightly compressed (5. *L.* sect. *Speirema*).
- 9a. Plants rhizomatous; corolla 12–18 mm, tube 3–6 mm; filament tube 6.5–8 mm; anther tube cream-colored, dorsal anthers 6–8 mm, slightly shorter to slightly longer than filament tube ..... 23. *L. deleiensis*
- 9b. Plants lacking rhizomes; corolla (15–)18–26 mm, tube 6–13 mm; filament tube 8.5–12 mm; anther tube gray, dorsal anthers 4.8–7 mm, 2/5–3/4 as long as filament tube.
- 10a. Stems sparsely to densely puberulent toward apex; leaves sessile; uppermost 10–25 flowers often subtended by bracts only 1/10–1/4 as long as foliage leaves, thus forming a terminal raceme; pedicels densely puberulent; hypanthium pubescent along veins; calyx lobes narrowly triangular or triangular, 1.5–1.9 mm wide, erect; corolla greenish with purple spots on lip; anther tube 1.4–1.8 mm in diam., glabrous; trichomes at apex of ventral anthers 0.5–1 mm ..... 21. *L. fangiana*
- 10b. Stems glabrous (rarely sparsely scabrous); leaves petiolate; all flowers subtended by unreduced foliage leaves; pedicels glabrous; hypanthium glabrous; calyx lobes linear or linear-triangular, 0.5–1.4 mm wide, ascending, spreading, or recurved; corolla dark violet or purple to bluish lilac, lip often paler, or striped or blotched with white; anther tube 2–2.8 mm in diam., dorsal surface sparsely shortly pubescent at least toward apex; trichomes at apex of ventral anthers 1.2–2 mm ..... 22. *L. montana*
- 8b. Flowers in terminal racemes or panicles; corolla tube curved or arcuate; fruit a capsule; seeds ovoid, lenticular (4. *L.* sect. *Rhynchoptalum*).
- 11a. Leaves truncate, rounded, or obtuse at base; pedicels ebracteolate; calyx lobe margins revolute ..... 20. *L. sessilifolia*
- 11b. Leaves cuneate or attenuate at base; pedicels commonly bibracteolate; calyx lobe margins flat.
- 12a. Stems densely pubescent.
- 13a. Stems tomentose; leaves hispidulous; pedicels 5–12 mm, densely pannose; hypanthium densely pannose; corolla white or faintly tinged with blue or pink ..... 13. *L. clavata*
- 13b. Stems hispidulous or scaberulose; leaves glabrous adaxially and sometimes abaxially; pedicels 3–5 mm, hispidulous; hypanthium scaberulose; corolla purple-red or red-purple.
- 14a. Capsule 6–10 × 6–8 mm; raceme 10–25 cm, densely flowered ..... 19. *L. erectiuscula*
- 14b. Capsule 4–6 × 4–5 mm; raceme 20–50 cm, laxly flowered ..... 18. *L. davidii*
- 12b. Stems glabrous or sparsely pubescent.
- 15a. Corolla 11–20 mm.
- 16a. Leaves rounded and mucronate at apex; corolla glabrous ..... 16. *L. colorata*
- 16b. Leaves acuminate (sometimes acute or obtuse) at apex; corolla pubescent at least internally.
- 17a. Leaves 12–31 cm, attenuate at base; corolla white, sometimes suffused with pale blue or pink; anther tube densely white hirsute in sutures; flowering Jan–May ..... 10. *L. pyramidalis*
- 17b. Leaves 6–12(–15) cm, cuneate at base; corolla purple-red, reddish, or blue-purple; anther tube sparingly pubescent on back; flowering Aug–Oct.
- 18a. Stems and leaves glabrous; pedicels 3–5 mm; calyx lobes 13–21 × < 1 mm, entire ..... 8. *L. melliana*
- 18b. Stems sparsely pubescent; leaves densely white hirsute; pedicels 5–13 mm; calyx lobes 6–14 × 1–1.5 mm, denticulate ..... 9. *L. pleotricha*
- 15b. Corolla 20–35 mm.
- 19a. Bracteoles leaflike, denticulate, 6–12 × 1–2 mm, at summit of pedicel ..... 15. *L. foliiformis*
- 19b. Bracteoles subulate, entire, 1–2 × ca. 0.2 mm, near middle of pedicel.
- 20a. Leaves 3.5–7 cm, obtuse or acute at apex ..... 17. *L. taliensis*
- 20b. Leaves (6–)10–35 cm, acuminate at apex.
- 21a. Raceme lax; hypanthium hemispheric ..... 14. *L. iteophylla*
- 21b. Raceme dense; hypanthium campanulate, oblong, or obconic.
- 22a. Leaves glabrous abaxially; hypanthium glabrous; calyx lobes entire ..... 11. *L. seguinii*
- 22b. Leaves sparsely hispidulous abaxially; hypanthium scaberulose; calyx lobes denticulate ..... 12. *L. doniana*

### 1. *Lobelia* sect. *Hypsela* (C. Presl) Lammers, comb. nov.

半边莲组 ban bian lian zu

Basionym: *Hypsela* C. Presl, Prodr. Monogr. Lobel. 45. 1836; *Pratia* Gaudichaud-Beaupré.

Plants perennial or less often annual, 2–40 cm tall; a few species dioecious. Stems commonly prostrate, radicant, or caespitose, rarely decumbent or ascending, slender, herbaceous. Leaves commonly small, petiolate or rarely sessile; blade typically not much longer than wide, variously rounded at apex and base, margin coarsely toothed or shallowly lobed. Flowers typically solitary in axils of upper leaves. Corolla sub-bilabiate (unilabiate in *Lobelia chinensis*), blue, purple, magenta, pink, or white, 2–12(–15) mm; lobes typically monomorphic. Anthers with a single long bristle on apex of each ventral anther, often also bearded with tufts of shorter filiform hairs, very rarely all nude. Fruit a capsule or fleshy berry. Seeds ovoid to oblong, terete (rarely slightly compressed); testa reticulate.

Forty-three species: amphi-Pacific, largely in the S Hemisphere; two species in China.

**1. *Lobelia nummularia*** Lamarck, *Encycl.* 3: 589. 1792.铜锤玉带草 *tong chui yu dai cao*

*Lobelia begoniifolia* Wallich; *L. horsfieldiana* Miquel; *L. javanica* Thunberg; *L. obliqua* Buchanan-Hamilton ex D. Don; *Pratia begoniifolia* (Wallich) Lindley; *P. nummularia* (Lamarck) A. Brown & Ascherson; *P. wollastonii* S. Moore.

Herbs, perennial. Stems prostrate, 12–55 cm, villous, rarely glabrous, simple or branched at base, nodes rooted. Leaves alternate, petiolate; petiole 2–14 mm, puberulent; blade orbicular, reniform, or ovate, 0.7–2.6 × 0.5–2.7 cm, both surfaces glabrous or puberulent, base obliquely cordate or rarely truncate, margin serrate or crenulate, apex acute, obtuse, or rounded. Flowers solitary and axillary; pedicels 0.7–3.5 cm, glabrous. Hypanthium narrowly ellipsoid or urceolate, 2–4 × 2–3 mm, glabrous or villous; calyx lobes linear-triangular, 2.5–6 mm, margin with 2 or 3 pairs of denticles. Corolla purple-red, pale purple, pink, green, or yellow-white, 6–10 mm; tube glabrous or rarely ciliate outside, villous inside; limb 2-lipped; upper 2 lobes linear-triangular; lower 3 lobes lanceolate. Stamens connate above middle; filament tube glabrous; anther tube 1–1.5 mm, back villous; lower 2 anthers barbate at apex. Fruit a berry, purple-red, ellipsoid or globose, 0.7–1.5 cm. Seeds sub-orbicular, slightly compressed, reticulate. Fl. and fr. all year round.

By fields, roadsides, wet places on hills, grassy slopes, open woods; lower elevations. Hubei, Hunan, Guangxi, Taiwan, Xizang [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

**2. *Lobelia* sect. *Stenotium*** (C. Presl) Lammers, **comb. nov.**卵叶半边莲组 *luan ye ban bian lian zu*

Basionym: *Rapuntium* sect. *Stenotium* C. Presl, *Prodr. Monogr. Lobel.* 11. 1836.

Plants annual or perennial, 2–50(–90) cm tall. Stems slender, herbaceous or subshrubby, prostrate, decumbent, ascending, or erect, sometimes rhizomatous or stoloniferous, terete to sharply 3- or 4-angled or -winged. Leaves sessile or petiolate. Flowers solitary in axils of upper leaves or these reduced in size, creating a terminal sometimes secund raceme (rarely spiciform or corymbose); pedicels often ebracteolate. Corolla bilabiate, various shades of blue, purple, pink, or white, 3–20(–24) mm; lobes strongly dimorphic, spreading, sometimes with a pair of gibbosities on ventral lip at mouth of tube. Anthers bearded with tufts of filiform hairs at apex of ventral pair. Fruit a capsule or rarely baccate. Seeds ovoid to oblong, terete or somewhat compressed; testa striate.

About 145 species: throughout most of the range of the genus; two species (one endemic) in China.

**3. *Lobelia heyneana*** Schultes, *Syst. Veg.* 5: 50. 1819.翅茎半边莲 *chi jing ban bian lian*

*Lobelia trialata* Buchanan-Hamilton ex D. Don; *L. tri-alata* var. *asiatica* Chiovenda.

Herbs, annual, 10–50(–60) cm tall. Stems erect, 3-angular, winged, glabrous, branched. Leaves alternate; petiole 1–4 mm, winged; blade broadly deltoid-ovate, 0.8–2.5 × 0.4–2.5 cm, upper ones smaller and more narrow, abaxially glabrous, adaxially sparsely puberulent, base truncate or shallowly cordate, often decurrent, apex rounded or acute. Flowers solitary, axillary at leaflike bracts, often forming a raceme; bracts narrowly elliptic, shorter than pedicels; pedicels 1–1.5(–2) cm, slender,

**2. *Lobelia chinensis*** Loureiro, *Fl. Cochinch.* 2: 514. 1790.半边莲 *ban bian lian*

*Lobelia caespitosa* Blume; *L. campanuloides* Thunberg; *L. chinensis* var. *albiflora* (F. E. Wimmer) F. E. Wimmer; *L. radicans* Thunberg; *L. radicans* var. *albiflora* F. E. Wimmer; *Pratia thunbergii* G. Don.

Herbs, perennial. Stems decumbent, slender, 6–30 cm tall, glabrous, lower nodes rooted. Leaves alternate, sessile or petiole to 1 mm; blade narrowly elliptic, elliptic, or lanceolate, 7–26 × 1.5–7 mm, glabrous, base rounded, obtuse, or broadly cuneate, margin entire or obviously serrate at upper part, apex acute or acuminate. Flowers usually solitary, axillary at upper leaves of branches; pedicels slender, 1.2–2.5(–3.5) cm; bracteoles 2 at base, ca. 1 mm, glabrous, or absent. Hypanthium narrowly obconical, base attenuate, not well distinguished from pedicel, 3–5 mm, glabrous; calyx lobes lanceolate, ± as long as tube, margin entire or with a pair of denticles. Corolla rose, white, or bluish, 10–15 mm, divided to base at back, white villous below throat; lobes all spreading in a plane on anterior side; lateral 2 lobes lanceolate or oblanceolate, longer than others, central 3 elliptic. Filament tube 6–8 mm, connate above middle, glabrous; anther tube 2–2.5 mm, back glabrous or sparsely villous. Capsule obconic, 6–7 mm. Seeds broadly elliptic, compressed, pitted. Fl. and fr. May–Oct.

By paddy fields, streams, among wet grasses. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, Cambodia, India, Japan (including Ryukyu Islands), Korea, Laos, Malaysia, Nepal, Sri Lanka, Thailand, Vietnam].

with 2 bracteoles at base; bracteoles subulate, less than 1 mm, often caducous. Hypanthium campanulate, 1–2 mm, glabrous; calyx lobes longer than hypanthium at anthesis, but shorter than tube after anthesis, subulate, 2–3 mm, entire. Corolla pale purple, 3–5 mm, inside sparsely puberulent; limb 2-lipped, upper lobes erect, linear, less than 1 mm; lower lobes spreading, elliptic to suborbicular, ca. 2 mm. Stamens connate into tube above middle of filaments; anther tube ca. 1 mm, lower 2 anthers barbate at top. Capsule oblong or obovoid-oblong, 4–5 × 2–4 mm. Seeds pale red-brown, ellipsoid, slightly compressed, smooth. Fl. and fr. Jan–Dec.

Moist places; 500–2700 m. Taiwan, Yunnan [Bhutan, India, Indonesia, Laos, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa].

**4. *Lobelia hainanensis*** F. E. Wimmer, Ann. Naturhist. Mus. Wien 56: 348. 1948.

海南半边莲 hai nan ban bian lian

Stems 4-angular, ascending or erect, up to 20 cm tall, glabrous. Leaves alternate, denser at upper part of stems, subsessile; blade oblong or elliptic, ca.  $15 \times 7$  mm, glabrous, base cuneate, margin cartilaginous-crenulate, apex obtuse. Flowers solitary, axillary at leaves; pedicels ca. 12 mm, glabrous,  $\pm$  as long as leaves. Hypanthium broadly top-shaped, ca.  $2 \times 2$  mm;

calyx lobes sublinear, ca. 3 mm, glabrous, margin entire, apex acute. Corolla 2-lipped, blue, ca. 1 cm, glabrous; upper lobes spatulate, shorter than lower ones; lower lobes obovate, ca.  $4 \times 2$  mm, base with a pale black spot, apex rounded, mucronate. Filament tube ca. 5 mm, glabrous; anther tube gray-brown and black striate, ca. 2 mm, back puberulent at apex; lower 2 anthers barbate at top.

• Hainan.

No specimens have been examined by us, but based on the original description, we judge it to be distinct from its allies.

**3. *Lobelia* sect. *Delostemon*** (F. E. Wimmer) Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15: 356. 1995.

翅茎半边莲组 chi jing ban bian lian zu

*Lobelia* subsect. *Delostemon* F. E. Wimmer, Ann. Naturhist. Mus. Wien 56: 359. 1948.

Plants perennial or annual, 6–60 cm tall. Stems slender, herbaceous or sometimes subshrubby, prostrate, decumbent, ascending, or erect, simple to branched, sometimes stoloniferous, caespitose, or radicant. Leaves sessile or petiolate. Flowers solitary in axils of upper leaves or these much reduced, creating a terminal sometimes secund raceme; pedicels bibracteolate at or below middle. Corolla bilabiate, typically some shade of blue or purple, less often pink or white, 5–20(–32) mm; lobes strongly dimorphic, spreading. Anthers bearded with tufts of filiform hairs at apex on all 5 (those on ventral pair sometimes longer). Fruit a capsule. Seeds ovoid to oblong, trigonous or lenticular; testa striate.

Forty-four species: S Hemisphere, north to Senegal, Ethiopia, India, Japan, Colombia, and Hispaniola; three species in China.

**5. *Lobelia zeylanica*** Linnaeus, Sp. Pl. 2: 932. 1753.

卵叶半边莲 luan ye ban bian lian

*Lobelia affinis* Wallich ex G. Don (1834), not Mirbel (1805); *L. affinis* var. *lobbiana* (J. D. Hooker & Thomson) C. B. Clarke; *L. barbata* Warburg (1891), not Cavanilles (1800); *L. hirta* Linnaeus; *L. lobbiana* J. D. Hooker & Thomson; *L. subcuneata* Miquel; *L. succulenta* Blume; *L. succulenta* var. *lobbiana* (J. D. Hooker & Thomson) F. E. Wimmer; *L. zeylanica* var. *hirta* (Linnaeus) Martyn; *L. zeylanica* var. *lobbiana* (J. D. Hooker & Thomson) Y. S. Lian.

Herbs, succulent. Stems prostrate, 4-angular, 20–60 cm, glabrous or puberulent, laxly branched, lower nodes rooted. Leaves spirally alternate; petiole 3–12 mm, puberulent; blade broadly deltoid-ovate or ovate,  $1.5\text{--}4 \times 0.8\text{--}3$  cm, abaxially sparsely scaberrulose along veins, adaxially glabrescent, base truncate, shallowly cordate, or broadly cuneate, margin serrulate, apex acute or obtuse. Flowers solitary and axillary; pedicels 0.5–2.8 cm, sparsely puberulent, bracteoles 2 at base, 1–2 mm, sometimes caducous. Calyx campanulate, 2–5 mm, puberulent; lobes linear, narrowly triangular, or narrowly oblong,  $3\text{--}7 \times 0.5\text{--}1$  mm, ciliate. Corolla 2-lipped, purple, pale purple, or white, 5–15 mm, posterior side divided to base, lobes of upper lip obovate-oblong, those of lower lip broadly elliptic, abaxially sparsely villous along middle ribs. Filaments connate into a tube at 2/3; anther tube 1–1.8 mm, abaxially puberulent, anthers all barbate at top. Ovary inferior. Capsule broadly ellipsoid, obovoid, or oblong,  $4\text{--}7 \times 2\text{--}4$  mm, obviously veined. Seeds 3-angular, red-brown. Fl. and fr. whole year round.

By water and streams in ravines; below 1500(–2000) m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

**6. *Lobelia alsinoides*** Lamarck, Dict. Bot. 3: 588. 1791.

短柄半边莲 duan bing ban bian lian

Herbs, annual, 10–30 cm tall. Stems succulent, decumbent to ascending, laxly branched, glabrous, angular. Leaves alternate, sparse; petiole 1–3 mm, glabrous; blade suborbicular, broadly ovate, elliptic, or lanceolate,  $7\text{--}14 \times 4\text{--}6$  mm, both surfaces scabrous but glabrous, base cuneate or broadly cuneate, margin crenate or crenulate, apex rounded, obtuse, acute, or acuminate. Flowers axillary at leaflike bracts forming a lax raceme; pedicels (1–)2–2.7 cm, slender, glabrous; base with 2 lanceolate bracteoles ca. 3 mm. Hypanthium funnellform-campanulate, 2–3 mm, glabrous; calyx lobes linear or subulate, slightly longer than tube at anthesis, but shorter than tube in fruit, glabrous, entire. Corolla 2-lipped, pale blue or white, 4–8 mm; upper lobes erect, oblong-oblancheolate; lower lobes spreading, oblong-elliptic. Stamens connate above middle of filaments; filament tube glabrous; anther tube 1–1.5 mm, back glabrous, anthers all barbate at top. Capsule oblong or ovoid,  $4\text{--}5 \times 3\text{--}4$  mm. Seeds numerous, 3-angular, dark brown. Fl. and fr. Jan–Dec.

Paddy fields, by water or among wet grasses in forests, wet places; below 800 m. Guangdong, Guangxi, Hainan, Taiwan, Xizang, Yunnan [Bangladesh, India, Japan (including Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Thailand, Vietnam].

Two subspecies are recognized.

- 1a. Leaves suborbicular,  $\pm$  as long as broad, margin serrate ..... 6a. subsp. *alsinoides*
- 1b. Leaves ovate to ovate-lanceolate, longer than broad, margin less prominently toothed ..... 6b. subsp. *hancei*

**6a. *Lobelia alsinoides* subsp. *alsinoides***

短柄半边莲(原亚种) duan bing ban bian lian (yuan ya zhong)

*Lobelia stipularis* Roth ex Schultes; *L. trigona* Roxburgh.Leaves suborbicular,  $\pm$  as long as broad, margin serrate.

Wet places; lower elevations. Hainan [Bangladesh, India, Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Thailand, Vietnam].

**6b. *Lobelia alsinoides* subsp. *hancei* (H. Hara) Lammers, Bot. Bull. Acad. Sin. 33: 286. 1992.**

假半边莲 jia ban bian lian

*Lobelia hancei* H. Hara, J. Jap. Bot. 17: 23. 1941; *L. alsinoides* var. *cantonensis* (F. E. Wimmer ex Danguy) F. E. Wimmer; *L. chinensis* Loureiro var. *cantonensis* F. E. Wimmer ex Danguy.Leaves ovate or lanceolate, 7–14  $\times$  4–6 mm, longer than broad, margin less prominently toothed.

Paddy fields, by water or among wet grasses in forests; below 800 m. Guangdong, Guangxi, Taiwan, Xizang, Yunnan [Japan (including Ryukyu Islands)].

**7. *Lobelia terminalis* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 424. 1881.****4. *Lobelia* sect. *Rhynchopetalum* (Fresenius) Benth in Benth & J. D. Hooker, Gen. Pl. 2: 552. 1876.**

山梗菜组 shan geng cai zu

*Rhynchopetalum* Fresenius, Flora 21: 603. 1838.

Plants perennial or pliestesial, shrubs, treelets, or trees, 0.5–9 m tall. Stems robust, typically pachycaul, herbaceous, subshrubby, or woody, prostrate, decumbent, ascending, or erect, simple, often apically rosulate. Leaves sessile (very rarely petiolate). Flowers in a terminal raceme or panicle. Corolla sub-bilabiate or unilabiate, various shades of blue, purple, red, yellow, green, or white, (12–) 22–50 mm; tube curved or arcuate; lobes spreading or deflexed, as long as tube or longer. Anthers bearded with tufts of filiform hairs at apex of ventral pair or all anthers nude at apex. Fruit a capsule. Seeds ovoid, lenticular, commonly winged; testa striate-reticulate.

Sixty-one species: tropical Africa, SE Asia, South America (SE Brazil); 13 species (four endemic) in China.

**8. *Lobelia melliana* F. E. Wimmer, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 61: 111. 1924.**

线萼山梗菜 xian e shan geng cai

Herbs, perennial, 80–150 cm tall. Stems glabrous, simple or branched. Leaves alternate, subsessile or shortly petiolate,  $\pm$  falcate-ovate to falcate-lanceolate, 6–15  $\times$  1.5–4 cm, thinly papery, glabrous, base broadly cuneate, margin ciliate-denticulate, apex caudate-acuminate. Racemes terminal, 15–40 cm, lax, lower bracts conformable with leaves, upper ones narrowed to linear, longer than flowers, margin ciliate-denticulate; pedicels compressed, 3–5 mm, with 2 subulate bracteoles at middle. Hypanthium semiellipsoid, 3–4 mm, glabrous; calyx lobes filiform, 13–21  $\times$  less than 1 mm, margin entire, spreading at fruiting. Corolla reddish, 12–17 mm; limb 2-lipped; upper lobes ascending, linear-lanceolate, as long as tube, inside villous; lower ones lanceolate-elliptic, ca. 2/3 as long as tube, inside densely villous, spreading. Stamens densely villous at base, connate into tube above base; filament tube glabrous; anther tube ca. 4 mm, back sparsely villous, only lower anthers barbate at top. Capsule erect, subglobose, 5–6 mm wide, glabrous. Seeds

顶花半边莲 ding hua ban bian lian

*Lobelia thorelii* F. E. Wimmer.Herbs, annual, slender. Stems ascending or erect, 10–20(–40) cm tall, branched, angular but wingless, puberulent. Leaves spirally and laxly arranged; petiole 1–3 mm, hairy; blade suborbicular to elliptic, 6–10(–15)  $\times$  6–10 mm, both surfaces puberulent, base truncate, subcordate, or rounded, margin subentire for lower several, but obviously serrate for rest, apex rounded. Flowers solitary, axillary at upper leaflike bracts, forming a lax raceme or corymb; bracts ovate-lanceolate, margin serrate, hairy; pedicels slender, 1.5–4 cm, sparsely puberulent; bracteoles 2, persistent or caducous. Hypanthium obovoid or semiglobose, ca. 2 mm, puberulent; calyx lobes linear-subulate, 2–3  $\times$  ca. 0.5 mm, entire. Corolla 2-lipped, pale purple, 4–5(–8) mm; tube 2-divided to base at back, glabrous; upper lobes erect, oblong-linear, lower lobes oblong, slightly shorter than upper ones. Stamens connate into a tube above middle of filaments; filament tube glabrous; anther tube ca. 1 mm, back sparsely villous, apex shortly barbate. Capsule obovoid, 4–5  $\times$  ca. 3 mm, sparsely puberulent. Seeds numerous, brown-yellow, 3-angular. Fl. Nov.

Wet places in forests; 200–900 m. S Yunnan [India, Laos, Thailand, Vietnam].

oblong, slightly compressed, ca. 0.6 mm, foveolate. Fl. and fr. Aug–Oct.

• Ravines, roadsides, by streams or wet places in forests; below 1000 m. Fujian, Guangdong, Hubei (Badong, Zigui), Hunan (Yizhang), Jiangsu (Suzhou), S and W Jiangxi, Zhejiang (Longquan).

**9. *Lobelia pleotricha* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 170. 1912.**

毛萼山梗菜 mao e shan geng cai

*Lobelia davidii* Franchet var. *handelii* (F. E. Wimmer) F. E. Wimmer; *L. davidii* var. *pleotricha* (Diels) F. E. Wimmer; *L. handelii* F. E. Wimmer; *L. pleotricha* var. *cacumiflora* Y. S. Lian; *L. pleotricha* var. *handelii* (F. E. Wimmer) C. Y. Wu.Herbs, perennial, 60–80 cm tall. Stem dark red, sparsely pubescent. Leaves alternate; lower leaves petiolate; petiole 2–3 cm, narrowly winged; upper leaves sessile or shortly petiolate; blade elliptic-lanceolate, 6–12  $\times$  2–3.5 cm, both surfaces densely white hirsute, base cuneate, margin sinuate or irregularly crenate, apex acuminate. Racemes terminal, 10–30 cm; bracts leaflike, lower ones much longer, but upper ones some-

times shorter than flowers; pedicels 5–13 mm, densely white hirsute. Hypanthium shortly oblong, 4–6 × 4–6 mm, densely white hirsute; calyx lobes linear-lanceolate, 6–14 × 1–1.5 mm, reflexed at fruiting, densely white hirsute, margin glandular-denticulate. Corolla purple-red to blue-purple, ca. 2 cm, lobes hairy along midrib and ciliate; upper lobes ascending, linear; lower lobes spreading, ovate-lanceolate. Filament tube glabrous or sparsely puberulent; anther tube ca. 5 mm, back sparsely pubescent; lower 2 anthers barbate at top. Capsule shortly columnar, 7–8 × 5–6 mm, base truncate, concave. Seeds ellipsoid, slightly compressed. Fl. and fr. Aug–Oct.

Grassy slopes, thickets, margins of bamboo forests; 2000–3600 m. Xizang (Mêdog), W Yunnan [N Myanmar].

**10. *Lobelia pyramidalis* Wallich, Asiat. Res. 13: 376. 1820.**

塔花山梗菜 ta hua shan geng cai

*Lobelia pyramidalis* var. *wallichiana* (C. Presl) Steudel; *L. wallichiana* (C. Presl) J. D. Hooker & Thomson; *Rapuntium wallichianum* C. Presl.

Herbs, shrubby, 0.4–3 m tall. Stems glabrous. Leaves alternate, subleathery, sessile or shortly petiolate; basal leaves spatulate; lower ones oblong, up to 25 cm; middle and upper ones narrowly elliptic or narrowly oblong, 12–31 × 1–4 cm, both surfaces glabrous, base attenuate, margin serrulate, apex acuminate. Racemes terminal, paniculate; flowers dense, oriented toward one side. Pedicels 0.6–2.4 cm, arched, bibracteolate or sometimes ebracteolate; bracts linear, often shorter than flowers, entire. Hypanthium campanulate or broadly ellipsoid (rarely obconic), length slightly greater than width, 2–4 × 2–4 mm, glabrous; calyx lobes subulate or linear-triangular, 8–16 × 1–1.8 mm, margin entire. Corolla white, rose, or bluish, 1.1–2.1 cm, outside glabrous, inside tube densely villous, nearly 2-lipped; lobes of upper lip linear, ca. 2/3 as long as total length of corolla; those of lower lip elliptic or lanceolate, ca. 1/3 as long as total length of corolla. Stamens connate into tube above base; filament tube glabrous; anther tube ca. 5 mm, densely villous along sutures, lower 2 anthers barbate at top. Capsule subglobose, oblate, or broadly ovoid, 3.5–6.5 mm in diam., glabrous, often pendulous. Seeds elliptic, obviously compressed, margin pale in color. Fl. Jan–May.

Grassy slopes, scrub, roadsides; 1200–2500 m. W Guangxi, SW Guizhou, Xizang (?Lhasa), Yunnan [Bhutan, N India, N Myanmar, Nepal, N Thailand].

**11. *Lobelia seguinii* H. Léveillé & Vaniot, Repert. Spec. Nov. Regni Veg. 12: 186. 1913 [“*seguinii*”].**

西南山梗菜 xi nan shan geng cai

*Lobelia seguinii* f. *brevisepala* F. E. Wimmer; *L. seguinii* f. *longisepala* F. E. Wimmer.

Herbs, subshrubby, 0.9–2.5(–5) m tall. Stems much branched, glabrous. Leaves alternate, thickly papery, lower leaves long petiolate, blade narrowly oblong, up to 25 cm; middle and upper ones sessile or shortly petiolate, lanceolate or elliptic (rarely oblanceolate), 6–35 × 0.6–6 cm, both surfaces glabrous, base attenuate or cuneate, margin serrulate, apex acuminate. Racemes terminal, paniculate, densely flowered; flow-

ers oriented to one side; lower bracts linear-lanceolate, longer than flowers, margin denticulate; upper ones lanceolate or linear, shorter than flowers, entire or serrulate; pedicels 3–16 mm, slightly compressed, curved backward, with 2 linear bracteoles. Hypanthium campanulate, oblong, or obconic, 3–8 mm, glabrous; calyx lobes subulate, linear, or linear-triangular, (8–)16–20(–27) × 0.9–2.5 mm, glabrous, entire (rarely with 1 or 2 teeth per side). Corolla purple-red, purple-blue, pale blue, or pinkish, 2–3(–3.5) cm, inside densely villous below throat; upper lobes ascending or spreading, linear, 0.8–1.3 mm wide, ca. 2/3 as long as total length of corolla; lower ones spreading, lanceolate, ca. 1/2 as long as total length of corolla. Stamens connate into tube; filament tube nearly as long as corolla tube, glabrous except at base; anther tube 4.5–7 mm, glabrous or base with several tufts of short hairs, lower 2 anthers barbate at top. Capsule pendent, oblong or ellipsoid, 10–16 × 5–9 mm, glabrous. Seeds ellipsoid, finely striate. Fl. and fr. Aug–Oct.

Grassy slopes, forest margins, roadsides; 500–3000 m. Chongqing (Fengjie, Wushan, Wuxi), W Guangxi, Guizhou (Anlong, Ceheng), Hubei (Badong, Zigui), SW Sichuan, Taiwan, Yunnan [N Thailand, N Vietnam].

**12. *Lobelia doniana* Skottsberg, Acta Horti Gothob. 4: 19. 1928.**

微齿山梗菜 wei chi shan geng cai

*Lobelia seguinii* H. Léveillé & Vaniot var. *doniana* (Skottsberg) F. E. Wimmer.

Herbs, perennial, 0.3–2.4 m tall. Stems erect, up to 1.5 cm in diam., branched above, glabrous or variously shortly pubescent above. Cauline leaves alternate, at least lower ones petiolate; petiole cuneate-winged, up to 3 cm; blade elliptic to linear-elliptic, 6–33 × 1–6 cm, abaxially sparsely hispidulous, adaxially glabrous or sparsely minutely pubescent, base cuneate, margin serrulate, apex acuminate. Racemes terminal, paniculate; lower bracts leaflike, gradually smaller up stems; pedicels 3–15 mm, usually bibracteolate, densely hispidulous. Hypanthium campanulate, oblong, or obconic, scaberrulose; calyx lobes linear or linear-triangular, 7–22 mm, with (1–)4–7 teeth on each side. Corolla bilabiate, purple, purple-red, rose-purple, or blue-purple, 20–31 mm, outside scaberrulose below, inside villous; upper 2 lobes linear, slightly longer than lower 3. Filaments connate above base, filament tube glabrous or sparsely shortly pubescent; anther tube glabrous or white hirsute only at base; lower 2 anthers barbate at top. Capsule oblong or ellipsoid, 8–16 × 4–9 mm. Seeds ellipsoid, finely striate. Fl. and fr. Sep–Nov.

Grassy slopes, forest margins, glades; (800–)1400–3200 m. Xizang (Nyalam), Yunnan [Bhutan, N India, N Myanmar, Nepal].

This species is very similar to *Lobelia seguinii*, differing primarily in its increased pubescence and toothed calyx lobes.

**13. *Lobelia clavata* F. E. Wimmer, Repert. Spec. Nov. Regni Veg. 38: 78. 1935.**

密毛山梗菜 mi mao shan geng cai

Herbs, subshrubby, 0.5–3.7 m. Stems terete, fistulose, tomentose. Cauline leaves alternate, sessile; blade oblanceolate or oblong (uppermost often narrowly elliptic or lanceolate), 7–33

× 2.2–8.4 cm, thickly papery, both surfaces hispidulous, base cuneate or attenuate into a petioloid base, margin serrulate or crenulate, apex acuminate, acute, or obtuse. Racemes densely paniculate; flowers oriented toward one side, erect; bracts lanceolate, narrowly elliptic, narrowly oblong, or linear, 10–30 mm, shortly pannose; pedicels 5–12 mm, terete, pannose, twisted toward posterior side, usually bibracteolate near base (rarely at middle). Hypanthium campanulate or hemispherical, 3–6.5 × 3–6 mm, densely pannose, base rounded or truncate (rarely obtuse); calyx lobes linear-triangular, 7–16 × 0.7–2.5 mm, margin entire or with 1–4 denticles per side. Corolla sub-bilabiate, white (rarely tinged pale pink or pale blue), 2–3.4 cm, outside shortly pannose, inside villous; upper lobes linear, ca. 2/3 as long as total length of corolla; lower lobes wider, ca. 1/3 as long as total length of corolla. Stamens connate into tube above base; filament tube densely puberulent; anther tube 5–7.5 mm, densely villous along sutures; lower 2 anthers barbate at top. Capsule pendulous, subovoid or broadly ellipsoid, 6–13 × 5–9 mm, densely puberulent. Seeds elliptic, compressed, finely striate, margin pale in color. Fl. and fr. Nov–Apr.

Grassy slopes, forests, roadsides; 700–1800 m. SW Guizhou (Anlong), S Yunnan [NE India, Laos, N Myanmar, N Thailand, Vietnam].

This species is closely related to *Lobelia rosea* Wallich of the E Himalaya, which differs in its narrowly elliptic leaves only 2–3.5 cm wide; typically ebracteolate pedicels; pink, pale rose, or mauve corolla; and shorter staminal column (filament tube 10–15 mm, anther tube 3–5 mm).

**14. *Lobelia iteophylla*** C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 93. 1965.

柳叶山梗菜 liu ye shan geng cai

Herbs, perennial, up to 85 cm tall. Stems erect, often purplish, terete, simple, glabrous, lower part often leafless. Cauline leaves alternate, sessile; blade linear-lanceolate, 6.5–11 × 1.3–1.6 cm, both surfaces glabrous, base cuneate, margin glandular-serrate, apex acuminate. Racemes lax; flowers almost oriented toward one side; bracts conformable to leaves, 2.5–5.5 × 0.5–1 cm, longer than flowers; pedicels 5–10 mm, straight, puberulent; bracteoles 2, subulate. Hypanthium semiglobose, 2.5–4 mm, glabrous or sparsely puberulent; calyx lobes linear-lanceolate, 11–15 × 1.5–2 mm, glabrous, margin glandular-denticulate. Corolla nearly 2-lipped, purple-blue, 17–25 mm, glabrous; upper 2 lobes ascending, ca. 13 mm; lower lobes spreading, narrowly oblong, ca. 8 mm, acute. Stamens connate into tube; filament tube ca. 12 mm, glabrous; anther tube gray-blue, 5–6 mm, back sparsely setulose; lower 2 anthers barbate at top. Fl. and fr. Sep–Oct.

• Forests, forest margins and grassy slopes by streams; 800–2500 m. Yunnan.

**15. *Lobelia foliiformis*** T. J. Zhang & D. Y. Hong, Acta Phytotax. Sin. 30: 155. 1992.

苞叶山梗菜 bao ye shan geng cai

Subshrubs, 1–2 m tall, branched, glabrous. Cauline leaves sessile or shortly petiolate; blade oblong to broadly lanceolate, up to 25 × 3.5 cm, papery, abaxially often puberulent, adaxially

glabrous or sparsely puberulent, base cuneate, margin glandular-serrate, apex acuminate. Racemes terminal, densely flowered, 5–20 cm, often pendulous; bracts linear-lanceolate, usually entire; pedicels ca. 5 mm, with 2 bracteoles at top; bracteoles leaflike, 6–12 × ca. 1 mm, margin glandular-denticulate. Hypanthium obconic, ca. 6 × 4 mm, glabrous to puberulent; calyx lobes erect or spreading, linear, 12–16 mm, usually denticulate. Corolla blue-purple or purple-red, 20–30 cm, puberulent; upper 2 lobes ca. 17 mm; lower 3 lobes ovate-lanceolate, ca. 8 mm. Filaments 12–15 mm, puberulent below; anther tube gray-blue, ca. 5 mm, back densely setulose; lower 2 anthers sparsely barbate at top. Capsule oblong, ca. 12 × 8–10 mm. Seeds dark brown, ellipsoid. Fl. and fr. Aug.

• Sunny slopes; 2300–3000 m. Yunnan (Dali).

**16. *Lobelia colorata*** Wallich, Pl. Asiat. Rar. 2: 42. 1831.

狭叶山梗菜 xia ye shan geng cai

*Lobelia colorata* var. *baculus* F. E. Wimmer; *L. colorata* var. *dsolinhoensis* F. E. Wimmer; *L. colorata* subsp. *guizhouensis* T. J. Zhang & D. Y. Hong; *L. palustris* Kerr.

Herbs, perennial, 30–100 cm tall. Stems erect, terete, simple, glabrous or puberulent near axils. Cauline leaves alternate, subsessile or winged-petiolate; blade obovate-oblong to linear-lanceolate, 3.5–11 × 0.5–3 cm, glabrous, base cuneate, apex rounded but mucronate. Racemes terminal, 15–30 cm, lax; flowers oriented toward one side; bracts lanceolate to linear, shorter or longer than flowers; pedicels 4–7 mm, glabrous or sparsely setulose, with 2 bracteoles at or below middle. Hypanthium semiellipsoid, 2–4 mm, glabrous or puberulent; calyx lobes linear, 5–12 × ca. 1 mm, margin with 2–4 pairs of glandular denticles. Corolla nearly 2-lipped, purple-blue or blue, rarely white, 12–20 mm, glabrous; upper 2 lobes linear, 11–15 mm; lower ones ovate-oblong, 4–8 mm. Filament tube glabrous, 7–11 mm; anther tube 5–6 mm, glabrous or sparsely villous; lower 2 anthers barbate at top. Capsule ovoid-globose, ca. 6 × 4–6 mm. Seeds ellipsoid, slightly compressed. Fl. and fr. Sep–Oct.

Thickets in ravines, moist meadows; 1000–3000 m. Guizhou, Yunnan [NE India, N Thailand].

"*Lobelia purpurascens*" (Wallich, Numer. List, no. 1307. 1829) belongs here but is a nomen nudum and was therefore not validly published (*Vienna Code*, Art. 32.1(d)).

**17. *Lobelia taliensis*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 170. 1912.

大理山梗菜 da li shan geng cai

*Lobelia colorata* Wallich subsp. *taliensis* (Diels) T. J. Zhang & D. Y. Hong; *L. fossarum* F. E. Wimmer; *L. hybrida* C. Y. Wu (1965), not Voss (1894).

Herbs, perennial, 50–120 cm tall. Rhizomes short. Stems erect, often purplish, terete, simple or few branched, glabrous. Basal leaves petiolate; petiole narrowly winged; blade spatulate, up to 8 cm; cauline leaves sessile or shortly petiolate, blade obovate-oblong to obovate-lanceolate or elliptic, 3.5–7 × 1.5–2(–3) cm, papery, both surfaces glabrous, base cuneate, margin

with glandular denticles, apex obtuse or acute. Racemes terminal, lax, one-side-oriented; bracts similar to leaves, sessile; pedicels compressed, 4–7 mm, puberulent; bracteoles 2 at middle of pedicels. Hypanthium oblong, 3–4 mm, puberulent; calyx lobes linear-lanceolate, 9–12 × ca. 1 mm, margin glandular-denticulate or also ciliate. Corolla pale blue or rose, 24–30 mm; lobes of upper lip slightly ascending, linear, ca. 15 mm, back sparsely villous along midvein; lobes of lower lip spreading, oblong-lanceolate, ca. 8 mm. Filament tube ca. 11 mm, glabrous; anther tube ca. 6 mm, back sparsely villous at apex, lower 2 anthers barbate at top. Capsule oblong, ca. 6 × 4 mm. Seeds ellipsoid. Fl. and fr. Aug–Oct.

• Grassy slopes; 1600–2600 m. Hunan, NW Yunnan (Dali, Heqing, Yangbi).

**18. *Lobelia davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 82. 1883 [*“davidii”*].

江南山梗菜 *jiang nan shan geng cai*

*Lobelia davidii* var. *dolichothyrsa* (Diels) F. E. Wimmer; *L. davidii* var. *glaberrima* F. E. Wimmer; *L. davidii* var. *kwangsiensis* (F. E. Wimmer) Y. S. Lian; *L. davidii* var. *sichuanensis* Y. S. Lian; *L. dolichothyrsa* Diels; *L. kwangsiensis* F. E. Wimmer; *L. oligantha* C. Y. Wu; *L. tibetica* W. L. Zheng.

Herbs, perennial, up to 180 cm. Stems erect, simple or branched, usually densely hispidulous or scaberulose. Leaves alternate, lower leaves usually petiolate; petiole winged, up to 4 cm; blade ovate-elliptic to linear-lanceolate, up to 17 × 7 cm, abaxially glabrous or hispidulous, adaxially glabrous, base cuneate, apex acuminate. Racemes terminal, 20–50 cm, inflorescence rachises glabrous to densely hispidulous; bracts ovate-lanceolate to lanceolate, longer than flowers; pedicels 3–5 mm, usually hispidulous, with 1 or 2 minute bracteoles near base. Hypanthium obovoid, ca. 4 mm, rounded at base, sparsely to densely scaberulose; calyx lobes linear-lanceolate, 5–12 × 1–1.5 mm, margin denticulate. Corolla nearly 2-lipped, purple-red or red-purple, 1.1–2.8 cm; upper lobes linear; lower lobes narrowly elliptic or lanceolate-elliptic, glabrous or puberulent, villous below throat. Stamens connate above base; filament tube glabrous or puberulent near anthers; lower 2 anthers barbate at top. Capsule globose, 6–10 in diam. Seeds yellow-brown, slightly compressed, one side thicker than other. Fl. and fr. Aug–Oct.

Forest margins, by streams; below 4000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, S Xizang (Cona, Yadong), Yunnan, Zhejiang [Bhutan, N India, Myanmar, Nepal].

**19. *Lobelia erectiuscula*** H. Hara, J. Jap. Bot. 40: 328. 1965.

直立山梗菜 *zhi li shan geng cai*

*Lobelia erecta* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 28. 1857, not de Vriese (1845).

**5. *Lobelia* sect. *Speirema*** (J. D. Hooker & Thomson) Lammers, J. Bot. Res. Inst. Texas 4: 161. 2010.

紫锤草组 *zi chui cao zu*

*Speirema* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 27. 1857.

Plants perennial, 0.3–2 m tall. Stems herbaceous or subshrubby. Flowers solitary in axils of little-reduced or unreduced leaves (rarely supplemented by a terminal 10–25-flowered raceme); pedicels ascending, spreading, sigmoid, or incurved, 1/10–3/4 as long

Perennials, erect, 50–80 cm tall. Stems simple, densely hispidulous. Leaves alternate, lower leaves narrowly elliptic or elliptic-lanceolate, 5–13 × 3–4 cm, base cuneate, margin crenate or irregularly doubly serrate, apex acute or acuminate; petiole 2–6 cm; middle and upper leaves elliptic or ovate, 4–8 × 3–4 cm, base broadly cuneate or rounded, margin obscurely serrate, apex acute; petiole 0.5–1.5 cm, winged. Flowers in a raceme, raceme 10–25 cm; pedicels 2–3 mm, densely hispidulous; bracts leaflike, narrowly elliptic or lanceolate to linear-elliptic, lower ones longer than but upper ones shorter than corolla. Hypanthium subglobose, ca. 5 mm, scaberulose; calyx lobes linear-lanceolate, 6–8 × 1.5–2 mm, ciliate and denticulate. Corolla purple-blue, 13–19 cm. Filament tube villous at top; 2 anterior anthers barbate at top, other 3 glabrous. Capsule globose-cylindric, 9–12 × 6–8 mm. Seeds pale brown, ellipsoid. Fl. Aug–Sep, fr. Sep.

*Quercus* or mixed forests; 3000–4000 m. SE Xizang (Cona) [NE India (Sikkim), N Myanmar, Nepal].

**20. *Lobelia sessilifolia*** Lambert, Trans. Linn. Soc. London 10: 260. 1811.

山梗菜 *shan geng cai*

*Lobelia camtschatica* Pallas ex Sprengel, nom. illeg. superfl.; *L. salicifolia* Fischer ex Trautvetter (1883), not Sweet (1818); *L. saligna* Fischer.

Herbs, perennial, 20–170 cm tall. Stems simple, glabrous. Leaves alternate, larger at middle part of stem, thickly papery, sessile; blade lanceolate, narrowly oblong, or narrowly elliptic, 1.8–9 × 0.2–2.2 cm, both surfaces glabrous, base rounded, truncate, obtuse, or cuneate, margin serrulate, apex acute or acuminate. Racemes terminal, 8–35-flowered, glabrous; bracts leaflike, lanceolate or narrowly elliptic, shorter than flowers but longer than pedicels; pedicels 5–24 mm, ebracteolate. Hypanthium campanulate, hemispheric, ellipsoid, obovoid, or obconic, 3–7 mm, glabrous; calyx lobes subulate or narrowly triangular, 4.5–12 × 1–3 mm, glabrous, margin entire, revolute. Corolla blue-purple or violet, 2.5–3.7 cm, 2-lipped, outside glabrous, inside villous; upper 2 lobes ascending, spatulate, 10–20 × 1.5–4 mm, equaling or longer than corolla tube; lower lobes elliptic, 10–21 × 2.3–6.5 mm, nearly as long as corolla tube, densely long ciliate. Stamens connate above base; filament tube glabrous; anther tube 4–6 mm, glabrous or villous along upper sutures toward apex; lower 2 anthers barbate at top. Capsule obovoid, broadly ellipsoid, or globose, 7–15 × 5–11.5 mm. Seeds brown-red, oblong or ellipsoid, 1.3–2 mm, terete but winged on one side, finely striate. Fl. and fr. Jul–Oct.

Wet meadows; sea level up to 3400 m. Anhui (Jixi), N Guangxi, Heilongjiang, Hunan (Anjiang), Jilin, Liaoning, Shandong, Sichuan, NW Yunnan, Zhejiang [Japan, Korea, Russia (Far East, Siberia)].

as subtending leaf or bract, commonly ebracteolate. Corolla sub-bilabiate with 2 dorsal lobes and a trifold ventral lip. Anther tube 0.4–1.25 × as long as filament tube; ventral anthers bearded at apex with tufts of white filiform hairs. Fruit a berry, black-purple to violet or greenish, globose or obovoid. Seeds numerous, amber-colored or tan, broadly ellipsoid, subterete to slightly compressed or sometimes angular, small; testa striate-reticulate.

Five species: SE Asia, from NE India to Java; three species (one endemic) in China.

**21. *Lobelia fangiana*** (F. E. Wimmer) S. Y. Hu, J. Arnold Arbor. 61: 90. 1980.

峨嵋紫锤草 e mei zi chui cao

*Pratia fangiana* F. E. Wimmer, Repert. Spec. Nov. Regni Veg. 38: 3. 1935; *Lobelia omeiensis* F. E. Wimmer.

Herbs, perennial, up to 1.5 m tall, simple. Stems erect, terete, sparsely to densely puberulent toward apex. Leaves sessile; blade elliptic, narrowly elliptic, narrowly oblong, or lanceolate, 5.5–16 × 1.2–3 cm, both surfaces glabrous, base cuneate, margin glandular-serrulate or -crenulate, apex acuminate. Flowers solitary in axils of little-reduced or unreduced leaves, and uppermost 10–25 often aggregated into a terminal raceme; pedicels 12–38 mm, densely puberulent. Hypanthium obconic or campanulate, 3–5(–7) mm, puberulent on veins or sometimes glabrous; calyx lobes erect, narrowly triangular or triangular, 3–7 mm, glabrous, margin entire or with 1–3 teeth per side. Corolla red-purple or greenish with lip purple spotted, 18–23 mm, both sides sparsely pubescent; dorsal lobes linear or linear-triangular; ventral lobes lanceolate, acuminate. Filament tube glabrous, ca. 2 × as long as anther tube; anther tube gray, 5–6 mm, glabrous; ventral anthers barbate at apex with white hairs ca. 1 mm or smaller. Berry dry, globose or obovoid, 7–17 mm. Seeds amber-colored, dull, broadly ellipsoid, 0.6–0.7 × 0.3–0.4 mm, subterete. Fl. and fr. Aug–Sep.

• Grassy slopes, forests, moist thickets on slopes and riverbanks; 1700–3000 m. SC Sichuan.

**22. *Lobelia montana*** Reinwardt ex Blume, Bijdr. 728. 1826.

山紫锤草 shan zi chui cao

*Lobelia brevisepala* (Y. S. Lian) Lammers; *L. reflexisepala* Lammers; *L. wardii* C. E. C. Fischer; *Pratia brevisepala* Y. S. Lian; *P. montana* (Reinwardt ex Blume) Hasskarl; *P. reflexa* Y. S. Lian; *P. wardii* (C. E. C. Fischer) F. E. Wimmer; *Speirema montanum* (Reinwardt ex Blume) J. D. Hooker & Thomson.

Herbs, perennial, up to 2 m tall. Stems erect, arching, or sprawling, terete, commonly branched from base and sometimes above, upper internodes zigzag, glabrous (rarely sparsely scabrous, or puberulent when young). Leaves petiolate; blade elliptic, ovate, or lanceolate, 3.5–13 × 1.2–4.6 cm, papery, glabrous (rarely puberulent when young, or sparsely scabrous on midrib), base cuneate, obtuse, or rounded, margin glandular-serrulate, -denticulate, or -crenulate, apex caudate or sometimes merely acuminate; petiole 0.3–1.3 cm. Flowers solitary and

axillary; pedicels slender, 24–55 mm, glabrous. Hypanthium globose or campanulate (rarely obconic), 3–6 mm, glabrous; calyx lobes spreading, recurved, or rarely reflexed, linear-triangular or linear, 2–14 mm, margin entire. Corolla dark violet to bluish lilac, lip often paler, or striped, margined, or blotched with white, 15–26 mm, outside glabrous, inside villous; dorsal lobes linear; ventral lobes elliptic, apex caudate. Filament tube glabrous, up to 2.5 × as long as anther tube; anther tube light gray, 4.8–7 mm, dorsal surface sparsely shortly pubescent at least toward apex; lower 2 anthers barbate at apex with tufts of white hairs up to 2 mm. Berry violet to black-purple, globose, 6–15 mm. Seeds amber-colored, shiny, broadly ellipsoid, slightly compressed, 0.5–0.8 × 0.3–0.5 mm. Fl. Jul–Nov, fr. Aug–Apr.

Moist ravines, glades, meadows, scrub, forest margins; 1000–4000 m. Xizang, SE Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Vietnam].

**23. *Lobelia deleiensis*** C. E. C. Fischer, Bull. Misc. Inform. Kew 1940: 297. 1941.

滇紫锤草 dian zi chui cao

*Pratia montana* (Reinwardt ex Blume) Hasskarl var. *deleiensis* (C. E. C. Fischer) F. E. Wimmer.

Herbs, rhizomatous, up to 2 m tall. Stems erect or arching, often branched from base and sometimes above, glabrous. Leaves petiolate; blade elliptic or lanceolate, 6–14 × 1.4–4.2 cm, papery or somewhat leathery, both surfaces glabrous, base cuneate to obtuse, margin glandular-serrulate, -crenulate, or -denticulate, apex caudate; petiole 0.3–1.8 cm. Flowers solitary and axillary; pedicels slender, 1.6–4.5 cm. Hypanthium campanulate or obovoid, 4–7 mm, glabrous; calyx lobes spreading or recurved, linear or linear-triangular, 5–17 mm, glabrous, entire. Corolla cream-colored or greenish with purple or blue markings on lip, 1.2–1.8 cm, outside glabrous, inside pubescent; dorsal lobes linear or linear-spatulate; ventral lobes narrowly elliptic, apex caudate. Filament tube glabrous or sparsely pubescent, ± equaling anther tube; anther tube cream-colored, 6–8 mm, glabrous or sparsely shortly pubescent toward apex; ventral anthers bearded at apex with tufts of white hairs up to 2 mm. Berry greenish, globose, 8–11 mm. Seeds tan, dull, broadly ellipsoid, slightly compressed, ca. 0.6 × 0.4 mm. Fl. Jul–Nov, fr. Aug–Apr.

Evergreen broad-leaved forests; 1500–2400 m. SW Yunnan [NE India].

## 16. HIPPOBROMA G. Don, Gen. Hist. 3: 698, 717. 1834.

马醉草属 ma zui cao shu

Hong Deyuan (洪德元); Laura L. Klein, Thomas G. Lammers

Herbs, perennial. Roots coarse, thickened, fascicled. Leaves alternate, margin repand-dentate or repand-serrate, sometimes

merely sinuate, teeth apiculate. Flowers large, fragrant, solitary, axillary; pedicels with 2 filiform bracteoles at base. Corolla salverform, white; tube entire; lobes monomorphic. Filament tube adnate to corolla; all anthers with apical tufts of stiff hairs; anther tube scarcely exserted. Fruit pendent, capsular, 2-locular, apically dehiscent by 2 valves.  $2n = 28$ .

One species: native to Jamaica; widely introduced and naturalized in tropics and subtropics, including China.

**1. *Hippobroma longiflora*** (Linnaeus) G. Don, Gen. Hist. 3: 717. 1834.

马醉草 ma zui cao

*Lobelia longiflora* Linnaeus, Sp. Pl. 2: 930. 1753; *Isotoma longiflora* (Linnaeus) C. Presl; *Laurentia longiflora* (Linnaeus) Petermann; *Solenopsis longiflora* (Linnaeus) M. R. Almeida.

Stems erect, 9–35 cm tall, simple or branching at base, glabrous or increasingly villous toward apex. Leaves sessile or shortly petiolate; blade  $7\text{--}16 \times 1\text{--}3.7$  cm, oblanceolate or elliptic, glabrous or sometimes sparsely villous, base attenuate, apex

acute or acuminate. Pedicels 3–10 mm, densely villous. Corolla white; tube 6.5–10 cm, villous, entire; lobes elliptic, narrowly elliptic, or linear, 1.8–2.5 cm. Hypanthium campanulate, obconic, or ellipsoid, 6–9 mm, densely villous; calyx lobes linear, 8–19 mm, villous, margin denticulate. Anther tube ca. 7 mm. Capsule obconic, campanulate, broadly ellipsoid, or obovoid,  $11\text{--}15 \times 8\text{--}12$  mm, densely villous. Seeds light brown to red-brown, broadly ellipsoid, terete or slightly compressed, ca. 0.7 mm, reticulate.  $2n = 28$ .

Guangdong, Taiwan [native to Jamaica; widely introduced and naturalized in tropics and subtropics].

## PENTAPHRAGMATACEAE

五膜草科 wu mo cao ke

Hong Deyuan (洪德元)<sup>1</sup>; Nicholas J. Turland<sup>2</sup>

Herbs perennial, ± succulent, without latex. Rhizome elongate, robust, often ± woody. Leaves alternate; leaf blade large, asymmetric at base. Inflorescence an axillary cyme or cincinnus, solitary or 2 or 3 together; pedicels short or absent. Flowers bisexual, actinomorphic except calyx. Calyx tube campanulate or tubular; calyx lobes 5, persistent, often white, unequal in width, often 2 wider and other 3 narrower. Corolla adnate to calyx as far as distal part of calyx, 5-cleft for more than halfway, or nearly fully divided and appearing petaloid, often white. Stamens 5, alternate with corolla lobes, inserted at proximal part of corolla tube; filament glabrous; anther ovoid or long ellipsoid, introrse or almost lateral due to connective being developed and exerted higher than anther cells. Ovary inferior, 2-loculed; ovules numerous; stigma capitate or conic, entire. Fruit an indehiscent berry. Seeds numerous, minute, ovoid or ovoid-globose; testa obviously reticulate.

One genus and ca. 25 species: S China, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, Vietnam; two species (one endemic) in China.

Pentaphragmataceae and Campanulaceae are not immediately related, although both are in the Asterales. *Pentaphragma* has quite different flowers, with no hint of the secondary pollen presentation that occurs throughout Campanulaceae s.l. Thus the inflorescence is cymose, usually scorpioid; the sepals are petaloid, with two large ones and three small ones; the corolla is ± deeply lobed; there are nectariferous cavities between septa joining hypanthium to ovary (unique in flowering plants); and the anthers are extrorse (introrse in all Campanulaceae s.l.). In addition, there is no latex; the leaves are distichous, with leaf blades strongly asymmetric; and the endosperm is starchy, the latter condition being extremely uncommon in Campanulaceae s.l.

Hong De-yuan. 1983. Campanulaceae (Pentaphragmatoideae). In: Hong De-yuan, ed., Fl. Reipubl. Popularis Sin. 73(2): 174–176.

### 1. PENTAPHRAGMA Wallich ex G. Don, Gen. Hist. 3: 731. 1834.

五膜草属 wu mo cao shu

Morphological characters and geographic distribution are the same as those of the family.

- 1a. Calyx longer than corolla; inflorescence strongly curved; flowers 2 in axil of bract ..... 1. *P. sinense*  
1b. Calyx shorter than corolla; inflorescence straight; flower 1 in axil of bract ..... 2. *P. spicatum*

**1. *Pentaphragma sinense*** Hemsley & E. H. Wilson, Bull. Misc. Inform. Kew 1906: 160. 1906.

五膜草 wu mo cao

Plants covered with glandular hairs and these mixed with stellate hairs on young stems, petioles, abaxial surface of leaf blade, inflorescence axis, bracts, pedicels, and calyx. Rhizome to 30 × 1 cm, ± woody. Fibrous roots ca. 3 mm in diam. Stem short but robust, with leaves borne at one side. Leaves petiolate; petiole 3–10 cm; leaf blade ovate, asymmetric, 10–20 × 5–12 cm, main veins arcuate, margin entire or obscurely verrucose denticulate. Inflorescences solitary or 2 together, pedunculate, strongly curved, bracteate; peduncle 2–4 cm; bracts ovate, with 2 flowers at axil; pedicels 1–2 mm. Calyx tube campanulate; calyx lobes broadly elliptic or linear-oblong, ca. 6 × 2–3 mm. Corolla white, 6–7 mm, cleft for more than halfway; lobes long elliptic. Stamens: connective higher than anther cells; anther cells long ellipsoid, almost laterally longitudinally dehiscent. Stigma conic, almost smooth. Berry obovoid, ca. 9 mm. Seeds ovoid, ca. 0.3 mm; testa yellow, obviously reticulate. Fl. and fr. May–Nov.

Forests, by streams, moist shady banks of ravines; [200–1500 m]. S Yunnan (Hekou, Pingbian, Xishuangbanna) [N Vietnam].

**2. *Pentaphragma spicatum*** Merrill, Philipp. J. Sci. 21: 511. 1922.

直序五膜草 zhi xu wu mo cao

*Pentaphragma corniculatum* Chun & F. Chun.

Plants rather densely covered with glandular hairs and these mixed with stellate hairs on young stems, petioles, abaxial surface of leaves, inflorescence axis, bracts, and abaxial surface of calyx. Rhizome oblique, elongate, robust, to 15 × 1.5 cm, ± woody. Fibrous roots ca. 2 mm in diam. Stem short, often with leaves at one side, usually with remains of petioles. Leaves petiolate; petiole 5–15 cm; leaf blade ovate or ovate-orbicular, asymmetric, 10–30 × 6–20 cm, margin entire or verrucose denticulate. Inflorescences solitary or 2 together, pedunculate, straight; peduncle with an involucre of bracts much smaller than leaves; bracts obovate, ca. 4 mm, with 1 flower at axil; pedicels 1–2 mm. Flowers ca. 1.6 cm. Calyx tube campanulate; calyx lobes ca. 5 mm, 3-veined, broader 2 ovate-orbicular, ca. 4 mm wide, other 3 long oblong, ca. 2 mm wide. Corolla white or yellow-green, ca. 9 mm, cleft for more than halfway; lobes slightly incurved, lanceolate, glabrous. Stamens: connective higher than anther cells. Stigma

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conic, almost without ribs. Berry ellipsoid, ca. 8 mm. Seeds ovoid, ca. 0.3 mm; testa dark brown, obviously reticulate. Fl. May–Jul, fr. Oct–Nov.

- Tropical forests in ravines, dense forests; ca. 1400 m. SW

Guangdong (Xinyi), S Guangxi (Daxin, Dongxing, Shiwan Dashan), Hainan (Baisha, Baoting).

*Pentaphragma spicatum* should be expected in N Vietnam. The type locality (Dongxing in Guangxi Province) is close to the border.

## STYLIDIACEAE

花柱草科 hua zhu cao ke

Hong Deyuan (洪德元)<sup>1</sup>; Juliet A. Wege<sup>2</sup>

Herbs [rarely small shrubs or cushion plants], without laticifers. Stipules absent. Leaves in rosettes or alternate [rarely whorled or imbricate], simple. Inflorescences terminal, cymes, lax spikes [racemes, panicles, pseudoheads, or corymbs], or with flowers solitary. Flowers perfect [rarely unisexual by abortion], usually zygomorphic. Calyx synsepalous; tube adnate to ovary; limb with 5[–9] distinct or partly connate lobes, occasionally 2-labiate. Corolla sympetalous, [4 or]5[–9]-lobed; lower lobe (labellum) often smaller and reflexed [rarely hooded]. Stamens 2, adnate with style, forming a gynostemium (column); gynostemium often irritable, normally bent to labellar side but snapping to an oppositely bent position when touched; anthers extrorse, 2-celled, protandrous. Ovary inferior, incompletely 2-locular [occasionally 1-locular due to reduction of septum]; ovules few to numerous, on axile or free central placentas, anatropous; stigma entire or 2-cleft. Fruit a capsule, usually septicidal. Seeds minute; seed coat thin; embryo small, embedded in copious endosperm.

Four genera and ca. 320 species: Australia, New Zealand, S end of South America, with only *Stylidium* extending into tropical Asia; one genus and two species in China.

Hong De-yuan. 1983. Stylidiaceae. In: Hong De-yuan, ed., Fl. Reipubl. Popularis Sin. 73(2): 180–182.

### 1. *STYLIDIUM* Swartz ex Willdenow, Sp. Pl. 4: 7, 146. 1805, nom. cons., not Loureiro (1790).

花柱草属 hua zhu cao shu

Herbs [rarely small shrubs or cushion plants], annual [or perennial], bearing glandular [and/or non-glandular] trichomes [seldom completely glabrous]. Leaves cauline or in a basal rosette [rarely whorled or imbricate]. Inflorescences lax spikes, cymes [racemes, panicles, pseudoheads, or corymbs], or with flowers solitary. Flowers perfect, zygomorphic. Calyx lobes 5, [distinct or] with 3 distinct and 2 connate [occasionally 2-labiate]. Corolla 5-merous, irregular; throat appendages (paracorolla) often present; lobes 5 but lowest (labellum) much smaller, usually reflexed, simple [or appendiculate]. Gynostemium usually exerted from corolla, bent and irritable [rarely erect and immobile]; anthers 2-locular; stigma entire [or 2-cleft]. Ovary incompletely 2-locular [or 1-locular due to reduction of septum]; ovules few to more often numerous.

About 300 species: tropical Asia, Australia, New Zealand; two species in China.

Almost all species occur in Australia with Asia only having seven species, six of which are endemic to Asia.

- 1a. Leaves basal, with a short petiole; leaf blade ovate-orbicular, ovate, or obovate; capsule ca. 0.8 cm ..... 1. *S. uliginosum*  
1b. Leaves cauline, sessile or subsessile; leaf blade oblong-obovate to lanceolate; capsule to 2 cm ..... 2. *S. tenellum*

**1. *Stylidium uliginosum*** Swartz ex Willdenow, Sp. Pl. 4: 147. 1805.

花柱草 hua zhu cao

*Stylidium sinicum* Hance.

Herbs 5–13 cm tall, annual. Stems compressed. Leaves in a basal rosette, with a short petiole; leaf blade ovate-orbicular, ovate, or obovate, 5–8 mm, glabrous, veins obscure, base cuneate, margin entire, apex obtuse to rounded. Inflorescences lax spikes; scapes 1–3, simple or dichotomously branched, covered with sparse short glandular trichomes; bracts ovate, less than 1 mm. Flowers sessile. Calyx tube (hypanthium) linear, with sparse glandular trichomes; lobes partly connate, with 3 distinct and 2 connate into a shallowly 2-lobed segment. Corolla white, ca. 2 mm, glabrous; tube slightly shorter than [or ca. equal to] calyx lobes; throat appendages minute [or absent]; labellum minute, ovate; lower pair of lobes much longer than upper pair,

lobe apices shallowly 2-lobed [or entire]. Gynostemium ca. 3.5 mm. Capsule columnar, ca. 8 mm. Fl. Oct–Nov.

Moist grassy places by streams in coastal hilly areas. Guangdong, Hainan [Cambodia, Sri Lanka, Thailand, Vietnam].

**2. *Stylidium tenellum*** Swartz ex Willdenow, Sp. Pl. 4: 146. 1805.

狭叶花柱草 xia ye hua zhu cao

Herbs 5–20[–27] cm tall, annual. Stems slender, simple or laxly dichotomously branched, glabrous. Leaves alternate, sessile or subsessile; leaf blade oblong-obovate to oblanceolate, 6–10 mm, apical ones smaller and grading into bracts, glabrous, veins 3, base cuneate, margin entire, apex obtuse. Inflorescences dichotomously branched lax spikes or with flowers solitary; scapes absent; bracts linear, ca. 2 mm. Flowers sessile. Calyx tube (hypanthium) linear, with sparse glandular trichomes

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or glabrous; lobes partly connate, with 3 distinct and 2 connate into a shallowly 2-lobed segment. Corolla white or rose-purple, less than 2 mm, with sparse glandular trichomes; tube slightly longer than calyx lobes; throat appendages minute; labellum minute, subulate; lower pair of lobes longer than upper pair,

lobe apices shallowly 2-lobed. Gynostemium 4–5 mm. Capsule thinly columnar, to 2 cm. Fl. and fr. Oct.

Paddy fields, swamps; below 1000 m. SE Fujian, Guangdong, Hainan, S Yunnan (Xishuangbanna) [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

## GOODENIACEAE

草海桐科 *cao hai tong ke*

Hong Deyuan (洪德元)<sup>1</sup>; Dianella G. Howarth<sup>2</sup>

Herbs, shrubs, or rarely small trees [or vines], without laticifers. Stipules absent. Leaves alternate, rarely opposite or whorled, simple. Inflorescences a cyme, raceme, head, or sometimes single flowered in axils. Flowers perfect, protandrous. Calyx epigynous, tubular, mostly (3–)5-lobed. Corolla sympetalous, irregular, 2-lipped or sometimes 1-labiate due to 2-segmentation of posterior lip to base; lobes 5, valvate, often induplicate. Stamens 5, alternate with corolla lobes, free from corolla or adnate to base of corolla tube; anthers 4-sporangiate and dithecal, introrse, longitudinally dehiscent. Ovary inferior, semi-inferior [or rarely (*Velleia* Smith) essentially superior], (1 or)2-locular [occasionally 4-locular (*Scaevola porocarya* F. Mueller)]; ovules 1 to many per locule, on axile or basal-axile placentas, anatropous. Fruit usually a capsule, less often a drupe or a small nut, often with persistent calyx. Seeds with a straight embryo embedded in copious endosperm.

Twelve genera and ca. 400 species: pantropical and extending into subtropics; two genera and three species in China.

The greatest diversity of the family is in Australia.

Pollen presentation mechanism in the family is complex. The anthers are connivent or connate to form a tube into which pollen grains shed. The style, with a cupular indusium below the small stigma, grows up through the anther tube and collects the pollen grains, which are subsequently deposited or brushed onto visiting insects.

Hong De-yuan. 1983. Goodeniaceae. In: Hong De-yuan, ed., Fl. Reipubl. Popularis Sin. 73(2): 177–180.

- 1a. Fruit a drupe; shrubs or small trees ..... 1. *Scaevola*  
1b. Fruit a capsule; herbs ..... 2. *Goodenia*

### 1. SCAEVOLA Linnaeus, Mant. Pl. 2: 145. 1771, nom. cons.

草海桐属 *cao hai tong shu*

*Lobelia* Miller (1754), not Linnaeus (1753).

Shrubs or small trees [or herbs]. Leaves alternate and spirally arranged, or opposite. Flowers in axillary cymes, or solitary and axillary; bracts opposite; bracteoles opposite. Calyx epigynous; tube adnate to ovary; limb cupular, short, 5-dentate or 5-lobed. Corolla zygomorphic, posterior side longitudinally divided to near base; lobes 5, subequal in size. Ovary 2-locular; each locule with 1 upright ovule on axile placenta [or 1-locular, with 1 or 2 ovules also on axile placenta]; stigma 2-cleft. Drupe often fleshy; endocarp hard; each locule with 1 seed.

About 80 species: pantropical but mainly in Australia; two species in China.

- 1a. Flowers in an inflorescence; leaf blade spatulate to obovate, 10–22 × 4–8 cm ..... 1. *S. taccada*  
1b. Flowers solitary, axillary; leaf blade linear-spatulate, 1–2.5 × 0.2–0.5 cm ..... 2. *S. hainanensis*

**1. *Scaevola taccada*** (Gaertner) Roxburgh, Hort. Bengal. 15. 1814.

草海桐 *cao hai tong*

*Lobelia taccada* Gaertner, Fruct. Sem. Pl. 1: 119. 1788;  
*Scaevola frutescens* Krause, nom. illeg. superfl.; *S. koenigii* Vahl; *S. sericea* Vahl.

Shrubs or small trees, to 7 m tall, erect or diffuse. Twigs 5–10 mm in diam., sometimes rooting, hollow, usually glabrous but axils with a tuft of dense white barbate trichomes. Leaves spirally arranged, mostly aggregated at apex of branches, sessile or shortly petiolate; leaf blade spatulate to obovate, 10–22 × 4–8 cm, slightly succulent, glabrous or abaxially sparsely villous, base cuneate, apex rounded, truncate, or emarginate. Cymes axillary; bracts and bracteoles small, with a tuft of barbate trichomes in axils. Pedicel with a joint at apex. Calyx glabrous;

tube obovoid; lobes linear-lanceolate, ca. 2.5 mm. Corolla white to pale yellow or purple, ca. 2 cm; tube thinly tubular, posterior side divided to base, outside glabrous, inside densely white villous; limb patent; lobes lanceolate, thickened at center, each side with a wide membranous and induplicate wing above middle, margin sparsely ciliate. Anthers connivent into a tube with basal part of indusium, becoming free after anthesis; connective longer than cells, becoming lamellar at apex. Drupe white, ovoid-globose, 7–10 mm in diam., divided longitudinally by furrows into 2 parts each 4-ribbed, 2-locular; locules each with 1 seed. Fl. and fr. Apr–Dec.  $2n = 16$ .

Open coastal sands or rocks; near sea level. Dongsha Qundao, SE Fujian, Guangdong, Guangxi, Hainan, Nansha Qundao, Taiwan, Xisha Qundao [India, Indonesia, S Japan, Malaysia, Myanmar, Papua New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, tropical Australia, Indian Ocean islands, Madagascar, Pacific islands].

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*Scaevola taccada* is naturalized in some coastal areas of tropical and subtropical America. It likely occurs in coastal Cambodia and the SE coast of Bangladesh, although these potential distributions need to be confirmed. For a discussion of the nomenclatural problems concerning the Indo-Pacific species *S. taccada* and the Indo-Atlantic species *S. plumieri* (Linnaeus) Vahl see P. S. Green (Taxon 40: 118–122. 1991), C. Jeffrey (Kew Bull. 34: 537–545. 1980), and R. K. Shannon et al. (Taxon 46: 801–802. 1997). The *Vienna Code*, Art. 33.3 Ex. 8, explains why the new combination as *S. taccada* was validly published by Roxburgh in 1814 due to reference to the published illustration by Rheede (Hort. Malab. 4: t. 59. 1683) which was also cited by Gaertner in his 1788 publication.

**2. *Scaevola hainanensis*** Hance, J. Bot. 16: 229. 1878.

小草海桐 xiao cao hai tong

Shrubs, small, diffuse. Old twigs elongate, glabrous; young shoots numerous, short, scaberulose, with a tuft of

woolly trichomes in axils. Leaves spirally arranged, aggregated at apex of branches, sometimes branches undeveloped and becoming extremely short and thus leaves appearing fascicled, sessile or shortly petiolate; leaf blade linear-spatulate, 1–2.5 × 0.2–0.5 cm, succulent, glabrous, only 1 main vein visible on abaxial side, margin entire. Flowers axillary, solitary. Pedicel ca. 1 mm; bracteoles opposite, at apex of pedicels, broadly linear, 3–4 mm, with a tuft of woolly trichomes. Calyx glabrous; tube obovoid-oblong, ca. 2 mm; limb shallowly cupular, apex sinuously 5-lobed. Corolla pale blue, ca. 8 mm, posterior side divided to base, remaining parts divided to middle, outside glabrous, inside of tube densely villous; lobes linear-elliptic, patent into 1 direction, with broad and membranous wings; wing margin basally ± fimbriate. Connective exerted beyond anther cells. Ovary 2-locular. Fl. and fr. Mar–Dec.

Coastal salt marshes, mangroves; near sea level. Dongsha Qundao, SE Fujian, Guangdong, Hainan, Taiwan [Vietnam].

**2. GOODENIA** Smith, Spec. Bot. New Holland 1: 15, t. 5. 1793.

离根香属 li gen xiang shu

*Balingayum* Blanco; *Calogyne* R. Brown.

Herbs, perennial [or more often annual], erect [or diffuse]. Leaves variable. Flowers axillary, inflorescence variable; both bracts and bracteoles present or absent. Calyx tube adnate to ovary or free; limb 5-lobed. Corolla usually cleft over 1/2 at posterior side; lobes patent toward anterior side, with a broad wing on each side; posterior 2 lobes with asymmetrical wings. Stamens free, epigynous. Ovary inferior, incompletely 2-locular; locules each with several ovules; style with 2 or 3 segments from middle; indusium cupular, shallowly 2-lobed, margin densely ciliate; stigma lamellar, entire. Fruit usually a capsule, 2-valvate. Seeds compressed, slightly thickened on margins, usually winged.

About 180 species: E and SE Asia, Australia; one species in China.

**1. *Goodenia pilosa*** (R. Brown) Carolin subsp. **chinensis** (Benth.) D. G. Howarth & D. Y. Hong, **comb. nov.**

离根香 li gen xiang

Basionym: *Calogyne chinensis* Benth., J. Proc. Linn. Soc., Bot. 5: 78. 1860; *Calogyne pilosa* R. Brown subsp. *chinensis* (Benth.) H. S. Kiu.

Herbs, perennial, erect. Stems slender, branched, single or several and caespitose, 5–15 cm tall but sometimes decumbent after anthesis, basally glabrous, apically sparsely hirsute. Basal leaves several; petiole to 1.5 cm; leaf blade long elliptic to linear-oblong, 2–5 × 0.3–0.6 cm, sparsely hirsute only along main vein on abaxial side and on margin, margin sparsely triangular serrate. Basal cauline leaves with a shorter petiole; leaf blade similar to but smaller than basal leaves. Apical cauline

leaves sessile; leaf blade similar in shape to but smaller than more basal leaves, often less than 1 cm. Flowers axillary, solitary, each cauline leaf with a flower but sometimes branches short and multiflowered to almost becoming a raceme. Pedicel 2–8 mm, slender, sparsely hirsute. Calyx tube ca. 2 mm, densely hirsute; lobes linear-lanceolate, ca. 4 mm. Corolla purple outside with bright brownish shade and inside yellow with orange spots, ca. 8 mm. Stamens ca. 3 mm; anthers mucronate at apex. Capsule ovoid-globose, ca. 3 mm in diam., with 5 seeds. Seeds ovoid, ca. 4 × 2 mm. Fl. and fr. Nov–Mar.

Paddy fields, grassy areas in forests or on hillsides; below 100 m. Fujian (Jinmen Dao, Xiamen), Guangdong (Huilai, Raoping), Guangxi (Fangcheng, Hepu), Hainan (Ding'an, Qionghai, Sanya) [Vietnam].

The typical subspecies is an annual herb that occurs in tropical Australia, Indonesia, Papua New Guinea, and the Philippines.

## ADOXACEAE

五福花科 wu fu hua ke

Yang Qiner (杨亲二)<sup>1</sup>, Hong Deyuan (洪德元)<sup>2</sup>; Valéry Malécot<sup>3</sup>, David E. Boufford<sup>4</sup>

Shrubs, less frequently perennial herbs, or small trees. Leaves opposite, simple or compound; ternate, biternate, ternate-pinnate, biternate-pinnate, or odd-pinnate. Inflorescences terminal panicles or umbellate, spicate, or capitate cymes. Flowers bisexual; calyx and corolla both connate, (3–)5-merous. Stamens 5 (*Sambucus*, *Viburnum*) or 5, 4, or 3 (*Adoxa*, *Sinadoxa*), alternate corolla lobes, inserted on corolla tube; filaments cleft into 2 semi-stamens (in *Adoxa*, *Sinadoxa*); anthers 1-celled, peltate, extrorse, longitudinally dehiscent; staminodes 5, 4, or 3, in inner whorl, opposite corolla lobes. Ovary semi-inferior to inferior, 1- or 3–5-loculed; styles 5, 4, or 3, connate or free, or absent; stigmas capitate or 2- or 3-fid. Fruit drupes; seeds 1 or 3–5.

Four genera and ca. 220 species: mainly in the N Hemisphere; four genera (one endemic) and 81 species (49 endemic) in China.

Chiu Lien-ching. 1986. ADOXACEAE. In: Lu An-ming & Chen Shu-kun, eds., Fl. Reipubl. Popularis Sin. 73(1): 1–5; Hu Jia-qi & Hsu Ping-sheng. 1988. *Sambucus* and *Viburnum*. In: Hsu Ping-sheng, ed., Fl. Reipubl. Popularis Sin. 72: 4–104.

- 1a. Leaves simple; ovary 1-loculed; drupes 1-seeded; shrubs or small trees ..... 1. *Viburnum*
- 1b. Leaves compound; ovary 3–5-loculed; drupes usually 3–5-seeded; shrubs, perennial herbs, or small trees.
  - 2a. Shrubs or small trees, rarely coarse perennial herbs more than 0.5 m tall; stamens 5, undivided ..... 2. *Sambucus*
  - 2b. Perennial herbs less than 30 cm tall; fertile stamens 5, 4, or 3, cleft into 2 semi-stamens, anthers 2-celled.
    - 3a. Basal and cauline leaves pinnately compound; inflorescence of several condensed cymes in an interrupted spike ..... 3. *Sinadoxa*
    - 3b. Basal leaves simple, 3-cleft, or ternately or biternately compound; cauline leaves simple and 3-cleft or ternate; inflorescences condensed capitate, several flowered cymes or racemelike ..... 4. *Adoxa*

### 1. VIBURNUM Linnaeus, Sp. Pl. 1: 267. 1753.

荚蒾属 jia mi shu

Yang Qiner (杨亲二); Valéry Malécot

*Actinotinus* Oliver, p.p.

Shrubs or small trees, deciduous or sometimes evergreen. Branchlets glabrous or pubescent with simple, fascicled or stellate hairs, rarely lepidote hairs; winter buds perulate or naked. Leaves usually opposite, rarely ternate, simple, petiolate, entire, dentate, or 3–5-lobed; stipules usually small or absent. Inflorescence terminal or at apices of short branches with 1- or 2-jugate leaves, compound, corymbose- or paniculate-cymose. Flowers small, actinomorphic, but sometimes marginal flowers of inflorescence enlarged, somewhat zygomorphic and sterile, rarely entire inflorescence consisting of such sterile flowers; bracts and bracteoles usually small and caducous. Calyx small, 5-toothed. Corolla white, rarely reddish, pinkish, or greenish, rotate, campanulate, hypocrateriform, or tubular, 5-lobed. Stamens 5; filaments filiform; anthers medifixed, longitudinally dehiscent, introrse. Ovary semi-inferior, 3-loculed, 1 locule fertile with a single ovule, and 2 sterile; styles short; stigmas slightly capitate to 3-lobed. Fruit a 1-seeded drupe with a ± compressed pyrene, red, purplish, black, or rarely yellow when mature.

About 200 species: mostly in temperate and subtropical regions of Asia and South America; 73 species (45 endemic) in China.

We were unable to check the original material of *Viburnum nervosum* var. *hassianum* Loesener (Beih. Bot. Centralbl., Abt. 2, 37: 185. 1920; Shandong: *Forstamt* 114, 596; *Krug* 236, 561, 305; *Zimmermann* 531). The loci typici are temples where the plant was cultivated (“Kap Yatau: angepflanz in der Tempelanlagen von Huayenan und Taitschingkung”) and are clearly outside the known distribution of *V. nervosum*; additionally, the provided description is quite vague (“a typo indumento parciore recedens”), while the phenological information provided (“mit länglichen Früchten im Mai”) does not match the known phenology of *V. nervosum*.

*Viburnum wrightii* Miquel (Ann. Mus. Bot. Lugduno-Batavi 2: 267. 1866) was recorded in FRPS (72: 88. 1988) as occurring in Anhui and Zhejiang, but we could not satisfactorily identify this species. Material from Anhui (*Feng* 1046, LBG – sheet no. 00081428) may belong to *V. betulifolium*, as well as material from Jiangxi (*Xiang* 8234, LBG – sheet no. 0029514) and that reported in Fl. Zhejiang (6: 150. 1986).

*Viburnum chinense* Hooker & Arnott (Bot. Beechey Voy. 190. 1833, not *V. sinense* Zeyher ex Colla, 1824) is a synonym of *Premna integrifolia* Linnaeus (Lamiaceae), according to FRPS (72: 104. 1988), which is treated in Fl. China (17:26. 1994) as a synonym of *P. serratifolia* Linnaeus. *Viburnum dielsii* H. Léveillé (Repert. Spec. Nov. Regni Veg. 9: 443. 1911, not Graebner, 1901) is a synonym of *Callicarpa rubella* Lindley var. *rubella* (see Fl. China 17: 13. 1994). *Viburnum versatile* R. H. Miao, W. B. Liao & Q. Y. Sun (Acta Sci. Nat. Univ. Sunyatseni 38(6): 129. 1999) apparently belongs to the Rubiaceae (Malécot, Hommes & Pl. 49: 22–27. 2004). *Actinotinus* was based on a mixed gathering comprising an inflorescence of *Viburnum* inserted on the terminal bud of a leafy shoot of *Aesculus chinensis* var. *wilsonii* (Rehder) Turland & N. H. Xia (see Fl. China 12: 3. 2007).

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- 1a. Inflorescence a panicle, sometimes densely clustered, rarely a corymblike panicle, rays opposite, decussate, first node of inflorescence with 2 rays; pyrenes with a deep ventral groove (if first node of panicle-like inflorescence with 4–6 rays and pyrenes with 2 deep dorsal grooves and 1 shallow ventral groove then see *V. pyramidatum*) (4. *V.* sect. *Solenotinus*).
- 2a. Corolla rotate, lobes as long as or longer than tube.
- 3a. Leaves papery, abaxially with red-brown glandular dots; inflorescence a corymblike panicle ..... 38. *V. yunnanense*
- 3b. Leaves thickly papery to leathery, abaxially without red-brown glandular dots; inflorescence a corymblike or pyramidal panicle.
- 4a. Panicle corymblike ..... 24. *V. corymbiflorum*
- 4b. Panicle pyramidal.
- 5a. Lateral veins at least partly directly ending in teeth; inflorescence axes glabrous or subglabrous; calyx reddish ..... 28. *V. henryi*
- 5b. Lateral veins arched and anastomosing near margin, not directly ending in teeth; inflorescence axes glabrous or stellate-pubescent; calyx green.
- 6a. Leaves thickly papery; pyrenes ca.  $4 \times 3.5$  mm ..... 36. *V. tengyuehense*
- 6b. Leaves leathery; pyrenes  $7-8 \times 4-5$  mm.
- 7a. Calyx and corolla glabrous; flowers fragrant; pyrenes ovoid or ovoid-ellipsoid, apex rounded ..... 30. *V. odoratissimum*
- 7b. Calyx and corolla, or at least calyx, stellate-pubescent outside; flowers not fragrant; pyrenes ovoid or narrowly ovoid, apex acuminate ..... 21. *V. brachybotryum*
- 2b. Corolla funnellform or hypocrateriform, very rarely rotate-campanulate, lobes shorter than tube.
- 8a. Stamens inserted at or above middle of corolla tube, generally at different heights; flowers opening before leaves; leaves papery.
- 9a. Leaves abaxially slightly pubescent on veins, veins 5–7-jugate, apex acute; inflorescence a panicle, at apices of short branchlets with young leaves; bracts ciliate, subglabrous ..... 26. *V. farreri*
- 9b. Leaves abaxially densely pubescent, veins 6–10-jugate, apex acuminate; inflorescence densely clustered at apices of leafless short branchlets; bracts densely silvery sericeous initially ..... 27. *V. grandiflorum*
- 8b. Stamens inserted at apex of corolla tube; flowers opening after leaves; leaves papery to leathery.
- 10a. Leaves abaxially with sparse red-brown glandular dots, orbicular or broadly elliptic ..... 34. *V. subalpinum*
- 10b. Leaves abaxially without red-brown glandular dots, broadly elliptic to linear.
- 11a. Both surfaces of leaf blade glabrous.
- 12a. Leaf margin remotely crenulate except at base, apex acute; corolla tube ca. 3.5 mm ..... 32. *V. omeiense*
- 12b. Leaf margin remotely and shallowly serrate above base, apex abruptly narrowed or acuminate to long acuminate, shortly or long caudate; corolla tube 6–8 mm.
- 13a. Leaves subleathery to leathery, rarely thickly papery, midvein adaxially obviously raised, petiole purple-red; inflorescence peduncle (1.2–)2.5–7 cm; anthers purple-reddish; fruit 6–7 mm ..... 31. *V. oliganthum*
- 13b. Leaves papery, midvein adaxially not obviously raised, petiole green; inflorescence peduncle (3.5–)6–9 cm; anthers yellow-whitish; fruit 8–10 mm ..... 29. *V. longipedunculatum*
- 11b. Leaf blade abaxially stellate-pubescent in axils of veins at least, sometimes also along veins, adaxially glabrous or sparsely pubescent.
- 14a. Petiole glabrous, 2.5–5 cm; leaf blade 14–20 cm ..... 37. *V. trabeculosum*
- 14b. Petiole stellate-pubescent, sparsely stellate-pubescent, or glabrous, less than 2.5 cm; leaf blade 2–14 cm.
- 15a. Petiole less than 10 mm.
- 16a. Inflorescence  $4-5 \times 3-4$  cm, rays sparsely stellate-pubescent, immediately glabrescent; anthers purple-brownish; plant deciduous ..... 22. *V. brevitubum*
- 16b. Inflorescence ca.  $3 \times 2$  cm, rays stellate-pubescent; anthers yellow-whitish; plant evergreen ..... 35. *V. taitoense*
- 15b. Petiole 10–25 mm.
- 17a. Lateral veins mostly anastomosing near margin; leaves subleathery ..... 23. *V. chingii*
- 17b. Lateral veins mostly directly ending in teeth; leaves papery.
- 18a. Corolla hypocrateriform, tube 5–6(–8) mm; stamens slightly exceeding corolla tube; flowers fragrant; leaf petiole purple ..... 25. *V. erubescens*
- 18b. Corolla rotate-campanulate, tube ca. 3 mm; stamens obviously exceeding corolla tube; flowers not fragrant; leaf petiole green or reddish ..... 33. *V. shweliense*
- 1b. Inflorescence compound and umbel-like, rarely pyramidal panicle consisting of umbels; rays whorled, first node of inflorescence with 4–8 rays, (if first node of corymblike inflorescence with 2 rays and pyrenes with a deep ventral groove then see *V. yunnanense* and *V. corymbiflorum*); pyrenes with 1 shallow ventral, or with both ventral and dorsal grooves.

- 19a. Winter buds naked; young branchlets and young leaves densely stellate-tomentose, fruit maturing from green, to red then black.
- 20a. Stipules 2 subulate, sometimes absent; inflorescence not pedunculate; pyrenes with 1 shallow dorsal groove and 1 deep ventral groove (2. *V. sect. Pseudotinus*).
- 21a. Inflorescence without large sterile flowers, inflorescence rays and calyx tube with small red-brownish glands; anthers purple; style exceeding calyx lobes ..... 14. *V. nervosum*
- 21b. Inflorescence with large sterile flowers on margin, inflorescence rays and calyx tube without small red-brownish glands; anthers yellow; style not exceeding calyx lobes ..... 15. *V. sympodiale*
- 20b. Stipules always absent; inflorescence pedunculate; pyrenes usually with 2 dorsal grooves and (1–)3 ventral grooves (1. *V. sect. Viburnum*).
- 22a. Shrubs or small trees, evergreen or semievergreen; leaf margin entire or indistinctly dentate, rarely serrulate; lateral veins often anastomosing near margin, not directly ending in teeth.
- 23a. Calyx tube glabrous; leaves 2–6(–8.5) cm, veins adaxially not impressed.
- 24a. Corolla campanulate-funnelform, lobes shorter than tube; old leaves abaxially evenly stellate-pubescent, hairs not totally covering leaf surface; flowers fragrant; leaf lateral veins 3 or 4 pairs ..... 5. *V. congestum*
- 24b. Corolla rotate, lobes as long as or slightly longer than tube; stellate hairs totally covering abaxial surfaces of old leaves; flowers not fragrant; leaf lateral veins 5 or 6 pairs ..... 13. *V. utile*
- 23b. Calyx tube ± stellate-pubescent; leaves 5–25 cm.
- 25a. Leaf blade adaxially densely stellate-pubescent, margin serrulate, apex acute to shortly acuminate, rarely obtuse to rounded ..... 1. *V. buddleifolium*
- 25b. Leaf blade adaxially glabrous or glabrescent, sparsely stellate-pubescent when young particularly on midvein and lateral veins, margin entire or rarely inconspicuously dentate, apex slightly acute or obtuse.
- 26a. Leaves lanceolate-oblong to narrowly oblong, usually 5–15 × 1.5–4.5 cm, thickly papery when old; lateral veins and veinlets adaxially slightly impressed, not obviously rugose; petioles 1–2 cm; corolla outside sparsely stellate-pubescent; flowers on rays of 2nd order ..... 4. *V. chinshanense*
- 26b. Leaves ovate-lanceolate to ovate-oblong, usually 8–25 × 2.5–8 cm, leathery; midvein, lateral veins, and veinlets adaxially deeply impressed, strongly rugose; petioles 1.5–4 cm; corolla outside subglabrous; flowers on rays of 3rd order ..... 10. *V. rhytidophyllum*
- 22b. Leaves deciduous in winter, margin often dentate.
- 27a. Lateral veins directly ending in teeth, not anastomosing, or at least mostly so.
- 28a. Calyx tube glabrous; corolla lobes shorter than tube; stamens shorter than corolla; style exceeding calyx lobes; leaf margin serrulate or entire ..... 6. *V. cotinifolium*
- 28b. Calyx tube stellate-tomentose; corolla lobes nearly as long as or less than 2 × as long as tube; stamens slightly exceeding corolla lobes; style not exceeding calyx lobes; leaf margin dentate ..... 7. *V. glomeratum*
- 27b. Lateral veins anastomosing near margin, not directly ending in teeth, or at least mostly so.
- 29a. Inflorescence with large sterile radiant flowers ..... 8. *V. macrocephalum*
- 29b. Inflorescence with only fertile flowers, without large sterile radiant flowers.
- 30a. Corolla rotate, tube shorter than lobes.
- 31a. Branchlets of previous year gray-brownish; leaves apically obtuse or rounded, sometimes emarginate or slightly acute; flowers mostly on rays of 3rd and 4th orders, flowers appearing with leaves; pyrenes dorsally raised or indistinctly 2-grooved ..... 11. *V. schensianum*
- 31b. Branchlets of previous year yellow-white; leaves apically usually acute, rarely slightly obtuse; flowers mostly on rays of 2nd order, flowers appearing after leaves; pyrenes with 2 dorsal grooves ..... 2. *V. burejaeticum*
- 30b. Corolla tubular-campanulate, rarely hypocrateriform, tube obviously longer than lobes.
- 32a. Corolla hypocrateriform ..... 3. *V. carlesii*
- 32b. Corolla tubular-campanulate.
- 33a. Leaves broadly ovate or elliptic to rarely suborbicular, 2.5–5(–6) cm, apex acute or obtuse; petioles 4–10 mm; flowers usually on rays of 1st order; corolla yellow-white ..... 9. *V. mongolicum*
- 33b. Leaves ovate-lanceolate or ovate-oblong, 7–15(–18) cm, apex acuminate to narrowly caudate; petioles 1–4 cm; flowers on rays from 3rd to 4th order; corolla purple outside ..... 12. *V. urceolatum*
- 19b. Winter buds with 1 or 2 (very rarely 3 or more) pairs of scales (rarely winter bud naked, and if such, buds, young branchlets, abaxial surfaces of leaves, inflorescences, calyces, corollas, and fruit with lepidote scales, see *V. punctatum*); young branchlets and young leaves stellate-pubescent, bristlelike hairy, or glabrous, fruit maturing from green to red (*V. sect. Odontotinus* and *V. sect. Opulus*) or from green to blue-black (*V. sect. Tinus* and *V. sect. Megalotinus* p.p.), rarely maturing from green, to red then black (*V. sect. Tomentosa* and *V. sect. Megalotinus* p.p.).

- 34a. Pyrenes globose, ovoid, or ellipsoid, with or without a shallow and narrow ventral groove, absolutely not compressed; fruit blue-black or turning from blue to black; leaves evergreen, glabrous or subglabrous (3. *V.* sect. *Timus*).  
 35a. Leaves pinnateveined ..... 16. *V. atrocyanum*  
 35b. Leaves triplinerved.  
 36a. Leaves apically obtuse to rounded, 2–6(–7.5) cm, margin entire; inflorescence peduncle ca. 1 cm ..... 20. *V. triplinerve*  
 36b. Leaves apically acute to acuminate, margin entire or remotely serrate; inflorescence peduncle 1–3.5(–4) cm.  
 37a. Corolla white; old leaves thickly leathery; veinlets adaxially deeply impressed, obviously rugose; anthers red-blackish ..... 18. *V. davidii*  
 37b. Corolla greenish white or yellowish green; old leaves leathery; veinlets adaxially sometimes slightly impressed, not obviously rugose; anthers yellow.  
 38a. Shrubs 1–2 m tall; inflorescence 2–7 cm in diam., glabrous; leaves 3–9(–11) cm, margin usually remotely serrate ..... 19. *V. propinquum*  
 38b. Shrubs or small trees 3–6 m tall; inflorescence 6–15 cm in diam.; leaves 6–13(–18) cm, margin entire or occasionally remotely serrate toward apex ..... 17. *V. cinnamomifolium*  
 34b. Pyrenes not as above; if ellipsoid then pyrenes with a deep ventral groove wide in upper part yet narrow in lower part; fruit red when mature, or turning from red to black, rarely yellow.  
 39a. Winter buds surrounded by 2 pairs of connate scales; leaves 3–5-lobed; petiolar apex or leaf base adaxially with 1–4 conspicuous glands (8. *V.* sect. *Opulus*).  
 40a. Inflorescence without large sterile flowers; leaves 3–5-lobed; petioles not longer than 2.5 cm ..... 72. *V. koreanum*  
 40b. Inflorescence with large sterile flowers on margin; leaves usually 3-lobed or those in upper part of branchlets undivided; petioles 1–5 cm ..... 73. *V. opulus*  
 39b. Winter buds with 1 or 2 pairs of separate scales; glands absent at petiolar apex or leaf base adaxially, but abaxially sometimes with circular glands on both sides of midvein near base.  
 41a. Leaves palmately 3–5-lobed, palmatinerved (7. *V.* sect. *Odontotinus*, p.p.) ..... 62. *V. kansuense*  
 41b. Leaves not divided or 2- or 3-lobed, mostly pinnateveined, sometimes 2 lateral veins at base appearing triplinerved.  
 42a. Inflorescence with large sterile flowers; fruit maturing from green to red then black; pyrenes with 1 ventral groove broad in upper part yet narrow in lower part (5. *V.* sect. *Tomentosa*).  
 43a. Leaves with more than 10 pairs of lateral veins; peduncle with 6–8 rays; inflorescences at apices of short lateral branches ..... 40. *V. plicatum*  
 43b. Leaves with 5–7(–9) pairs of lateral veins; peduncle usually with 5 rays; inflorescence terminal ..... 39. *V. hanceanum*  
 42b. Inflorescence without large sterile flowers; fruit maturing from green to red, rarely to black (if so see *V. cylindricum*, *V. lutescens*, and *V. punctatum*); pyrenes usually compressed, usually with shallow ventral and dorsal grooves.  
 44a. Shrubs or small trees evergreen, rarely deciduous (if so see *V. ternatum*); stipules usually absent (but present in *V. ternatum* and *V. inopinatum*); winter buds with a pair of separate scales, very rarely naked (if so see *V. punctatum*) (6. *V.* sect. *Megalotinus*).  
 45a. Winter buds naked; winter buds, abaxial leaf surfaces, inflorescences, and outside of corollas with lepidote scales ..... 47. *V. punctatum*  
 45b. Winter buds 2-perulate; plant not lepidote.  
 46a. Lateral veins totally or at least partly ending in teeth; inflorescence at apices of lateral short branchlets with 1-jugate leaves.  
 47a. Young branchlets, petioles, and inflorescences yellow-brown stellate-tomentose; first node of inflorescence with 6 or 7 rays ..... 41. *V. amplifolium*  
 47b. Plant glabrous throughout; first node of inflorescence with 4 or 5 rays ..... 44. *V. laterale*  
 46b. Lateral veins arched and anastomosing near margin, not directly ending in teeth; inflorescences at apices of branchlets with 1 to several pairs of leaves.  
 48a. Corolla campanulate; lobes short, erect; leaves abaxially with reddish or yellow glandular dots ..... 42. *V. cylindricum*  
 48b. Corolla rotate.  
 49a. Leaf margin serrate, or sometimes serrate except at base, base not glandular spotted; stamens slightly exceeding corolla, filaments not folded in bud.  
 50a. Branchlets and abaxial leaf surfaces sparsely stellate-pubescent, glabrescent; plant elsewhere subglabrous; leaves leathery; inflorescence a compound umbel-like or panicle-like cyme, fragrant ..... 46. *V. lutescens*

- 50b. Branchlets, abaxial leaf surfaces, petioles, peduncles, pedicels, and calyces yellow-brown stellate-tomentose; leaves papery; inflorescence a pyramidal panicle composed of 2–4 layers of umbels, not fragrant ..... 48. *V. pyramidatum*
- 49b. Leaf margins entire or sometimes slightly dentate at apex, base often glandular spotted on midvein; stamens obviously exceeding corolla, filaments folded in bud.
- 51a. Leaves often whorled, 3 per whorl; stipules 2, persistent; inflorescence peduncle nearly absent ..... 49. *V. ternatum*
- 51b. Leaves opposite; stipules absent or 2, caducous; inflorescence peduncle (1–)1.5–3 cm, rarely absent.
- 52a. Leaves pubescent or only so on veins, papery; calyx tube glabrous ..... 45. *V. leiocarpum*
- 52b. Leaves thickly stellate-tomentose, leathery; calyx tube stellate-tomentose ..... 43. *V. inopinatum*
- 44b. Shrubs, rarely small trees, deciduous, rarely evergreen; stipules sometimes present; winter buds with 2 pairs of separate scales (7. *V.* sect. *Odontotinus*, p.p.).
- 53a. Leaf blade oblong-lanceolate, lanceolate, or linear-lanceolate, 9–19(–27) × 1–4 cm, irregularly or remotely serrate, sometimes subentire; pyrenes compressed, subquadrangular or slightly rectangular.
- 54a. Young branchlets, leaves, petioles, and inflorescence axes glabrous; leaves with ca. 6 pairs of lateral veins ..... 71. *V. squamulosum*
- 54b. Young branchlets, veins on abaxial leaf surfaces, petioles, and inflorescence axes stellate-pubescent; leaves with 7–12 pairs of lateral veins ..... 63. *V. lancifolium*
- 53b. Leaf blade orbicular, ovate to elliptic-oblong, obovate, or rhombic-ovate, rarely broadly oblong-lanceolate, generally less than 10 cm, margin dentate, serrate, denticulate, or entire, if more than 10 cm then more than 4 cm wide and with margin dentate, or less than 4 cm wide and with margin entire (see *V. integrifolium*); pyrenes obovoid, ovoid, ellipsoid-ovoid, or ellipsoid.
- 55a. Leaf margin entire, possibly remotely serrate or remotely dentate above middle part.
- 56a. Shrubs deciduous; inflorescence peduncle more than 2 cm.
- 57a. Leaves glabrous on both sides, margin entire, apex abruptly narrowed and long caudate, petiole green; style not exceeding calyx lobes ..... 61. *V. integrifolium*
- 57b. Leaves stellate-pubescent at least abaxially, margin subentire, apex acute to shortly acuminate, petiole reddish purple; style exceeding calyx lobes ..... 56. *V. foetidum*
- 56b. Shrubs evergreen; inflorescence peduncle less than 2 cm or nearly absent.
- 58a. Leaves abaxially with both golden yellow glandular dots and red-brown to black-brown glandular dots, adaxially usually not nigrescent when dry ..... 51. *V. chunii*
- 58b. Leaves with black or brown glandular dots, nigrescent when dry.
- 59a. Calyx tube stellate-pubescent; leaves subleathery; fruit acute at apex ..... 59. *V. hainanense*
- 59b. Calyx tube glabrous; leaves leathery; fruit rounded at apex ..... 69. *V. sempervirens*
- 55b. Leaf margin dentate, serrate, or denticulate, sometimes only so above 1/3 from base.
- 60a. Leaves with 2–4 pairs of lateral veins, basal pair often appearing triplinerved.
- 61a. Leaf blade 0.8–3 cm, apex rounded or slightly acute; inflorescence ca. 2.5 cm in diam., peduncles ca. 5 mm; pyrenes with 1 ventral groove ..... 68. *V. parvifolium*
- 61b. Leaf blade 4–10 cm, apex acute to shortly acuminate; inflorescence 5–8 cm in diam., peduncles 2–5 cm; pyrenes with 3 ventral grooves ..... 56. *V. foetidum*
- 60b. Leaves with more than 5 pairs of pinnate lateral veins.
- 62a. Corolla outside glabrous or subglabrous, very rarely hairy in bud but later glabrescent (cf. *V. betulifolium*).
- 63a. Inflorescence or infructescence nodding; leaves nigrescent or slightly pale black when dry ..... 70. *V. setigerum*
- 63b. Inflorescence or infructescence not nodding; leaves not nigrescent when dry.
- 64a. Inflorescence peduncles (5–)6–10(–12.5) cm ..... 60. *V. hengshanicum*
- 64b. Inflorescence peduncles shorter than 5 cm.
- 65a. Petioles more than 1 cm; inflorescence 4–12 cm in diam.
- 66a. Stipules caducous, or absent; first node of inflorescence usually with 5 rays; flowers on rays of 2nd and 3rd orders; fruit dark purple-red, maturing black, ellipsoid; branchlet of current year grayish black ..... 66. *V. melanocarpum*
- 66b. Stipules persistent, often present; first node of inflorescence usually with 7 rays; flowers on rays from 3rd to 5th orders; fruit red, globose; branchlet of current year purple-brown ..... 50. *V. betulifolium*

- 65b. Petiole less than 15 mm, inflorescence less than 4 cm in diam.  
 67a. Stipules absent, petiole 5–15 mm, leaf blade ovate, apex caudate ..... 58. *V. formosanum*  
 67b. Stipules present or absent, petiole 3–5 mm, leaf blade ovate-lanceolate, ovate-oblong, narrowly ovate, elliptic, or oblong-lanceolate, apex acuminate or acute ..... 55. *V. erosum*
- 62b. Corolla sparsely or densely stellate-pubescent.  
 68a. Leaves abaxially with yellow or yellowish or nearly colorless transparent glandular dots.  
 69a. Petiole 1–3 cm, stellate pubescent or simple hairs less than 1 mm; calyx tube stellate-pubescent, flowers fragrant; plant 2.5–5 m tall ..... 54. *V. dilatatum*  
 69b. Petiole 0.5–1 cm, densely yellowish brown bristlelike hairy; calyx tube with simple hairs, flowers not fragrant; plant 1–2 m tall ..... 52. *V. corylifolium*
- 68b. Leaves abaxially without glandular dots.  
 70a. Leaves adaxially with transparent or dispersed red-brown glandular dots.  
 71a. Leaf blade abaxially densely stellate-pubescent, adaxially with dispersed red-brown glandular dots; inflorescence peduncle 1–3.5 cm or very rarely nearly absent; pyrenes compressed, ovoid, ca.  $6 \times 4$  mm, with 1 dorsal groove and 2 ventral grooves ..... 57. *V. fordiae*  
 71b. Leaf blade abaxially sparsely stellate-pubescent or forklike pubescent, adaxially with transparent glandular dots; inflorescence peduncle usually very short or nearly absent, very rarely to 1.5 cm; pyrenes very compressed, ovoid,  $4\text{--}5 \times 3\text{--}4$  mm, with 3 shallow dorsal grooves and 2 shallow ventral grooves ..... 65. *V. luzonicum*
- 70b. Leaves adaxially without glandular dots.  
 72a. Leaf blade abaxially glabrous except midvein and lateral veins yellow-brown bristlelike hairy; lateral veins 8–12-jugate ..... 53. *V. dalzielii*  
 72b. Leaf blade abaxially stellate-pubescent, or only so in vein axils; lateral veins 5–9-jugate.  
 73a. Styles very short, shorter than calyx lobes; corolla lobes nearly as long as tube; stamens shorter than corolla; pyrenes 4–6 mm; leaf margin serrate ..... 67. *V. mullaha*  
 73b. Styles exceeding calyx lobes; corolla lobes longer than tube; stamens equaling or slightly exceeding corolla; pyrenes 6–7.5 mm; leaf margin crenate ..... 64. *V. longiradiatum*

### 1. *Viburnum* sect. *Viburnum*

裸芽组 *luo ya zu*

Winter buds naked. Inflorescence a compound umbel-like cyme, without large sterile radiant flowers, pedunculate. Corolla rotate, hypocrateriform or tubular. Fruit initially turning red, maturing black; pyrenes with 2 dorsal grooves and 3 ventral grooves; albumen solid.

About 20 species: mostly in temperate Asia and Europe; 13 species (seven endemic) in China.

This section was divided into three subsections by H. Hara (Ginkgoana 5: 204–213. 1983): *Viburnum* subsect. *Solenolantana* (Nakai) H. Hara for *V. carlesii*, *V.* subsect. *Urceolata* Nakai for *V. urceolatum*, and *V.* subsect. *Viburnum* for the remaining species. Recent phylogenetic work shows that *V. subsect. Urceolata* may be separated from the remainder of *V. sect. Viburnum*. *Viburnum* subsect. *Lantana* and *V. subsect. Solenolantana* form a monophyletic group, and the recognition of *V. subsect. Solenolantana* makes *V. subsect. Lantana* paraphyletic.

**1. *Viburnum buddleifolium*** C. H. Wright, Gard. Chron. 33: 257. 1903.

醉鱼草状荚蒾 *zui yu cao zhuang jia mi*

Shrubs, semievergreen, to 5 m tall. Bark gray-brownish. Branchlets of current year whitish stellate-tomentose; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, whitish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–2(–4) cm, gray-whitish or whitish stellate-pubescent; leaf blade whitish green when young, lanceolate or lanceolate-oblong, rarely ovate-lanceolate,  $9\text{--}13\text{--}(18) \times 4\text{--}5\text{--}(7.5)$  cm, papery, abaxially gray-whitish stellate-pubescent, adaxially densely stel-

late-pubescent, midvein raised abaxially, lateral veins 7–9-jugate, pinnate, arched, branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised or inconspicuous abaxially, inconspicuous adaxially, not lobed, base rounded, frequently unequal, rarely cordate, without glands, margin serrulate, apex acute to shortly acuminate, rarely obtuse to rounded. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 9–12 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, gray-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 1–3 cm; bracts caducous, leaflike, green, linear-lanceolate, stellate-pubescent; bracteoles scalelike. Flowers on rays of 3rd order, not fragrant, subsessile or shortly pedicellate. Calyx greenish; tube tubular-campanulate, 2–3 mm,

gray-whitish stellate-pubescent; lobes broadly triangular-ovate, very small, 0.5–1 mm, stellate-tomentose, apex obtuse, ciliate. Corolla white, rotate, ca. 7 mm in diam., outside sparsely stellate-hairy; tube 3–4 mm; lobes spreading, orbicular-ovate, 2–3 mm, equaling tube, apex rounded, margin entire. Stamens slightly exceeding corolla lobes, inserted near base of corolla tube; filaments ca. 6 mm; anthers yellow, broadly elliptic, ca. 1 mm. Styles slightly exceeding or subequaling calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, oblong, ca. 9 × 7 mm, base rounded, apex rounded, glabrous or sparsely stellate-pubescent; pyrenes compressed, oblong, 6–8 × 5–6 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. Apr–May, fr. Jul.  $2n = 20^*$ .

• Forests; 1000–2000 m. W Hubei.

**2. *Viburnum burejaeticum*** Regel & Herder, *Gartenflora* 11: 407. 1862.

修枝荚蒾 xiu zhi jia mi

*Viburnum arcuatum* Komarov; *V. burejanum* Herder; *V. davuricum* Maximowicz (1859), not Pallas (1789).

Shrubs, deciduous, to 5 m tall. Bark dark grayish. Branchlets of current year gray-whitish stellate-tomentose; branchlets of previous year yellow-whitish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, gray-whitish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 5–12 mm, gray-whitish stellate-tomentose; leaf blade greenish white when young, broadly ovate to elliptic-obovate, (3–)4–6(–10) × 2–3 cm, papery, abaxially at first densely stellate pubescent but later only midvein and lateral veins hairy, adaxially sparsely stellate-pubescent or glabrous at first, later stellate-pubescent on midvein and lateral veins only, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, branched, anastomosing near margin, or some ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised or inconspicuous abaxially, inconspicuous adaxially, not lobed, base obtuse or rounded, both sides often unequal, without glands, margin serrulate, apex acute, rarely slightly obtuse. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 4–5 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, gray-whitish stellate-tomentose, without large sterile radiant flowers; peduncle to 2 cm or nearly absent; bracts caducous, leaflike, green, linear to linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers mostly on rays of 2nd order, not fragrant, sessile. Calyx greenish; tube oblong-tubular, ca. 4 mm, glabrous or rarely sparsely stellate-pubescent; lobes triangular, small, 1–2 mm, glabrous or with few stellate ciliate hairs, apex obtuse. Corolla white, rotate, ca. 7 mm in diam., glabrous; tube 1–2 mm; lobes spreading, broadly ovate, 2.5–3 mm, nearly 2 × as long as tube, apex rounded, margin entire. Stamens slightly exceeding corolla lobes, inserted near base of corolla tube; filaments ca. 3 mm; anthers yellow, broadly ellipsoid, ca. 1 mm. Styles taller than calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, ellipsoid to oblong, ca. 1 cm, base rounded, apex rounded, glabrous or sparsely stellate pubescent; pyrenes compressed, oblong, 9–10 × 4–5 mm, with

2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. May–Jun, fr. Aug–Sep.

Needle-leaved and broad-leaved mixed forests; 600–1400 m. Heilongjiang, Jilin, Liaoning [N Korea, Mongolia, Russia].

**3. *Viburnum carlesii*** Hemsley var. ***bitchiuense*** (Makino) Nakai, *Bot. Mag. (Tokyo)* 28: 295. 1914.

备中荚蒾 bei zhong jia mi

*Viburnum bitchiuense* Makino, *Bot. Mag. (Tokyo)* 16: 156. 1902.

Shrubs, deciduous, to 3 m tall. Bark gray-brownish. Branchlets of current year grayish stellate-pubescent; branchlets of previous year grayish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, grayish stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 4–12 mm, grayish stellate-pubescent; leaf blade greenish white when young, ovate to elliptic-ovate, 4–10 × 2–6 cm, papery, abaxially stellate-pubescent particularly along veins, adaxially sparsely simple hairy and stellate-pubescent, glabrescent, midvein raised abaxially, lateral veins 4- or 5-jugate, pinnate, slightly arched, branched, anastomosing near margin, or rarely ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base rounded to slightly cordate, without glands, margin denticulate, apex acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, ca. 6 cm in diam.; rays whorled; first node of inflorescence usually with 4–7 rays, dense, gray-whitish stellate-pubescent, without large sterile radiant flowers; peduncle 1–4 cm; bracts caducous, leaflike, green, ovate to elliptic, stellate-pubescent; bracteoles scalelike. Flowers on rays of 2nd or 3rd order, fragrant, subsessile or shortly pedicellate. Calyx greenish or reddish; tube oblong-tubular, 0.7–1 mm, glabrous; lobes ovate, very small, 0.5–1 mm, glabrous, apex obtuse. Corolla pinkish, hypocrateriform, ca. 1 cm in diam., glabrous; tube 8–10 mm; lobes spreading, broadly ovate, 5–6 × 3–5 mm, apex rounded, margin entire. Stamens inserted at or below middle of corolla tube, ca. 5 mm; filaments 2–4 mm; anthers yellow, oblong, ca. 2 mm. Styles nearly as long as calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, elliptic, 1.1–1.4 cm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, 6–8 × ca. 4 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. Mar–May, fr. Jun–Sep.  $2n = 18(16)$ .

Forests; 700–1300 m. W Anhui [Japan, Korea].

The typical variety, var. *carlesii*, occurs in Japan and Korea.

**4. *Viburnum chinshanense*** Graebner, *Bot. Jahrb. Syst.* 29: 585. 1901.

金佛山荚蒾 jin fo shan jia mi

*Viburnum cavaleriei* H. Léveillé; *V. hypoleucum* Rehder; *V. rosthornii* Graebner; *V. utile* Hemsley var. *elaeagnifolium* Rehder.

Shrubs, semievergreen, to 5 m tall. Bark gray-brownish or gray-whitish. Branchlets of current year yellow-whitish or

brownish stellate-tomentose; branchlets of previous year brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, yellow-whitish or brownish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–2 cm, gray-whitish or yellow-whitish stellate-tomentose; leaf blade greenish white when young, dark green when mature, lanceolate-oblong or narrowly oblong, 5–10(–15) × 1.5–4.5 cm, papery to thickly leathery, abaxially gray-whitish or yellow-whitish stellate-pubescent (particularly on young leaves), on old leaves gray-brownish, adaxially glabrous, or with sparse short hairs on midvein and lateral veins when young, midvein raised abaxially, lateral veins 7–10-jugate, pinnate, arched, branched, anastomosing near margin, raised abaxially, slightly (more conspicuously on young leaves) raised adaxially, veinlets transverse, conspicuous abaxially, slightly impressed or inconspicuous adaxially, not lobed, base rounded or slightly cordate, without glands, margin entire or rarely inconspicuously dentate, apex slightly acute or obtuse. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 4–6(–8) cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, subequal in length, dense, gray-whitish or yellow-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 1–2.5 cm; bracts caducous, leaflike, green, linear-lanceolate, stellate-pubescent; bracteoles scalelike. Flowers usually on rays of 2nd order, not fragrant, shortly pedicellate. Calyx greenish; tube oblong-ovate, ca. 2.5 mm, ± stellate-hairy; lobes broadly ovate, very small, 0.5–1 mm, sparsely stellate-pubescent, apex obtuse. Corolla white, rotate, ca. 7 mm in diam., outside sparsely stellate-hairy; tube ca. 3 mm; lobes spreading, orbicular-ovate or suborbicular, ca. 2 mm, apex rounded, margin entire. Stamens slightly exceeding corolla lobes, inserted near base of corolla tube; filaments ca. 5 mm; anthers yellow, broadly elliptic, ca. 1 mm. Styles slightly exceeding or subequaling calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, oblong-ovoid, base rounded, apex rounded, sparsely stellate-pubescent; pyrenes very compressed, oblong, 8–9 × 4–5 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. Apr–May, fr. Jul.

• Sparse forests, thickets; 100–1900 m. Chongqing, Gansu, Guizhou, Shaanxi, Sichuan, E Yunnan (Luoping).

**5. *Viburnum congestum*** Rehder in Sargent, *Trees & Shrubs* 2: 111. 1908.

密花荚蒾 mi hua jia mi

*Hedyotis mairei* H. Léveillé; *Oldenlandia mairei* (H. Léveillé) Chun; *Premna esquirolii* H. Léveillé; *Viburnum mairei* H. Léveillé.

Shrubs, evergreen, to 5 m tall. Bark gray-brownish. Branchlets of current year gray-whitish stellate-tomentose; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, gray-whitish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 5–10 mm, gray-whitish stellate-tomentose; leaf blade greenish white when young, elliptic-ovate or elliptic, rarely elliptic-oblong, 2–4(–6) × 1–2 cm, leathery, abaxially gray-

whitish stellate-tomentose, adaxially sparsely stellate-hairy at first, immediately glabrescent, midvein raised abaxially, lateral veins 3- or 4-jugate, pinnate, arched, branched, anastomosing near margin, slightly raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base rounded or narrowed, without glands, margin entire, apex obtuse or slightly acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 2–5 cm in diam.; rays whorled; first node of inflorescence with 5 short rays, dense, gray-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 0.5–2 cm; bracts caducous, leaflike, green, linear to linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers on rays of 1st and 2nd orders, fragrant, sessile. Calyx greenish; tube tubular, 2–3 mm, glabrous; lobes broadly ovate, very small, 0.5–1 mm, glabrous, apex obtuse. Corolla white, campanulate-funnelform, ca. 6 mm in diam., glabrous; tube 4–5 mm; lobes spreading, orbicular-ovate, ca. 1/2 as long as tube, apex rounded, margin entire. Stamens nearly as long as corolla, inserted near base of corolla tube; filaments ca. 6 mm; anthers yellow, broadly ellipsoid, ca. 1 mm. Styles taller than calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, globose, 5–6 mm in diam., base rounded, apex rounded, glabrous; pyrenes very compressed, oblong, ca. 5 mm in diam., ca. 2 mm thick, with 2 shallow dorsal grooves and 3 ventral grooves, apex rounded. Fl. Jan–Sep, fr. Aug–Oct.

• Forests, forest margins, thickets; 1000–2800 m. Gansu, NE Guizhou, SW Sichuan, Yunnan.

**6. *Viburnum cotinifolium*** D. Don, *Prodr. Fl. Nepal*. 141. 1825.

黄栌叶荚蒾 huang lu ye jia mi

*Viburnum multratum* K. Koch; *V. polycarpum* Wallich ex Candolle.

Shrubs, deciduous, to 5 m tall. Bark gray-brownish. Branchlets of current year yellow-whitish or gray-whitish stellate-tomentose; branchlets of previous year gray-brownish, slightly quadrangular, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, yellow-whitish or gray-whitish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 6–17 mm, yellow-whitish or gray-whitish stellate-tomentose; leaf blade greenish white when young, orbicular-ovate or shallowly cordate to ovate-lanceolate, 5–12 × 4–8.5 cm, papery, abaxially stellate-pubescent, adaxially densely stellate-pubescent, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised or inconspicuous abaxially, inconspicuous adaxially, not lobed, base truncate, rounded to slightly cordate, without glands, margin remotely serrulate or subentire, apex acute to shortly acuminate, rarely obtuse to rounded. Flowers appearing with leaves; inflorescence a compound umbel-like cyme, terminal, 5–8 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, yellow-whitish or gray-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 1–3 cm, slightly sulcate; bracts caducous, leaflike, green, linear-lanceolate, stellate-pubescent; bracteoles scalelike. Flowers on rays of 2nd and 3rd orders, not fragrant; pedicel 2–3 mm. Calyx greenish; tube

tubular-obconical, 3–4.5 mm, glabrous; lobes ovate-orbicular, very small, 0.5–1 mm, glabrous, apex obtuse. Corolla white, pinkish outside, funnelform-campanulate, glabrous; tube 5.5–6.5 mm, longer than lobes; lobes spreading, orbicular-ovate, 1–2 mm, shorter than tube, apex rounded, margin entire. Stamens shorter than corolla, inserted near base of corolla tube; filaments ca. 3 mm; anthers yellow, subglobose, ca. 1 mm. Styles taller than calyx lobes; stigmas capitate. Fruit black, oblong-ellipsoid, 8–12 × 5–6 mm, base rounded, apex rounded, glabrous; pyrenes ellipsoid to ovoid-oblong, 7–10 mm, with 2 shallow dorsal grooves and 3 ventral grooves, apex rounded. Fl. Apr–Jun, fr. Jul–Aug.

Mixed *Abies* and *Quercus* forests; 2300–2600 m. S Xizang [Afghanistan, E Bhutan, N India, Kashmir, Nepal].

**7. *Viburnum glomeratum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 483. 1880.

聚花荚蒾 ju hua jia mi

Shrubs or small trees, deciduous, to 3(–6) m tall. Bark gray-brownish or gray-whitish. Branchlets of current year yellow or yellow-whitish stellate-tomentose; branchlets of previous year gray-brownish or gray-whitish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, yellow or yellow-whitish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–2(–3) cm, yellow or yellow-whitish stellate-tomentose; leaf blade yellowish white when young, ovate-elliptic, ovate, or broadly ovate, rarely suborbicular, obovate, or obovate-oblong, (3.5–)6–10(–19) × (2.5–)3.5–8(–10) cm, papery, abaxially at first densely but later sparsely stellate-tomentose, adaxially sparsely stellate-pubescent, midvein raised abaxially, lateral veins 5–11-jugate, pinnate, arched, branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised or inconspicuous abaxially, inconspicuous adaxially, not lobed, base rounded or ± slightly obliquely cordate, without glands, margin dentate, apex obtuse, acute, or shortly acuminate. Flowers appearing with leaves; inflorescence a compound umbel-like cyme, terminal, 3–6 cm in diam.; rays whorled; first node of inflorescence with (4 or) 5–7(–9) rays, dense, yellow or yellow-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 1–2.5(–7) cm; bracts caducous, leaflike, green, linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers on rays of 3rd order, not fragrant, shortly pedicellate. Calyx greenish; tube tubular-obconical, 1.5–3 mm, stellate-tomentose; lobes triangular, small, 1–2 mm, ca. as long as or less than 2 × as long as calyx tube, stellate-tomentose, apex acute. Corolla white, rotate, ca. 5 mm in diam., glabrous; tube 1.5–2.5 mm; lobes spreading, ovate-orbicular, ca. 2 mm, nearly as long as or slightly longer than tube, apex rounded, margin entire. Stamens slightly taller than corolla lobes, inserted near base of corolla tube; filaments ca. 7 mm; anthers yellow, subglobose, ca. 1 mm. Styles not exceeding calyx lobes; stigmas 3-lobed. Fruit initially turning red, maturing black, oblong-globose, 10–13 × 6–8 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, 5–7(–9) × (4–)5(–6) mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. Apr–Jun, fr. Jul–Sep.

Forests, thickets, shaded moist places on grassy slopes; 300–3200 m. W Anhui, S Gansu, W Henan, W Hubei, Jiangxi, S Ningxia, E Shaanxi, Sichuan, SE Xizang, NW Yunnan, NW Zhejiang [N Myanmar].

- 1a. Leaves suborbicular, veins 5 or 6 ..... 7c. subsp. *rotundifolium*
- 1b. Leaves ovate or ovate-oblong, veins 6–11.
  - 2a. Leaves ovate; inflorescence 5–7 cm in diam.; fruit 5–7(–9) mm ..... 7a. subsp. *glomeratum*
  - 2b. Leaves ovate-oblong; inflorescence 8–10 cm in diam.; fruit 9–11 mm ..... 7b. subsp. *magnificum*

**7a. *Viburnum glomeratum* subsp. *glomeratum***

聚花荚蒾(原亚种) ju hua jia mi (yuan ya zhong)

*Viburnum veitchii* C. H. Wright.

Leaves ovate, (3.5–)6–10(–15) × 4–6 cm, lateral veins 6–11. Inflorescence 5–7 cm in diam. Fruit 5–7(–9) mm.

Forests, thickets, shaded moist places on grassy slopes; 300–3200 m. W Anhui, S Gansu, W Henan, W Hubei, Jiangxi, S Ningxia, E Shaanxi, Sichuan, SE Xizang, NW Yunnan, NW Zhejiang [N Myanmar].

**7b. *Viburnum glomeratum* subsp. *magnificum*** (P. S. Hsu) P. S. Hsu, Fl. Reipubl. Popularis Sin. 72: 21. 1988.

壮大荚蒾 zhuang da jia mi

*Viburnum veitchii* subsp. *magnificum* P. S. Hsu, Acta Phytotax. Sin. 11: 75. 1966.

Leaves ovate-oblong, 10–19 × 4.5–11.5 cm, lateral veins 6–11. Inflorescence 8–10 cm in diam. Fruit 9–11 mm.

• Forests, thickets; 300–1000 m. W Anhui, NW Zhejiang.

**7c. *Viburnum glomeratum* subsp. *rotundifolium*** (P. S. Hsu) P. S. Hsu, Fl. Reipubl. Popularis Sin. 72: 21. 1988.

圆叶荚蒾 yuan ye jia mi

*Viburnum veitchii* subsp. *rotundifolium* P. S. Hsu, Acta Phytotax. Sin. 11: 75. 1966; *V. glomeratum* var. *rockii* Rehder.

Leaves suborbicular, 3.5–6 × 3–5 cm, lateral veins 5 or 6. Inflorescence less than 4 cm in diam. Fruit 4–7 mm.

Forests, thickets, shaded moist places on grassy slopes; 2200–3200 m. S Gansu, Sichuan, NW Yunnan [N Myanmar].

**8. *Viburnum macrocephalum*** Fortune, J. Hort. Soc. London 2: 244. 1847.

绣球荚蒾 xiu qiu jia mi

*Viburnum macrocephalum* var. *sterile* Dippel.

Shrubs, deciduous or semievergreen, to 4 m tall. Bark gray-brownish or gray-whitish. Branchlets of current year densely gray-whitish or yellow-whitish stellate-pubescent, glabrescent; branchlets of previous year gray-brownish or gray-whitish, terete, glabrous, with dispersed, small, rounded lenticels. Winter

buds naked, densely gray-whitish or yellow-whitish stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–1.5 cm, gray-whitish or yellow-whitish stellate-pubescent; leaf blade greenish white when young, ovate to elliptic or ovate-elliptic, 5–11 × 2–5 cm, papery, abaxially stellate-pubescent, adaxially densely stellate-pubescent at first, later only so on midvein, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, branched, anastomosing near margin, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised or inconspicuous abaxially, inconspicuous adaxially, not lobed, base rounded or sometimes slightly cordate, without glands, margin denticulate, apex obtuse or slightly acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 8–15 cm in diam.; rays whorled; first node of inflorescence with 5 rays, dense, gray-whitish or yellow-whitish stellate-pubescent, totally composed of large sterile flowers, or of fertile flowers yet with 8–18 large sterile radiant flowers; peduncle 1–2 cm; bracts caducous, leaflike, green, linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers on rays of 3rd order, not fragrant, sessile or shortly pedicellate. Sterile flowers: calyx like fertile flowers; corolla white, rotate, 1.5–4 cm in diam., glabrous; lobes orbicular-obovate, apex rounded; stamens and pistils not developed. Fertile flowers: calyx greenish; tube tubular, ca. 2.5 mm, glabrous; lobes oblong, small, ca. 2 mm, nearly as long as calyx tube, glabrous, apex obtuse; corolla white, rotate, 10–12 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, orbicular-obovate, ca. 2 mm, longer than tube, apex rounded, margin entire; stamens slightly taller than corolla lobes, inserted near base of corolla tube; filaments ca. 3 mm; anthers yellow, subglobose, small; styles slightly exceeding or subequaling calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, elliptic, ca. 12 mm, base rounded, apex rounded, glabrous; pyrenes compressed, oblong, 10–12 × 6–8 mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. Apr–May, fl. Sep–Oct.  $2n = 18^*$ .

• Forests, thickets on mountain slopes; 400–1000 m. W Anhui, Henan, W Hubei, Hunan, S Jiangsu, NW Jiangxi, S Shandong, Zhejiang; also commonly cultivated.

Two forms may be recognized as follows. The typical form (*f. macrocephalum*) has its inflorescence totally composed of large sterile flowers (without anthers) and is known from cultivation only, while *f. keteleeri* (Carrière) Rehder (Bibl. Cult. Trees, 603. 1949; *Viburnum keteleeri* Carrière, Rev. Hort. 1863: 269. 1863; *V. arborescens* Hemsley; *V. macrocephalum* var. *keteleeri* (Carrière) G. Nicholson; *V. macrocephalum* var. *indutum* Handel-Mazzetti) is the wild-related taxa and has its inflorescence with 8–18 large sterile radiant flowers (without anthers) only at margin and fertile flowers (with stamens) at center. Also commonly cultivated, the latter also occurs in forests, thickets on mountain slopes, at 400–1000 m, in W Anhui, W Hubei, Hunan, S Jiangsu, NW Jiangxi, and Zhejiang.

**9. *Viburnum mongolicum*** (Pallas) Rehder in Sargent, Trees & Shrubs 2: 111. 1908.

蒙古荚蒾 *meng gu jia mi*

*Lonicera mongolica* Pallas, Reise Russ. Reich. 3: 721. 1771; *Viburnum davuricum* Pallas.

Shrubs, deciduous, to 2 m tall. Bark gray-yellowish. Branchlets of current year yellow-whitish stellate-tomentose; branchlets of previous year yellow-whitish, very rounded, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, yellow-whitish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 4–10 mm, yellow-whitish stellate-tomentose; leaf blade abaxially gray-greenish and adaxially yellowish green when young, broadly ovate to elliptic, rarely suborbicular, 2.5–5(–6) × 1.5–3 cm, papery, abaxially stellate-pubescent, adaxially stellate-pubescent or forked-hairy, midvein raised abaxially, lateral veins 4- or 5-jugate, pinnate, arched, branched, anastomosing near margin, raised abaxially, slightly impressed adaxially or inconspicuous, veinlets transverse, inconspicuous on both surfaces, not lobed, base rounded or cuneate-rounded, without glands, margin crenulate, with tips of teeth mucronate, apex acute or obtuse. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 1.5–3.5 cm in diam.; rays whorled; first node of inflorescence with 5 or fewer rays, few flowered, yellow-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 5–10 mm; bracts caducous, leaflike, green, linear to linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers mostly on rays of 1st order, not fragrant, sessile. Calyx greenish; tube oblong-tubular, 3–5 mm, glabrous; lobes repand, very small, 0.5–1 mm, glabrous, apex obtuse. Corolla yellowish whitish, tubular-campanulate, ca. 3 mm in diam., glabrous; tube 5–7 mm; lobes spreading, orbicular-ovate, ca. 1.5 mm, shorter than tube, apex rounded, margin entire. Stamens nearly as long as corolla, inserted near base of corolla tube; filaments ca. 6 mm; anthers yellow, oblong, ca. 2 mm. Styles taller than calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, ellipsoid, ca. 1 cm, base rounded, apex rounded, glabrous; pyrenes compressed, oblong, ca. 8 × 5–6 mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. May–Jul, fr. Jul–Sep.  $2n = 18(16)$ .

Sparse forests; 800–2700 m. S Gansu, Hebei (Neiqiu), Henan, Nei Mongol, S Ningxia, NE Qinghai, Shaanxi, Shanxi [Mongolia, Russia].

**10. *Viburnum rhytidophyllum*** Hemsley, J. Linn. Soc., Bot. 23: 355. 1888.

皱叶荚蒾 *zhou ye jia mi*

*Callicarpa vastifolia* Diels.

Shrubs or small trees, evergreen, to 4 m tall. Bark gray-brownish. Branchlets of current year robust, thickly yellow-whitish, yellow-brownish, or red-brownish stellate-tomentose; branchlets of previous year red-brownish or gray-blackish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, yellow-brownish, or red-brownish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1.5–3(–4) cm, thickly yellow-whitish, yellow-brownish, or red-brownish stellate-tomentose; leaf blade yellow-whitish, yellow-brownish, or red-brownish when young, becoming intense green adaxially, ovate-oblong to ovate-lanceolate, rarely lanceolate, 8–18(–25) × (1.5–)2.5–8 cm, leathery, abaxially strongly rugose, obviously reticulate, adaxially lustrous, sparsely stellate-pubescent when

young, glabrescent, midvein raised abaxially, lateral veins 6–8(–12)-jugate, pinnate, arched, branched, anastomosing near margin, very rarely ending in teeth, raised abaxially, slightly raised adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base rounded or slightly cordate, without glands, margin entire or inconspicuously dentate, apex slightly acute or obtuse. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 7–12 cm in diam.; rays whorled; first node of inflorescence usually with 7 rays, dense, yellow-whitish, yellow-brownish, or red-brownish stellate-tomentose, without large sterile radiant flowers; peduncle robust, 1.5–4(–7) cm; bracts caducous, leaflike, green, linear to linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers on rays of 3rd order, not fragrant, subsessile or shortly pedicellate. Calyx greenish; tube tubular-campanulate, 2–3 mm, yellow-whitish stellate-tomentose; lobes broadly triangular-ovate, very small, 0.5–1 mm, sparsely stellate-pubescent, apex obtuse, slightly ciliate. Corolla white, pinkish in bud and outside, rotate, 5–7 mm in diam., subglabrous; tube 3–4 mm; lobes spreading, orbicular-ovate, 2–3 mm, apex rounded, margin entire. Stamens exceeding corolla, inserted near base of corolla tube; filaments ca. 6 mm; anthers yellow, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, broadly elliptic, 6–8 mm, base rounded, apex rounded, glabrous or sparsely stellate-pubescent; pyrenes compressed, broadly elliptic, 6–7 × 4–5 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. Apr–May, fr. Sep–Oct.  $2n = 18^*$ .

• Forests, thickets; 700–2400 m. Guizhou, W Hubei, S Shaanxi, Sichuan.

**11. *Viburnum schensianum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 480. 1880.

陕西荚蒾 shan xi jia mi

*Viburnum dielsii* Graebner (1901), not H. Léveillé (1911); *V. giraldii* Graebner; *V. schensianum* subsp. *chekiangense* P. S. Hsu & P. L. Chiu; *V. schensianum* var. *chekiangense* (P. S. Hsu & P. L. Chiu) Y. Ren & W. Z. Di.

Shrubs, deciduous, to 3 m tall. Bark gray-brownish. Branchlets of current year yellow-whitish stellate-tomentose; branchlets of previous year gray-brownish, slightly rectangular or terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, often rusty-brownish stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 7–10(–15) mm, yellow-whitish stellate-tomentose; leaf blade greenish white when young, ovate-elliptic, broadly ovate, or suborbicular, 3–6(–8) × 2–4.5 cm, papery, abaxially stellate-pubescent, adaxially sparsely stellate-pubescent at first, later almost glabrous, midvein raised abaxially, lateral veins 5–7-jugate, pinnate, arched, branched, anastomosing near margin, or some ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, slightly raised on both surfaces, not lobed, base rounded, without glands, margin denticulate, apex obtuse or rounded, sometimes emarginate or slightly acute. Flowers appearing with leaves; inflorescence a compound umbel-like cyme, terminal, (4–)6–7(–8) cm in diam., to 9 cm at fruiting stage; rays

whorled; first node of inflorescence with (3–)5 rays, 1–2 cm, dense, yellow-whitish stellate-tomentose, without large sterile radiant flowers; peduncle 1–1.5(–7) cm or very short; bracts caducous, leaflike, green, linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers mostly on rays of 3rd order, not fragrant, sessile or shortly pedicellate. Calyx greenish; tube cylindrical, 3.5–4 mm, glabrous or rarely stellate-tomentose; lobes ovate, very small, 0.5–1 mm, glabrous or with few stellate ciliate hairs, apex obtuse. Corolla white, rotate, ca. 6 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, orbicular-ovate, ca. 2 mm, longer than tube, apex rounded, margin entire. Stamens ca. as long as or slightly longer than corolla, inserted near base of corolla tube; filaments ca. 2 mm; anthers yellow, globose, ca. 1 mm. Styles slightly exceeding or subequaling calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, elliptic, ca. 8 mm, base rounded, apex rounded, glabrous; pyrenes ovoid-globose, 6–8 × 4–5 mm, dorsally raised and grooves absent, or indistinctly 2-grooved, ventrally 3-grooved, apex rounded. Fl. May–Jul, fr. Aug–Sep.

• Mixed forests, *Pinus* forests, thickets; 500–3200 m. Anhui, S and SE Gansu, Hebei (Neiqiu), Henan, Hubei, S Jiangsu, S Shaanxi, Shandong (Jinan), Shanxi, N Sichuan (Songpan), Zhejiang.

**12. *Viburnum urceolatum*** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 172. 1846.

壶花荚蒾 hu hua jia mi

*Viburnum taiwanianum* Hayata; *V. urceolatum* f. *brevifolium* (Makino) Nakai; *V. urceolatum* var. *brevifolium* Makino; *V. urceolatum* f. *procumbens* Nakai; *V. urceolatum* var. *procumbens* (Nakai) H. Hara.

Shrubs, deciduous, to 3(–4) m tall. Bark gray-brownish. Branchlets of current year gray-whitish or gray-brownish stellate-tomentose; branchlets of previous year dark purple-brownish to blackish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, gray-whitish or gray-brownish stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1–4 cm, gray-whitish or gray-brownish stellate-pubescent; leaf blade greenish white when young, ovate-lanceolate or ovate-oblong, 7–15(–18) × 4–6 cm, papery, abaxially stellate-pubescent along veins, adaxially hairy on midvein, midvein raised abaxially, lateral veins 4–6-jugate, pinnate, arched, branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base cuneate, rounded, or slightly cordate, without glands, margin often serrulate except at base, apex acuminate to narrowly caudate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short branches with 1- or 2-jugate leaves, ca. 5 cm in diam.; rays whorled; first node of inflorescence with 4 or 5 rays, dense, reddish sparsely stellate-pubescent, without large sterile radiant flowers; peduncle purplish, 3–7(–8.5) cm; bracts persistent, leaflike, reddish, lanceolate to ovate, sparsely stellate-pubescent; bracteoles linear; flowers mostly on rays of 3rd or 4th order, not fragrant, shortly pedicellate. Calyx reddish; tube tubular, ca. 2 mm, glabrous; lobes subdeltoid to ovate, very small, 0.5–1 mm, glabrous, apex ob-

tuse, slightly ciliate. Corolla purple-reddish outside, white inside, urceolate or tubular-campanulate, ca. 3 mm in diam., glabrous; tube 2–4 mm; lobes spreading or erect, broadly ovate, 1/5–1/4 as long as tube, apex rounded, margin papillose. Stamens obviously taller than corolla, inserted near base of corolla tube or sometimes below middle at slightly different levels, unequal in length, longest ca. 6 mm; filaments 3–4 mm; anthers yellow, elliptic-oblong, ca. 1.5 mm. Styles taller than calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, ellipsoid, 6–8 × 5–6 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, 4–5 × 3–4 mm, with 2 shallow dorsal grooves and 3 ventral grooves, base rounded, apex rounded. Fl. Jun–Jul, fr. Sep–Oct.  $2n = 18^*$ .

Forests; 600–2600 m. Fujian, Guangdong, NE Guangxi, Guizhou, Hunan, W Jiangxi, Taiwan, Yunnan, Zhejiang [Japan].

**13. *Viburnum utile*** Hemsley, J. Linn. Soc., Bot. 23: 356. 1888.

烟管荚蒾 *yan guan jia mi*

*Viburnum bockii* Graebner; *V. fallax* Graebner; *V. utile* var. *minus* Pampanini; *V. utile* var. *ningqianguense* Y. Ren & W. Z. Di.

Shrubs, evergreen, to 2 m tall. Bark gray-brownish. Branchlets of current year glabrescent, yellowish brown or grayish white stellate-tomentose; branchlets of previous year red-brownish, terete, glabrous, with dispersed, small, rounded, lenticels. Winter buds naked, yellowish brown or grayish white stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 5–10(–15) mm, gray-whitish or yellow-whitish stellate-tomentose; leaf blade greenish white when young, becoming intense green, lustrous, and glabrous, or dark green and sparsely stel-

late-hairy adaxially, ovate-oblong to ovate-lanceolate, 2–5(–8) × 1–2.5(–3.5) cm, leathery, abaxially veins sometimes with rusty stellate hairs, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, branched, anastomosing near margin, slightly raised abaxially, slightly raised or inconspicuous adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base rounded or narrowed, without glands, margin entire or rarely inconspicuously dentate, slightly involute, apex rounded to slightly obtuse, sometimes emarginate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 5–7 cm in diam.; rays whorled; first node of inflorescence with 5 rays, dense, gray-whitish or yellow-whitish stellate-tomentose, without large sterile radiant flowers; peduncle robust, 1–3 cm; bracts caducous, leaflike, green, linear to linear-lanceolate, stellate-pubescent; bracteoles linear. Flowers usually on rays of 2nd and 3rd orders, not fragrant, sessile. Calyx greenish; tube tubular, ca. 2 mm, glabrous; lobes ovate-triangular, very small, 0.5–1 mm, glabrous or with few stellate ciliate hairs, apex obtuse, slightly ciliate. Corolla white, reddish in bud, rotate, 6–7 mm in diam., glabrous; tube 2–3 mm; lobes spreading, orbicular-ovate, ca. 2 mm, ca. as long as or slightly longer than tube, apex rounded, margin entire. Stamens nearly as long as corolla lobes, inserted near base of corolla tube; filaments ca. 4 mm; anthers yellow, suborbicular, ca. 1 mm. Styles nearly as long as calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, ellipsoid-oblong to ellipsoid, (6–)7–8 mm in diam., base rounded, apex rounded, glabrous; pyrenes slightly compressed, ellipsoid or obovoid, (5–)7 × (4–)5 mm, with 2 very shallow dorsal grooves and 3 ventral grooves, apex rounded. Fl. Mar–Apr, fr. Aug.  $2n = 18^*$ .

• Forest margins, thickets; 500–1800 m. NE Guizhou, Henan, W Hubei, Hunan, SW Shaanxi, Sichuan.

**2. *Viburnum* sect. *Pseudotinus*** C. B. Clarke, Fl. Brit. India 3: 6. 1880.

合轴组 *he zhou zu*

Winter buds naked. Inflorescence a compound umbel-like cyme, with or without large sterile radiant flowers, subsessile. Corolla rotate. Fruit initially turning red, maturing black; pyrenes with 1 deep ventral groove; albumen ruminate.

Four species: temperate Asia and North America; two species (one endemic) in China.

Recent phylogenetic work shows that this section is clearly monophyletic and sister to *Viburnum* sect. *Lantana* Spach.

**14. *Viburnum nervosum*** D. Don, Prodr. Fl. Nepal. 141. 1825.

显脉荚蒾 *xian mai jia mi*

*Solenotinus nervosus* (D. Don) Oersted; *Viburnum cordifolium* Wallich ex Candolle; *V. cordifolium* var. *hypsohilum* Handel-Mazzetti; *V. nervosum* var. *hypsohilum* (Handel-Mazzetti) H. W. Li.

Shrubs or small trees, deciduous, to 5 m tall. Bark gray-brownish. Branchlets of current year lepidote or furfuraceous stellate-pubescent; branchlets of previous year gray or gray-brownish, terete, glabrous, with sparse, dispersed, large, elliptic lenticels. Winter buds naked, furfuraceous stellate-pubescent. Leaves often clustered at apices of branchlets; stipules 2, subulate, 2–5 mm, caducous, or absent; petiole green, robust, 2–5.5 cm, brownish stellate-pubescent; leaf blade greenish brown

when young, ovate to broadly ovate, rarely oblong-ovate, (4–)7–18 × (2.5–)4–11 cm, papery, abaxially often ± stellate-pubescent particularly along veins, adaxially glabrous or subglabrous, midvein raised abaxially, lateral veins 8–10-jugate, pinnate, arched, branched, anastomosing near margin, raised abaxially, impressed adaxially, veinlets transverse, conspicuous on both surfaces, not lobed, base cordate or rounded, without glands, margin irregularly serrate, apex acuminate. Flowers appearing with leaves; inflorescence a compound umbel-like cyme, terminal, 5–15 cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, dense, with small red-brownish glands, without large sterile radiant flowers; peduncles absent; bracts caducous, leaflike, green, ovate to elliptic, stellate-pubescent; bracteoles scalelike. Flowers on rays of 2nd and 3rd orders, fragrant, subsessile or shortly pedicellate. Calyx greenish; tube tubular-campanulate, ca. 1.5 mm, with small red-

brownish glands; lobes ovate, very small, 0.5–1 mm, sparsely stellate-pubescent, apex obtuse. Corolla white or reddish, rotate, 5–8 mm in diam., glabrous; tube 3–4 mm; lobes spreading, ovate-oblong to oblong, ca. 2 × as long as tube, unequal in size, outer ones, particularly marginal ones, often larger, apex rounded, margin entire. Stamens shorter than corolla, inserted near base of corolla tube; filaments ca. 1 mm; anthers purple, broadly ovoid, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit initially turning yellow, then red, maturing purplish black, ovoid, 7–9 × 5–7 mm, base rounded, apex rounded, glabrous; pyrenes compressed, oblong, 6–8 × 4–5 mm, with 1 shallow dorsal groove and 1 deep ventral groove, apex rounded. Fl. Apr–Jun, fr. Sep–Oct.  $2n = 18$ .

Forests (usually *Abies* forests), scrub; (1800–)2100–4500 m. Sichuan, Xizang, Yunnan [Bhutan, India, N Myanmar, Nepal, N Vietnam].

**15. *Viburnum sympodiale*** Graebner, Bot. Jahrb. Syst. 29: 587. 1901.

合轴荚蒾 *he zhou jia mi*

*Viburnum furcatum* Blume ex J. D. Hooker & Thomson var. *melanophyllum* (Hayata) H. Hara; *V. martini* H. Léveillé; *V. melanophyllum* Hayata.

Shrubs or small trees, deciduous, to 10 m tall. Bark gray-brownish. Branchlets of current year yellow-brownish lepidote or furfuraceous stellate-pubescent; branchlets of previous year red-brownish or gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds naked, furfuraceous stellate-pubescent. Leaves often clustered at apices of branchlets; stipules 2, subulate, 2–9 mm, bases often adnate to petioles, sometimes absent; petiole green, robust, 1.5–3(–4.5) cm, yellow-brownish stellate-pubescent; leaf blade greenish brown when young, ovate to elliptic-ovate or orbicular-ovate, 6–13

(–15) × 3–9(–11) cm, papery, abaxially yellow-brownish lepidote or furfuraceous stellate-pubescent particularly along veins, adaxially glabrous or stellate-pubescent on veins, midvein raised abaxially, lateral veins 6–8-jugate, pinnate, arched, branched, anastomosing near margin, raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuous on both surfaces, not lobed, base rounded, rarely shallowly cordate, without glands, margin irregularly serrate, apex acuminate or acute. Flowers appearing with leaves; inflorescence a compound umbel-like cyme, terminal, 5–9 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, subglabrescent or yellow-brownish lepidote or furfuraceous stellate-pubescent, with large white sterile radiant flowers on margin; peduncles absent; bracts caducous, leaflike, green, ovate to elliptic, stellate-pubescent; bracteoles scalelike. Flowers on rays of 3rd order, fragrant, subsessile or shortly pedicellate. Sterile flowers: calyx like fertile flowers, 2.5–3 cm in diam.; corolla lobes obovate, often unequal in size; stamens and pistils not developed. Fertile flowers: calyx greenish; tube subglobose, ca. 2 mm, glabrous; lobes ovate-orbicular, very small, 0.5–1 mm, sparsely stellate-pubescent, apex obtuse; corolla white or reddish, rotate, 5–6 mm in diam., glabrous; tube ca. 2 mm; lobes spreading, ovate, ca. 2 × as long as tube, apex rounded, margin entire; stamens shorter than corolla, inserted near base of corolla tube; filaments ca. 1 mm; anthers yellow, ovoid, ca. 1 mm; styles not exceeding calyx lobes; stigmas capitate. Fruit initially turning yellow, then red, maturing purple-nigrescent, ovoid, 8–9 mm, base rounded, apex rounded, glabrous; pyrenes slightly compressed, oblong, ca. 7 × 5 mm, with 1 shallow dorsal groove and 1 deep ventral groove, apex rounded. Fl. Apr–May, fr. Aug–Sep.

• Forests, thickets; 800–2600 m. S Anhui, N Fujian, S Gansu, N Guangdong, NE Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang.

### 3. *Viburnum* sect. *Tinus* (Miller) C. B. Clarke, Fl. Brit. India 3: 6. 1880.

球核组 *qiu he zu*

*Tinus* Miller, Gard. Dict. Abr., ed. 4. 1754.

Winter buds with 1 pair of separate scales. Inflorescence a compound umbel-like cyme, without large sterile radiant flowers, pedicellate or subsessile. Corolla rotate. Fruit not turning red, maturing blue-blackish; pyrenes with 1 very shallow ventral groove or without groove; albumen deeply ruminant.

Six to nine species: temperate and subtropical Asia and temperate Europe; five species (four endemic) in China.

Recent phylogenetic work shows that this section is clearly monophyletic and related to New World representatives of *Viburnum* sect. *Odontotinus* and *V.* sect. *Oreiotinus* (Oersted) Benth. & J. D. Hooker.

**16. *Viburnum atrocyaneum*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 7. 1880.

蓝黑果荚蒾 *lan hei guo jia mi*

*Viburnum calvum* Rehder; *V. schneiderianum* Handel-Mazzetti.

Shrubs, evergreen, to 3 m tall. Bark gray-brownish. Branchlets of current year purplish at first, later grayish yellowish, stellate-pubescent or subglabrous; branchlets of previous year gray or gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong,

with one pair of separate scales; scales reddish brown, ciliate, apex acute. Leaves generally opposite, sometimes in whorls of 3, not clustered at apices of branchlets; stipules absent; petiole green, slender, 6–12 mm, glabrous; leaf blade purplish when young, becoming abaxially pale greenish and adaxially intense green and lustrous, broadly ovate or ovate to ovate-lanceolate or rhombic-elliptic, rarely orbicular, (0.8–)3–6(–10) × 1.5–3(–6.5) cm, leathery, both surfaces glabrous, midvein raised abaxially, lateral veins 5–8-jugate, pinnate, arched, branched, anastomosing near margin, inconspicuous abaxially, impressed adaxially, veinlets transverse, inconspicuous abaxially, slightly impressed adaxially, not lobed, base broadly cuneate, both sides

often slightly asymmetric, without glands, margin often remotely irregularly denticulate, rarely entire, apex obtuse, mucronate, rarely acute or emarginate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 2–6 cm in diam.; rays whorled; first node of inflorescence usually with 5–7 rays, lax, glabrous, without large sterile radiant flowers; peduncles 0.6–6 cm; bracts caducous, leaflike, green, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers usually on rays of 2nd order, not fragrant; pedicel 2–3 mm. Calyx greenish; tube obconical, ca. 1 mm, glabrous; lobes broadly triangular, broader than long, very small, ca. 0.5 mm, nearly 1/2 as long as calyx tube, glabrous, apex obtuse. Corolla white, rotate, ca. 5 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, ovate-orbicular, ca. 1.5 mm, slightly longer than tube, apex rounded, margin entire. Stamens slightly shorter than corolla, inserted near base of corolla tube; filaments ca. 2 mm; anthers yellow, ovoid, ca. 1 mm. Styles nearly as long as calyx lobes; stigmas subsessile. Fruit not turning red, maturing blue-blackish, ovoid or globose, 5–6 mm, base rounded, apex acute, glabrous; pyrenes globose, ca. 5 mm in diam., with 1 very shallow ventral groove, apex rounded. Fl. Apr–Jun, fr. Jul–Oct.

Forests, scrub; 1000–3200 m. NW Guangxi, Guizhou, Sichuan, SE Xizang, Yunnan [Bhutan, N India, Myanmar, N Thailand].

Two forms may be recognized as follows: the typical form (*V. atrocyaneum* f. *atrocyaneum*) has leaves always opposite, leaf blade broadly ovate or ovate to ovate-lanceolate or rhombic-elliptic, whereas *V. atrocyaneum* f. *harryanum* (Rehder) P. S. Hsu (Acta Phytotax. Sin. 13(1): 120. 1975; *V. harryanum* Rehder, Mitt. Deutsch. Dendrol. Ges. 22: 263. 1913; *V. atrocyaneum* subsp. *harryanum* (Rehder) P. S. Hsu; *V. atrocyaneum* var. *puberulum* (C. K. Schneider) P. S. Hsu; *V. calvum* Rehder var. *kwapiense* Handel-Mazzetti; *V. calvum* var. *puberulum* C. K. Schneider) has leaves in whorls of 3, leaf blade orbicular.

**17. *Viburnum cinnamomifolium*** Rehder in Sargent, Trees & Shrubs 2: 31. 1907.

樟叶荚蒾 zhang ye jia mi

Shrubs or small trees, evergreen, to 6 m tall. Bark gray-brownish. Branchlets of current year purple-brownish, with many conspicuous lenticels, subglabrous; branchlets of previous year purple-brownish, terete, glabrous, with numerous, large, rounded lenticels. Winter buds ovoid, with 1 pair of separate scales; scales reddish brown, glabrous, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1.5–3.5 cm, glabrous; leaf blade purplish when young, elliptic-oblong, 6–13(–18) × 3–5(–7) cm, leathery, abaxially often yellowish stellate-pubescent in axils of veins, adaxially glabrous, midvein raised abaxially, triplinerved, veins pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, impressed adaxially, veinlets transverse, conspicuous abaxially, slightly impressed but not conspicuously rugose adaxially, not lobed, base cuneate to broadly cuneate, without glands, margin entire or occasionally remotely serrate near apex, apex acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 6–15 cm in diam.; rays whorled; first node of inflorescence with 6–8 rays, lax, large, glabrous, without large sterile radiant flowers; peduncles 1.5–3.5 cm; bracts caducous, leaflike, green, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flow-

ers on rays of 2nd and 3rd orders, not fragrant; pedicels 2–3 mm, slender. Calyx greenish; tube obconical, 1–2 mm, glabrous; lobes suborbicular or triangular, very small, ca. 0.5 mm, glabrous, apex obtuse. Corolla white, rotate, 4–5 mm in diam., glabrous; tube ca. 1 mm; lobes recurved, broadly ovate, ca. 1 mm, nearly as long as tube, apex rounded, margin entire. Stamens longer than corolla, inserted near base of corolla tube; filaments ca. 3 mm; anthers yellow, subglobose, ca. 1 mm. Styles nearly as long as calyx lobes; stigmas subsessile. Fruit not turning red, maturing blue-blackish, subglobose, ca. 4 mm in diam., base rounded, apex acute, glabrous; pyrenes globose, ca. 3 mm in diam., with 1 very small and shallow ventral groove or without groove, apex rounded. Fl. May, fr. Jun–Jul.  $2n = 18^*$ .

• Thickets; 1000–1500(–1800) m. Sichuan, SE Yunnan.

**18. *Viburnum davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 8: 251. 1885 [*"davidii"*].

川西荚蒾 chuan xi jia mi

Shrubs, evergreen, to 10 m tall. Bark gray-brownish. Branchlets of current year purple-brownish, with raised lenticels, subglabrous; branchlets of previous year gray-whitish, terete, glabrous, with numerous, large, rounded lenticels. Winter buds ovoid, with 1 pair of separate scales; scales reddish brown, glabrous, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole purplish, robust, 0.8–2.5(–3) cm, glabrous; leaf blade purplish when young, elliptic-obovate to elliptic, 6–14 × 4–7 cm, thickly leathery, lustrous and conspicuously rugose, abaxially yellowish stellate-pubescent only in axils of veins, adaxially glabrous, midvein raised abaxially, triplinerved, veins pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, impressed adaxially, veinlets transverse, conspicuous abaxially, deeply impressed and conspicuously rugose adaxially, not lobed, base broadly cuneate to subrounded, without glands, margin entire or sometimes with few irregular teeth above middle part, apex shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 4–6 cm in diam.; rays whorled; first node of inflorescence with 5 or 6 rays, 1–3 cm, dense, glabrous, without large sterile radiant flowers; peduncles (1–)1.5–3(–3.5) cm; bracts caducous, leaflike, green, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays of 2nd order, not fragrant, with very short pedicels. Calyx greenish; tube campanulate, ca. 1 mm, glabrous; lobes lanceolate, very small, ca. 1/2 as long as tube, glabrous, apex acute. Corolla white, rotate, ca. 5 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, orbicular, ca. 2 mm in diam., 2–4 × as long as tube, apex rounded, margin entire. Stamens ca. 1/2 as long as corolla, inserted near base of corolla tube; filaments ca. 2 mm; anthers red-blackish, subglobose, less than 1 mm. Styles nearly as long as calyx lobes; stigmas subsessile. Fruit not turning red, maturing blue-blackish, ovoid or ellipsoid-oblong, ca. 6 × 4 mm, base rounded, apex acute, glabrous; pyrenes globose, 4–5 mm in diam., with 1 small and shallow ventral groove, apex rounded. Fl. Jun, fr. Sep–Oct.  $2n = 18^*$ .

• Mountains; 1800–2400 m. W Sichuan.

**19. *Viburnum propinquum*** Hemsley, J. Linn. Soc., Bot. 23: 355. 1888.

球核荚蒾 *qiu he jia mi*

Shrubs, evergreen, to 2 m tall. Bark gray-brownish. Branchlets of current year red-brownish, lustrous, with small prominent lenticels, glabrous; branchlets of previous year grayish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 1 pair of separate scales; scales reddish brown, glabrous, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1–2 cm, glabrous; leaf blade purplish when young, ovate to ovate-lanceolate or elliptic to elliptic-oblong, or linear-lanceolate or oblanceolate, 3–9(–11) × 1–4.5 cm, leathery, abaxially sometimes stellate-pubescent in axils of veins, adaxially glabrous, midvein raised abaxially, triplinerved, veins reaching to middle of leaves or above, pinnate, arched, branched, anastomosing near margin, raised abaxially, impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base subrounded or cuneate, both sides slightly asymmetric, without glands, margin usually remotely serrate, apex acuminate or acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, (2–)4–7 cm in diam.; rays whorled; first node of inflorescence usually with 7 rays, lax, glabrous, without large sterile radiant flowers; peduncles 1.5–2.5(–4) cm, slender; bracts caducous, leaflike, green, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays of 3rd order, not fragrant; pedicels 1–2 mm, slender. Calyx greenish; tube obconical, ca. 0.6 mm, glabrous; lobes broadly triangular-ovate, very small, ca. 0.4 mm, glabrous, apex obtuse. Corolla greenish white, rotate, ca. 4 mm in diam., outside glabrous, inside with long hairs at base; tube ca. 1 mm; lobes spreading, broadly ovate, ca. 1 mm, nearly as long as tube, apex rounded, margin entire. Stamens usually slightly longer than corolla, inserted near base of corolla tube; filaments 2–3 mm; anthers yellow, subglobose, ca. 1 mm. Styles nearly as long as calyx lobes; stigmas subsessile. Fruit not turning red, maturing blue-blackish, lustrous, subglobose or ovoid, (3–)5–6 × (3–)3.5–4 mm, base rounded, apex acute, glabrous; pyrenes globose, ca. 4 × 3 mm, with 1 very small and shallow ventral groove or without groove, apex rounded. Fl. Mar–May, fr. May–Oct.

• Forests, scrub; 400–1300 m. Chongqing, N Fujian, S Gansu, N Guangdong, Guangxi, Guizhou, SW and W Hubei, Hunan, N Jiangxi, SW Shaanxi, Sichuan, Taiwan, Yunnan, S Zhejiang.

- 1a. Leaves ovate to ovate-lanceolate, or elliptic to elliptic-oblong, base subrounded or cuneate ..... 19a. var. *propinquum*  
 1b. Leaves linear-lanceolate or oblanceolate, base cuneate ..... 19b. var. *mairei*

**19a. *Viburnum propinquum* var. *propinquum***

球核荚蒾(原变种) *qiu he jia mi (yuan bian zhong)*

*Viburnum propinquum* f. *parvifolium* (Graebner) Nakai; *V. propinquum* var. *parvifolium* Graebner.

Leaves ovate to ovate-lanceolate, or elliptic to elliptic-oblong, base subrounded or cuneate.

• Forests, scrub; 500–1300 m. Chongqing, N Fujian, S Gansu, N Guangdong, Guangxi, Guizhou, W Hubei, Hunan, N Jiangxi, SW Shaanxi, Sichuan, Taiwan, Yunnan, S Zhejiang.

**19b. *Viburnum propinquum* var. *mairei*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 140. 1916.

狭叶球核荚蒾 *xia ye qiu he jia mi*

Leaves narrower, linear-lanceolate to oblanceolate, 3–8 × 1–1.5 cm, base cuneate, margin sparsely acutely denticulate, apex acute or acuminate. Inflorescence smaller, 2–4 cm wide. Fruit 3–4 mm in diam.

• Scrub; 400–500 m. W Guizhou, SW Hubei, Sichuan, Yunnan.

**20. *Viburnum triplinerve*** Handel-Mazzetti, Sinensia 5: 15. 1934.

三脉叶荚蒾 *san mai ye jia mi*

Shrubs, evergreen, to 2 m tall. Bark gray-brownish. Branchlets of current year brownish, slender, sometimes with dense lenticels, glabrous; branchlets of previous year gray-whitish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 1 pair of separate scales; scales reddish brown, glabrous, apex acute. Leaves often clustered at apices of branchlets; stipules absent; petiole green, slender, 7–15 mm, glabrous; leaf blade purplish when young, elliptic, elliptic-ovate, or suborbicular, 2–6(–7.5) × 1–3 cm, leathery, both surfaces glabrous, midvein raised abaxially, triplinerved, veins reaching 3/4 length of leaves, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, impressed adaxially, veinlets transverse, inconspicuous abaxially, slightly impressed adaxially, not lobed, base obtuse or rounded, without glands, margin entire, apex obtuse or rounded. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 1.5–10 cm in diam.; rays whorled; first node of inflorescence with 6–8 rays, lax, glabrous, without large sterile radiant flowers; peduncle ca. 1 cm, slender; bracts caducous, leaflike, green, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers usually on rays of 2nd order, not fragrant; pedicels 1–2 mm, slender. Calyx greenish; tube broadly campanulate, less than 1 mm, glabrous; lobes broadly triangular or broadly ovate, very small, ca. 0.5 mm, nearly 1/2 as long as calyx tube, glabrous, apex obtuse. Corolla greenish white, rotate, ca. 4 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, suborbicular, ca. 1 mm in diam., ca. 2 × as long as tube, apex rounded, margin entire. Stamens nearly as long as corolla, inserted near base of corolla tube; filaments ca. 3 mm; anthers yellow, globose, ca. 1 mm. Styles nearly as long as calyx lobes; stigmas subsessile. Fruit not turning red, maturing purple-blackish, suborbicular, 4–5 mm in diam., base rounded, apex acute, glabrous; pyrenes globose, ca. 4 mm in diam., with 1 very small and shallow ventral groove, apex rounded. Fl. Apr–May, fr. Jun–Oct.

• Mountains; 500–600 m. Guangxi.

This species is perhaps conspecific with *Viburnum propinquum*.

4. *Viburnum* sect. *Solenotinus* Candolle, Prodr. 4: 328. 1830.

圆锥组 yuan zhui zu

*Microtinus* Oersted; *Solenotinus* (Candolle) Spach; *Thyrsosma* Rafinesque.

Winter buds with 2 or 3 pairs of separate scales. Inflorescence paniculate, usually pyramidal, without large sterile radiant flowers, pedicellate or subsessile. Corolla rotate, tubular-campanulate, funnelform-hypocrateriform, or hypocrateriform. Fruit maturing red or purple-reddish and later nigrescent; pyrenes with 1 deep ventral groove; albumen solid.

About 20 species: temperate and subtropical Asia; 18 species (13 endemic) in China.

This section was divided into four subsections by H. Hara (Ginkgoana 5: 190–204. 1983): *Viburnum* subsect. *Loniceroides* (Oersted) H. Hara for *V. farreri* and *V. grandiflorum*, *V.* subsect. *Microtinus* (Oersted) H. Hara for *V. odoratissimum* and ca. six other species, *V.* subsect. *Sieboldiana* (Nakai) H. Hara for *V. sieboldii* and probably the Chinese *V. yunnanense* and *V. shweliense*, and *V.* subsect. *Solenotinus* for ca. ten species. Recent phylogenetic work shows that this section is clearly monophyletic (excluding the Bornean *V. clemensiae*) and sister to *V.* sect. *Tomentosa*. Current sampling does not allow a more precise discussion regarding the monophyly of subsections.

**21. *Viburnum brachybotryum*** Hemsley, J. Linn. Soc., Bot. 23: 349. 1888.

短序荚蒾 duan xu jia mi

Shrubs or small trees, evergreen, to 8 m tall. Bark light brown. Branchlets of current year yellow-whitish or sometimes gray-brownish, yellow-brownish stellate-pubescent, with sparse raised lenticels; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales yellow-brownish stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–2(–3) cm, sparsely stellate-pubescent, glabrescent; leaf blade green when young, obovate, obovate-oblong, or oblong, 7–20 × (2–)3–7 cm, leathery, abaxially sparsely yellow-brownish stellate-pubescent or subglabrous, adaxially glabrous, intense green and lustrous, midvein raised abaxially, lateral veins 5–7-jugate, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base broadly cuneate to subrounded, without glands, margin remotely serrate except at base, sometimes subentire, apex acuminate or acute. Flowers appearing after leaves; inflorescence paniculate, usually pyramidal, terminal or axillary on short branches, erect or nodding, 5–11(–22) × 2.5–8.5(–15) cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, large, yellow-brownish stellate-pubescent, without large sterile radiant flowers; peduncles 3–10 cm; bracts and bracteoles persistent, leaflike, yellowish green, lanceolate, yellow-brownish stellate-pubescent. Flowers on rays of 2nd and 3rd orders, not fragrant, sessile or shortly pedicellate. Calyx green; tube tubular-campanulate, ca. 1.5 mm, sparsely yellow-brownish stellate-pubescent; lobes ovate, ca. 1 mm, sparsely yellow-brownish stellate-pubescent, apex obtuse. Corolla white, rotate, 4–5(–6) mm in diam., sparsely stellate-pubescent; tube very short, ca. 1 mm; lobes spreading, ovate to oblong-ovate, ca. 1.5 mm, ca. 2 × as long as tube, apex obtuse, margin entire. Stamens slightly shorter than corolla, inserted at apex of corolla tube; filaments ca. 2 mm; anthers yellow-whitish, ellipsoid, ca. 1 mm. Styles slightly obviously exceeding calyx lobes; stigmas capitate, 3-lobed. Fruit initially turning yellow, maturing red, ovoid, ca. 1 cm × 6 mm, base rounded, apex acuminate, often stellate-pubescent; pyrenes slightly compressed, ovoid or narrowly ovoid, ca. 8 × 5 mm, with a deep ventral groove, apex acuminate. Fl. Nov–Feb, fr. May–Aug.

• Dense forests, scrub; (400–)600–1900 m. Guangxi, Guizhou, W Hubei, Hunan, Jiangxi, Sichuan, Yunnan.

**22. *Viburnum brevitubum*** (P. S. Hsu) P. S. Hsu, Acta Phytotax. Sin. 17(2): 80. 1979.

短筒荚蒾 duan tong jia mi

*Viburnum erubescens* Wallich var. *brevitubum* P. S. Hsu, Acta Phytotax. Sin. 11: 67. 1966; *V. carnosulum* (W. W. Smith) P. S. Hsu var. *impressinervium* P. S. Hsu; *V. chingii* P. S. Hsu var. *impressinervium* (P. S. Hsu) P. S. Hsu.

Shrubs, deciduous, to 4 m tall. Bark light brown. Branchlets of current year grayish green, glabrous, with dispersed lenticels; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales brownish, oblong, ca. 7 mm, inside pubescent, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, robust, 7–10 mm, sparsely stellate-pubescent, subglabrescent; leaf blade purplish green when young, becoming intense green and lustrous adaxially, elliptic-oblong to narrowly oblong, sometimes orbicular-oblong or suborbicular, 3–7.5 × 2–3 cm, papery, abaxially sparsely stellate-pubescent along veins, and with pedate holes in axils of veins, adaxially glabrous, midvein raised abaxially, lateral veins ca. 5-jugate, pinnate, arched, branched, ending in teeth or anastomosing near margin, slightly raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base obtuse to subrounded, without glands, margin serrate except at base, apex acuminate or acute. Flowers appearing after leaves; inflorescence paniculate, at apices of branchlets with 1-jugate leaves, 4–5 × 3–4 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, sparsely stellate-pubescent, immediately glabrescent, without large sterile radiant flowers; peduncles (0.8–)2–3.5 cm; bracts and bracteoles persistent, leaflike, purple-reddish, lanceolate, conspicuous, glabrous. Flowers mostly on rays of 2nd order, not fragrant, sessile. Calyx green; tube tubular, ca. 3 mm, glabrous; lobes broadly triangular, ca. 1 mm, glabrous, apex obtuse. Corolla white and reddish, tubular-campanulate, ca. 5 mm in diam., glabrous; tube ca. 4 mm; lobes spreading, broadly ovate, ca. 2.5 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of corolla tube; filaments ca. 2 mm; anthers purple-brownish, oblong, ca. 1 mm, slightly exerted. Styles nearly as long as calyx lobes; stigmas capitate. Fruit ma-

turing red, ellipsoid, ca.  $6 \times 4$  mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca.  $5 \times 3$  mm, with a broad and deep ventral groove, apex rounded. Fl. May–Jun, fr. Jul.

• Forests; 1300–2300 m. NE Guizhou, W Hubei, W Jiangxi, Sichuan.

**23. *Viburnum chingii*** P. S. Hsu, Acta Phytotax. Sin. 11: 68. 1966.

漾鼻荚蒾 yang bi jia mi

Shrubs or small trees, evergreen, to 5 m tall. Bark light brown. Branchlets of current year sparsely or densely yellowish stellate-pubescent, glabrescent; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales reddish brown, stellate-pubescent, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, robust, 1–2 cm, sparsely yellowish stellate-pubescent, glabrescent; leaf blade purplish green when young, elliptic, ovate-elliptic, or obovate to obovate-oblong, 3.5–9 cm, subleathery, abaxially sparsely yellowish stellate-pubescent or glabrescent on veins, adaxially lustrous, midvein raised abaxially, lateral veins ca. 6-jugate, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous or slightly impressed on both surfaces, not lobed, base broadly cuneate or obtuse, without glands, margin serrate except at base, apices of teeth slightly mucronate, apex shortly acute or obtuse, sometimes abruptly narrowed and shortly caudate. Flowers appearing with leaves; inflorescence paniculate, terminal,  $5-6 \times 4.5-5$  cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, yellowish stellate-pubescent, without large sterile radiant flowers; peduncles (2–)3.5–4.5(–6) cm; bracts caducous, leaflike, reddish, linear to linear-lanceolate, ciliate; bracteoles linear. Flowers on rays of 1st order or 2nd order, not fragrant, mostly sessile. Calyx reddish; tube tubular, ca. 2 mm, glabrous; lobes ovate-triangular, short, less than 1 mm, glabrous, apex obtuse. Corolla pinkish in bud, white when open, funnellform-hypocrateriform, ca. 6 mm in diam., glabrous; tube ca. 7 mm; lobes spreading, broadly ovate, 2–3 mm, apex rounded, margin entire. Stamens nearly as long as corolla, inserted at apex of corolla tube; filaments ca. 2 mm; anthers purple-blackish, oblong, ca. 1.5 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, obovoid-orbicular, ca.  $8 \times 6$  mm, base rounded, apex rounded, glabrous; pyrenes compressed, obovoid, ca.  $7 \times 4$  mm, with 1 broad and deep ventral groove, apex rounded. Fl. Apr–May, fr. Jun–Oct.

Forests, thickets; 1500–3200 m. ?Sichuan, Yunnan [N Myanmar].

*Viburnum chingii* is very similar to *V. erubescens*; so much so that it may be included in the variation of the latter taxon.

- 1a. Young branches, petioles, leaf veins  
sparsely yellowish stellate-pubescent,  
glabrescent ..... 23a. var. *chingii*
- 1b. Young branches, petioles, leaf veins  
densely yellowish stellate-pubescent  
..... 23b. var. *limitaneum*

### 23a. *Viburnum chingii* var. *chingii*

漾鼻荚蒾(原变种) yang bi jia mi (yuan bian zhong)

*Viburnum carnosulum* (W. W. Smith) P. S. Hsu; *V. chingii* var. *carnosulum* (W. W. Smith) P. S. Hsu; *V. chingii* var. *patentiserratum* P. S. Hsu; *V. chingii* var. *tenuipes* P. S. Hsu; *V. erubescens* Wallich var. *carnosulum* W. W. Smith; *V. erubescens* var. *neurophyllum* Handel-Mazzetti.

Young branches, petioles, leaf veins sparsely yellowish stellate-pubescent, glabrescent.

• Forests; 2000–2900 m. Yunnan.

**23b. *Viburnum chingii* var. *limitaneum*** (W. W. Smith) Q. E. Yang, **comb. nov.**

多毛漾鼻荚蒾 duo mao yang bi jia mi

Basionym: *Viburnum erubescens* var. *limitaneum* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 138. 1916; *V. subalpinum* Handel-Mazzetti var. *limitaneum* (W. W. Smith) P. S. Hsu.

Young branches, petioles, and leaf veins densely yellowish stellate-pubescent.

Forests, thickets; 1500–2900 m. W Yunnan (Tengchong) [N Myanmar].

**24. *Viburnum corymbiflorum*** P. S. Hsu & S. C. Hsu, Acta Phytotax. Sin. 11: 73. 1966.

伞房荚蒾 san fang jia mi

Shrubs or small trees, to 5 m tall. Bark light brown. Branchlets of current year yellow-whitish or pale brown, glabrous; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, ca. 1 cm, sparsely stellate-pubescent, later subglabrous; leaf blade green when young, becoming intense green and lustrous adaxially, oblong or oblong-lanceolate, or elliptic to obovate,  $5-10(-13) \times 3-4.5$  cm, papery, very rarely subleathery, abaxially glabrous or very sparsely stellate-pubescent on veins, midvein raised abaxially, lateral veins 4–6-jugate, pinnate, slightly arched, rarely branched, mostly ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, inconspicuous adaxially, not lobed, base rounded to broadly cuneate, without glands, margin remotely serrate except at base, apex acute. Flowers appearing after leaves; inflorescence paniculate, corymblike due to shortening of inflorescence axis, at apices of short branchlets with 1 pair of leaves,  $(1.5-3-4) \times (3-4-5.5) (-6)$  cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, sparsely stellate-pubescent, without large sterile radiant flowers; peduncles 2–4.5 cm; bracts persistent, leaflike, greenish, lanceolate, sparsely hairy; bracteoles scalelike. Flowers on rays of 3rd order, not fragrant, long pedicellate. Calyx green; tube tubular, ca. 2 mm, glabrous or subglabrous; lobes narrowly ovate, ca. 2 mm, glabrous, apex obtuse. Corolla white, rotate, ca. 8 mm in diam., glabrous; tube less than 1 mm; lobes spreading, oblong-orbicular, ca. 3 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of

corolla tube; filaments ca. 1.5 mm; anthers yellow-whitish, ellipsoid, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, ellipsoid,  $7-8(-10) \times 5-6$  mm, base rounded, apex rounded, glabrous; pyrenes obovoid or obovoid-oblong, ca.  $6 \times 4$  mm, with a deep ventral groove, apex rounded. Fl. Apr–May, fr. Jun–Jul.

• Forests, scrub; 1000–2400 m. N Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, SW Jiangxi, Sichuan, Yunnan, S Zhejiang.

- 1a. Branchlets yellow-whitish; leaves oblong or oblong-lanceolate,  $6-13 \times 3-4$  cm ..... 24a. subsp. *corymbiflorum*  
 1b. Branchlets pale brown; leaves elliptic to obovate,  $5-9.5 \times 3-4.5$  cm ..... 24b. subsp. *malifolium*

**24a. *Viburnum corymbiflorum* subsp. *corymbiflorum***

伞房荚蒾(原亚种) san fang jia mi (yuan ya zhong)

Branchlets yellow-whitish. Leaves oblong or oblong-lanceolate,  $6-13 \times 3-4$  cm.

• Forests, scrub; 1000–1800 m. N Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, SW Jiangxi, Sichuan, Yunnan, S Zhejiang.

**24b. *Viburnum corymbiflorum* subsp. *malifolium* P. S. Hsu, Acta Phytotax. Sin. 11: 74. 1966.**

苹果叶荚蒾 ping guo ye jia mi

Branchlets pale brown. Leaves elliptic to obovate,  $5-9.5 \times 3-4.5$  cm.

• Forests; 1700–2400 m. Yunnan.

**25. *Viburnum erubescens* Wallich, Pl. Asiat. Rar. 2: 29. 1831.**

红荚蒾 hong jia mi

*Solenotinus erubescens* (Wallich) Oersted; *Viburnum botryoideum* H. Léveillé; *V. burmanicum* (Rehder) C. Y. Wu ex P. S. Hsu; *V. burmanicum* var. *motoense* P. S. Hsu; *V. erubescens* var. *burmanicum* Rehder; *V. erubescens* var. *gracilipes* Rehder; *V. erubescens* var. *parvum* P. S. Hsu & S. C. Hsu; *V. erubescens* var. *prattii* (Graebner) Rehder; *V. prattii* Graebner; *V. pubigerum* Wight & Arnott; *V. thibeticum* C. Y. Wu & Y. F. Huang; *V. wightianum* Wallich.

Shrubs or small trees, deciduous, to 6 m tall. Bark light brown. Branchlets of current year stellate-pubescent or glabrous; branchlets of previous year gray-brownish or gray-whitish, terete, glabrous, with sparse, dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales reddish brown, stellate-pubescent, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole purplish, robust, 1–2.5 cm, stellate-pubescent or glabrous; leaf blade green when young, elliptic or oblong-lanceolate to narrowly oblong, rarely ovate-cordate or slightly obovate,  $(2-6-14) \times 1-9$  cm, papery, abaxially stellate-pubescent on midvein and lateral veins, adaxially glabrous or pubescent on midvein, midvein raised abaxially, lateral veins 4–9-jugate, pinnate, slightly arched, branched, mostly ending in teeth, raised abaxially, impressed adaxially, veinlets transverse,

slightly impressed on both surfaces, not lobed, base cuneate or obtuse to rounded or cordate, without glands, margin serrulate except at base, apex acuminate or acute to obtuse. Flowers appearing with leaves; inflorescence paniculate, at apices of short branchlets with 1-jugate leaves, usually nodding,  $(5-7.5-10) \times 3-4$  cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, stellate-pubescent or subglabrous, without large sterile radiant flowers; peduncles 2–6 cm; bracts caducous, leaflike, reddish, linear to linear-lanceolate, glabrous; bracteoles linear. Flowers on rays from 1st to 3rd orders, fragrant, sessile or shortly pedicellate. Calyx reddish; tube tubular, 2.5–3 mm, usually glabrous, sometimes with tiny red-brown glands; lobes ovate-triangular, very small, ca. 0.5 mm, glabrous or stellate-pubescent, apex obtuse. Corolla white tinted pink outside, or pink, hypocrateriform, ca. 8 mm in diam., glabrous; tube 5–6 mm; lobes spreading, ovate, 2–3.5 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of corolla tube; filaments very short; anthers yellow-whitish, slightly exserted, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing purple-reddish, later nigrescent, ellipsoid,  $6.5-8.5 \times 4.5-6$  mm, base rounded, apex rounded, glabrous; pyrenes compressed, obovoid,  $7-9 \times 4-5$  mm, with 1 broad and deep ventral groove, apex rounded. Fl. Apr–Jun, fr. Aug.  $2n = 48, 64$ .

Forests, scrub; (1500–)2400–3500 m. Gansu, Guizhou, Hubei, Shaanxi, Sichuan, SE Xizang, Yunnan [Bhutan, N India, N Myanmar, Nepal].

This taxon shows a complex variation pattern. The number of flowers in the inflorescence and the number of lateral veins have been used to recognize separate taxa such as *Viburnum burmanicum*, *V. erubescens* var. *parvum*, or *V. prattii*.

In Fl. Xizang (4: 483. 1985), “*Viburnum burmanicum* var. *medogense* P. S. Hsu” was written instead of *Viburnum burmanicum* var. *motoense* P. S. Hsu.

**26. *Viburnum farreri* Stearn, Taxon 15: 22. 1966.**

香荚蒾 xiang jia mi

*Lonicera mongolica* Gmelin; *Viburnum farreri* var. *stellipilum* D. Z. Ma & H. L. Liu; *V. fragrans* Bunge (1833), not Loisel (1824).

Shrubs, deciduous, to 5 m tall. Bark gray-brownish. Branchlets of current year green, subglabrous; branchlets of previous year red-brownish, later gray-brownish or gray-whitish, terete, glabrous, with sparse, dispersed, small, rounded lenticels. Winter buds ellipsoid, with 2 or 3 pairs of separate scales; scales reddish brown, ciliate, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole purplish, robust,  $(1-1.5-3)$  cm, adaxially pubescent on margin when young; leaf blade purplish green when young, elliptic or rhombic-obovate,  $4-8 \times 1-2.5$  cm, papery, abaxially slightly pubescent on veins, adaxially sparsely pubescent with fine and short hairs when young, later glabrous on both surfaces but stellate-pubescent in axils of veins, midvein raised abaxially, lateral veins 5–7-jugate, pinnate, straight or slightly arched, branched, ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, inconspicuous or slightly impressed on both sur-

faces, not lobed, base cuneate to broadly cuneate, without glands, margin triangular-serrate except at base, apex acute. Flowers appearing before leaves; inflorescence paniculate, at apices of short branchlets that can produce new leaves, 3–5 × 2.5–3.5 cm; rays opposite, decussate; first node of inflorescence with 2 rays, many flowered, sparsely pubescent when young, glabrescent, without large sterile radiant flowers; peduncles very short when flowers just open, later gradually elongated; bracts caducous, leaflike, reddish, linear-lanceolate, ciliate, subglabrous; bracteoles linear. Flowers on rays from 1st to 3rd orders, fragrant, sessile. Calyx reddish; tube tubular-obconical, ca. 2 mm, glabrous; lobes ovate, very small, ca. 0.5 mm, glabrous, apex obtuse. Corolla pink in bud, white when open, hypocrateriform, ca. 1 cm in diam., glabrous; tube 7–10 mm, slightly spreading in upper part; lobes spreading, broadly ovate, ca. 4 × 3 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted above middle of corolla tube generally at different heights; filaments very short or absent; anthers yellow-whitish, subglobose, ca. 1.5 mm. Styles not exceeding calyx lobes; stigmas 3-lobed. Fruit initially turning yellow, maturing purple-reddish, oblong, 8–10 × ca. 6 mm, base rounded, apex rounded, glabrous; pyrenes compressed, oblong, ca. 7 × 5 mm, with 1 deep ventral groove, apex rounded. Fl. Apr–May, fr. Jun–Jul.  $2n = 16^*$ ,  $32^*$ .

• Forests; 1600–2800 m. Gansu, Qinghai, Xinjiang; commonly cultivated in Gansu, Hebei, Henan, Qinghai, Shandong.

**27. *Viburnum grandiflorum*** Wallich ex Candolle, Prodr. 4: 329. 1830.

大花荚蒾 da hua jia mi

Shrubs or small trees, deciduous, to 5 m tall. Bark gray-brownish. Branchlets of current year green, glabrous or sometimes pubescent; branchlets of previous year gray or brown, trabeculate, glabrous, with sparse, dispersed, small, rounded lenticels. Winter buds ellipsoid, with 2 or 3 pairs of separate scales; scales reddish brown, ciliate, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole purplish, robust, 1–1.5 cm, sparsely stellate-pubescent or glabrous; leaf blade purplish green when young, elliptic-oblong, rarely elliptic or obovate-elliptic, 6–10 × 2.5–4 cm, papery, abaxially densely pubescent, adaxially sparsely pubescent, later pubescent only on veins and in axils of veins abaxially, midvein raised abaxially, lateral veins 6–10-jugate, pinnate, straight or slightly arched, branched, ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, inconspicuous or slightly impressed on both surfaces, not lobed, base cuneate, without glands, margin crenate-serrate except at base, apex acuminate. Flowers appearing before leaves; inflorescence paniculate, densely clustered at apices of leafless short branchlets, 2–7 × 3–4 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, sericeous, without large sterile radiant flowers, subtended by ovate to orbicular-ovate scales; outer scales nearly leaflike, to ca. 1 cm, intense brown, pubescent or glabrous; inner scales tomentose on margins of both sides; scales deciduous when inflorescence opens; peduncles very short when flowers just open, later gradually elongated; bracts caducous, leaflike, reddish, oblong to linear, to 1 cm, silvery

sericeous at first, later glabrous; bracteoles oblong to linear. Flowers on rays from 1st to 3rd orders, fragrant, sessile. Calyx reddish; tube tubular, ca. 3 mm, glabrous; lobes triangular, small, ca. 1 mm, glabrous, apex obtuse. Corolla pink outside, white inside, hypocrateriform, ca. 1 cm in diam., glabrous; tube to 1 cm; lobes spreading, broadly ovate, 4–5 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at or above middle of corolla tube, generally at different heights; filaments ca. 3 mm; anthers yellow, elliptic-oblong, ca. 2 mm. Styles exceeding calyx lobes; stigmas discoid, 2-lobed. Fruit initially turning yellow, maturing purple-reddish, ellipsoid or oblong-ellipsoid, ca. 12 × 8 mm, usually only 1 infructescence mature, base rounded, apex rounded, glabrous; pyrenes slightly compressed, oblong, 9–11 × 5–6 mm, with 1 deep ventral groove, apex rounded. Fl. May, fr. Jun–Jul.  $2n = 16$ .

Forests; 2800–4300 m. Xizang [Bhutan, India (Sikkim), Kashmir, Nepal, Pakistan].

In China, only *Viburnum grandiflorum* f. *grandiflorum* is reported. A glabrous form, with pure white or pink-tinged corolla, known as *V. grandiflorum* f. *foetens* (Decaisne) N. P. Taylor & Zappi, occurs in India, Nepal, and Pakistan.

**28. *Viburnum henryi*** Hemsley, J. Linn. Soc., Bot. 23: 353. 1888.

巴东荚蒾 ba dong jia mi

*Viburnum rosthornii* Graebner var. *xerocarpum* Graebner.

Shrubs or small trees, evergreen or semievergreen, to 7 m tall. Bark light brown. Branchlets of current year purplish brown or green, glabrous; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds oblong, with 2 pairs of separate scales; scales yellow stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, robust, 1–2 mm, glabrous; leaf blade purplish green when young, obovate-oblong to oblong or narrowly oblong, 5–10(–13) × 2–4 cm, subleathery, abaxially stellate-pubescent in axils of veins, and with pedate holes in axils of veins, adaxially glabrous and lustrous, midvein raised abaxially, lateral veins 5–7-jugate, pinnate, slightly arched, rarely branched, partly ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base cuneate to rounded, without glands, margin serrate above middle part, apex acute to acuminate. Flowers appearing after leaves; inflorescence paniculate, terminal, 4–9 × 5–8 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, glabrous, without large sterile radiant flowers; peduncles 2–4 cm, slender; bracts and bracteoles late deciduous or persistent and conspicuous, leaflike, green-whitish, linear-lanceolate, glabrous. Flowers on rays of 2nd and 3rd orders, fragrant, sessile. Calyx reddish; tube tubular to obconical-tubular, ca. 2 mm, glabrous; lobes broadly triangular, ca. 1 mm, glabrous, apex obtuse. Corolla white, rotate, ca. 6 mm in diam., glabrous or subglabrous; tube ca. 1 mm; lobes spreading, ovate-orbicular, ca. 2 mm, apex rounded, margin entire. Stamens equaling or slightly exceeding corolla lobes, inserted at apex of corolla tube; filaments ca. 2 mm; anthers yellow-whitish, oblong, ca. 1 mm. Styles nearly as long

as calyx lobes; stigmas capitate. Fruit initially turning red, maturing purple-blackish, ellipsoid,  $8-9 \times$  ca. 6 mm, base rounded, apex rounded, glabrous; pyrenes slightly compressed, ellipsoid,  $7-8 \times$  ca. 4 mm, with a deep ventral groove, apex rounded. Fl. Jun, fr. Aug–Sep.  $2n = 48^*$ .

• Dense forests, moist grassy slopes; 900–2600 m. N Fujian, Guangxi, SE Guizhou, W Hubei, W Jiangxi, S Shaanxi, Sichuan, S Zhejiang.

**29. *Viburnum longipedunculatum*** (P. S. Hsu) P. S. Hsu, Acta Phytotax. Sin. 17(2): 78. 1979.

长梗荚蒾 *chang geng jia mi*

*Viburnum corymbiflorum* P. S. Hsu & S. C. Hsu var. *longipedunculatum* P. S. Hsu, Acta Phytotax. Sin. 13(1): 115. 1975.

Shrubs, deciduous, total size unknown. Bark unknown. Branchlets of current year grayish yellow, with dispersed, rounded lenticels; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales brownish, yellow-brownish stellate-pubescent, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–2 cm, glabrous; leaf blade green when young, becoming dark green adaxially, oblong to obovate-oblong,  $(4-5)-14 \times (1.5-2.5)-6$  cm, papery, both surfaces glabrous, midvein raised abaxially but not adaxially, lateral veins 4- or 5-jugate, pinnate, arched, branched, anastomosing near margin, conspicuously raised abaxially, inconspicuous adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base broadly cuneate, without glands, margin remotely and shallowly serrate above  $1/5-1/3$  from base, apex abruptly narrowed and caudate. Flowers appearing after leaves; inflorescence paniculate, at apices of short branchlets with 1-jugate leaves,  $2.5-4.5 \times 2-4$  cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, with dispersed small glands, without large sterile radiant flowers; peduncles  $(3.5)-6-9$  cm, nodding at fruiting stage; bracts persistent, leaflike, reddish, linear to linear-lanceolate, large and conspicuous, sparsely glandular hairy; bracteoles persistent, scalelike. Flowers on rays of 1st and 2nd orders, not fragrant, sessile. Calyx reddish; tube obconical, ca. 3 mm, outside with few small glands; lobes orbicular-ovate to ovate-triangular, ca. 1 mm, glabrous, apex slightly acute or obtuse. Corolla white, tubular-funnelform, ca. 8 mm in diam., glabrous; tube ca. 7 mm; lobes spreading, orbicular-ovate, ca. 3 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of corolla tube; filaments very short; anthers yellow-whitish, elliptic-oblong, ca. 1.7 mm. Styles nearly as long as calyx lobes; stigmas slightly 3-lobed. Fruit initially turning red, maturing intense red, ellipsoid or oblong-ellipsoid,  $8-10 \times 5-6$  mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca.  $7.5 \times 5$  mm, with 1 deep ventral groove, apex rounded. Fl. Apr–May, fr. Jul–Aug.

• Dense forests; 1400–1600 m. Guangxi, SE Yunnan (Xichou).

**30. *Viburnum odoratissimum*** Ker Gawler, Bot. Reg. 6: t. 456. 1820.

珊瑚树 *shan hu shu*

Shrubs or small trees, evergreen, to 10(–15) m tall. Bark gray-brownish. Branchlets of current year green or reddish, glabrous or sometimes sparsely yellow-brownish stellate-pubescent; branchlets of previous year gray or gray-brownish, terete, glabrous, with dispersed, small, raised lenticels. Winter buds ovoid-lanceolate, with 2–4 pairs of separate scales; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, robust, 1–2(–3) cm, glabrous or stellate-pubescent; leaf blade green when young, becoming intense green and lustrous adaxially, elliptic to oblong or oblong-obovate to obovate, sometimes suborbicular,  $7-20 \times (3-4)-9$  cm, leathery, abaxially sometimes with sparse, dispersed dark red minute glands, both surfaces glabrous or sparsely stellate-pubescent on veins, midvein raised and conspicuous abaxially, lateral veins 4–9-jugate, pinnate, arched, branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised abaxially, inconspicuous adaxially, not lobed, base broadly cuneate, rarely rounded, without glands, margin irregularly serrate except at base or subentire, apex shortly acute to obtusely acute and mucronate, sometimes obtuse or subrounded. Flowers appearing after leaves; inflorescence paniculate, pyramidal, terminal or at apices of short lateral branchlets with 1-jugate leaves,  $(3.5)-6-13.5 \times (3-4.5)-6$  cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, large, glabrous or stellate-pubescent, without large sterile radiant flowers; peduncles 4–10 cm; bracts caducous, leaflike, greenish, less than 1 cm  $\times$  2 mm, lanceolate to ovate, sparsely hairy; bracteoles scalelike. Flowers usually on rays of 2nd and 3rd orders, fragrant, sessile or shortly pedicellate. Calyx green; tube tubular-campanulate, 1.5–4 mm, glabrous; lobes broadly triangular, ca. 1 mm, glabrous, apex obtuse. Corolla white, later yellow-whitish, sometimes reddish, rotate, ca. 7 mm in diam., glabrous; tube ca. 2 mm; lobes reflexed, orbicular-ovate, 2–3 mm, apex rounded, margin entire. Stamens slightly exceeding corolla lobes, inserted at apex of corolla tube; filaments 2.5–3 mm; anthers yellow, oblong, nearly 2 mm. Styles not exceeding calyx lobes; stigmas capitate or slightly 3-lobed. Fruit initially turning red, maturing nigrescent, ovoid or ovoid-ellipsoid, ca.  $8 \times 5-6$  mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid or ovoid-ellipsoid, ca.  $7 \times 4$  mm, with a deep ventral groove, apex rounded. Fl. Mar–May, fr. Jun–Sep.  $2n = 40$ .

• Forests, scrub; sea level to 2500 m. SE Fujian, Guangdong, Guangxi, ?Guizhou, Hainan, Hebei, Henan, Hunan, Taiwan, Yunnan, Zhejiang [E India, Japan, Korea, N Myanmar, ?Philippines, Thailand, Vietnam].

This species is commonly cultivated in China.

- 1a. Inflorescence axes brownish  
stellate-pubescent ..... 30c. var. *arboricola*
- 1b. Inflorescence axes glabrous.
  - 2a. Leaf blade elliptic-obovate, thickly  
leathery and lustrous, petiole reddish,  
lateral veins 5–8-jugate; corolla  
campanulate, tube 3–4 mm ..... 30b. var. *awabuki*
  - 2b. Leaf blade obovate, papery and  
dull, petiole green, lateral veins  
4–6-jugate; corolla subrotate,  
tube less than 2.5 mm ..... 30a. var. *odoratissimum*

**30a. *Viburnum odoratissimum* var. *odoratissimum***

珊瑚树(原变种) shan hu shu (yuan bian zhong)

*Microtinus odoratissimus* (Ker Gawler) Oersted; *Thyrso-sma chinensis* Rafinesque, nom. illeg. superfl.; *Viburnum kerrii* Geddes; *V. sinense* Zeyher ex Colla (1824), not *V. chinense* Hooker & Arnott (1833).

Petiole green; leaf blade dull, obovate, papery, lateral veins 4–6-jugate. Inflorescence axes glabrous. Corolla subrotate; tube less than 2.5 mm.  $2n = 32$ .

Forests; 200–1300 m. SE Fujian, Guangdong, Guangxi, ?Guizhou, Hainan, Hebei, Henan, Hunan, Taiwan, Yunnan [E India, Japan, Korea, N Myanmar, Thailand, Vietnam].

This variety is commonly cultivated in China.

**30b. *Viburnum odoratissimum* var. *awabuki* (K. Koch) Zabel ex Rümpler, Ill. Gartenbau-Lex., ed. 3, 877. 1902.**

日本珊瑚树 ri ben shan hu shu

*Viburnum awabuki* K. Koch, Wochenschr. Vereines Beförd. Gartenbaues Königl. Preuss. Staaten 10: 109. 1867; *V. awabuki* var. *serratum* (Makino) Nakai; *V. odoratissimum* var. *consersum* W. W. Smith; *V. odoratissimum* var. *serratum* Makino; *V. sessiliflorum* Geddes; *V. simonsii* J. D. Hooker & Thomson.

Petiole reddish; leaf blade lustrous, elliptic-obovate, thickly leathery, lateral veins 5–8-jugate. Inflorescence axes glabrous. Corolla campanulate; tube 3–4 mm.  $2n = 40$ .

Forests; sea level to 1500 m. Taiwan [Japan, ?Philippines].

This variety is commonly cultivated in China (e.g., Anhui, Jiangsu, Zhejiang).

**30c. *Viburnum odoratissimum* var. *arboricola* (Hayata) Yamamoto, J. Soc. Trop. Agric. 8: 69. 1936.**

台湾珊瑚树 tai wan shan hu shu

*Viburnum arboricola* Hayata, Icon. Pl. Formosan. 4: 12. 1914; *V. sphaerocarpum* Y. C. Liu & C. H. Ou.

Petiole green; leaf blade dull, elliptic to oblong, papery to subleathery, lateral veins 6–9-jugate. Inflorescence axes brownish stellate-pubescent. Corolla campanulate; tube ca. 1.5 mm.

• Forests; 1500–2500 m. Taiwan.

**31. *Viburnum oliganthum* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 372. 1894.**

少花荚蒾 shao hua jia mi

*Viburnum stapfianum* H. Léveillé.

Shrubs or small trees, evergreen, to 6 m tall. Bark gray-brownish. Branchlets of current year brown, with rounded lenticels; branchlets of previous year gray-brownish or black, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds oblong, with 2 pairs of separate scales; scales brownish, stellate-pubescent, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole purple-

reddish, robust, 5–15 mm, stellate-pubescent or glabrous; leaf blade green when young, becoming intense green and lustrous adaxially, oblanceolate to linear-ob lanceolate or obovate-oblong to oblong, rarely obovate, 5–10(–13) × (1.5–)2–3.5 cm, subleathery or leathery, very rarely thickly papery, both surfaces glabrous, midvein raised on both surfaces, particularly so adaxially, lateral veins 5- or 6-jugate, pinnate, arched, branched, anastomosing near margin, slightly conspicuous abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base cuneate to obtuse, rarely subrounded, without glands, margin remotely and shallowly serrate above 1/3–1/2 from base, apex abruptly narrowed and acuminate to long acuminate, shortly or long caudate. Flowers appearing after leaves; inflorescence paniculate, at apices of short branchlets with 1-jugate leaves, 2.5–4.5(–10) × 2–4 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, glabrous, without large sterile radiant flowers; peduncles (1.2–)2.5–7 cm, slender and compressed, purple-reddish, sparsely yellow-brownish stellate-pubescent; bracts persistent, leaflike, purple-reddish, linear to linear-lanceolate, glabrous; bracteoles persistent, scalelike. Flowers on rays of 1st and 2nd orders, not fragrant, sessile. Calyx purple-reddish; tube tubular-obconical, ca. 2 mm, glabrous; lobes triangular-ovate, ca. 0.5 mm, glabrous, apex acute. Corolla white or reddish, funnelform, ca. 6 mm in diam., glabrous; tube 6–8 mm; lobes spreading, broadly ovate, ca. 2 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of corolla tube; filaments very short; anthers purple-reddish, oblong, ca. 1.5 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit initially turning red, maturing nigrescent, ellipsoid, 6–7 × 4–5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca. 6 × 4 mm, with 1 broad and deep ventral groove, apex rounded. Fl. Apr–Jun, fr. Jun–Aug.

• Forests, scrub; 1000–2200 m. Guizhou, W Hubei, Sichuan, Xizang, NE Yunnan.

**32. *Viburnum omeiense* P. S. Hsu, Acta Phytotax. Sin. 11: 67. 1966.**

峨眉荚蒾 e mei jia mi

Shrubs, deciduous, ca. 75 cm tall. Bark unknown. Branchlets of current year gray-yellowish, with dispersed, raised lenticels; branchlets of previous year gray-yellowish, terete, glabrous, with dispersed, small, raised lenticels. Winter buds oblong, with 2 pairs of separate scales; scales reddish brown, glabrous, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole reddish, robust, 5–10 mm, glabrous; leaf blade purplish green when young, oblong, 3–7 × 1.5–3 cm, thickly papery, both surfaces glabrous, midvein raised on both surfaces, lateral veins ca. 4-jugate, pinnate, arched, rarely branched, anastomosing near margin, slightly raised abaxially, inconspicuous or slightly impressed adaxially, veinlets transverse, inconspicuous or slightly impressed on both surfaces, not lobed, base cuneate, without glands, margin remotely crenulate except at base, apices of teeth slightly mucronate, apex acute. Flowers appearing with leaves; inflorescence paniculate, terminal or at apices of short lateral branchlets with 1 pair of leaves, ca. 3.5 × 4.5 cm; rays

opposite, decussate; first node of inflorescence with 2 rays, dense, glabrous, without large sterile radiant flowers; peduncle 2–3 cm; bracts caducous, leaflike, green, oblong or linear, ca.  $1.8 \times 0.8$  mm, midvein red at base, lateral veins inconspicuous, apex obtuse, sparsely stellate-pubescent or sometimes sparsely ciliate; bracteoles scalelike. Flowers on rays of 1st and 2nd orders, not fragrant, sessile. Calyx reddish; tube tubular-obconical, ca. 1.8 mm, glabrous; lobes broadly ovate, short, ca. 0.8 mm, glabrous, apex acute. Corolla white, hypocrateriform, less than 5 mm in diam., glabrous; tube ca. 3.5 mm; lobes ?spreading, broadly ovate, ca. 1 mm, 1 slightly larger than others, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of corolla tube; filaments very short; anthers yellow-whitish, elliptic-oblong, ca. 1 mm. Styles slightly exceeding calyx lobes or not; stigmas 3-lobed. Fruit unknown. Fl. Nov–May.

- Mountains; ca. 1300 m. Sichuan (Emei Shan).

This species is represented by the type collection, which appears to have a premature inflorescence, and an additional collection with old flowers. Field work is needed to determine the identity of these plants.

**33. *Viburnum shweliense*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 12: 227. 1920.

瑞丽荚蒾 rui li jia mi

Shrubs or small trees, deciduous, to 3 m tall. Bark light brown. Branchlets of current year reddish green, glabrous, with dispersed, gray lenticels; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds oblong, with 2 pairs of separate scales; scales reddish brown, stellate-pubescent, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, robust, 2–2.5 cm, sparsely stellate-pubescent or glabrous; leaf blade purplish green when young, broadly elliptic or oblong-elliptic, 8–12.5 cm, papery, abaxially stellate-pubescent on midvein and lateral veins, adaxially glabrous, midvein raised abaxially, lateral veins 6- or 7-jugate, pinnate, slightly arched, branched, ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, slightly impressed adaxially, not lobed, base nearly broadly cuneate, without glands, margin conspicuously serrulate, apex obtuse or mucronate. Flowers appearing with leaves; inflorescence panicle, at apices of short branchlets with 1-jugate leaves, ca.  $5 \times 5$  cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, densely whitish stellate-pubescent or subglabrous, without large sterile radiant flowers; peduncles 3–4 cm, sparsely pubescent; bracts caducous, leaflike, green, ovate to elliptic, ciliate; bracteoles linear. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate. Calyx reddish; tube obconical, ca. 3 mm, usually glabrous, sometimes with few hairs; lobes ovate-triangular, very small, less than 1 mm, glabrous, apex acute. Corolla whitish, rotate-campanulate, ca. 6 mm in diam., glabrous; tube ca. 3 mm; lobes recurved, broadly ovate, 1.5–2 mm, apex rounded. Stamens obviously exceeding corolla tube, inserted at apex of corolla tube; filaments ca. 3 mm; anthers yellow, elliptic-oblong, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit unknown. Fl. Jul.

- Forests; ca. 800 m. W Yunnan [?Myanmar].

**34. *Viburnum subalpinum*** Handel-Mazzetti, Symb. Sin. 7: 1034. 1936.

亚高山荚蒾 ya gao shan jia mi

Shrubs, deciduous, very rarely to 1 m tall. Bark light brown. Branchlets of current year sparsely or densely yellow-brownish stellate-pubescent or subglabrous; branchlets of previous year gray-yellowish, terete, glabrous, with dispersed, rounded lenticels. Winter buds oblong, with 2 pairs of separate scales; scales reddish brown, glabrous, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole purple-reddish, robust, 5–13 mm, sparsely yellow-brownish stellate-pubescent, glabrescent; leaf blade purplish green when young, orbicular or broadly elliptic, 1.5–4(–5)  $\times$  1.5–4.5 cm, papery, abaxially with sparse red-brownish tiny glands, sparsely stellate-pubescent on veins, adaxially sparsely pubescent or glabrous, midvein raised on both surfaces, lateral veins 3–5-jugate, pinnate, arched, rarely branched, mostly anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base truncate to broadly cuneate, without glands, margin remotely serrate except at base, apex obtuse or rounded and mucronate, rarely acuminate. Flowers appearing with leaves; inflorescence panicle, at apices of lateral branchlets with 1-jugate leaves, 2–4  $\times$  2–3 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, glabrous, without large sterile radiant flowers; peduncles nodding, 1.2–3.7 cm, slender, stellate-pubescent; bracts persistent, leaflike, purple-reddish, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays of 1st and 2nd orders, not fragrant, shortly pedicellate. Calyx reddish; tube tubular-obconical, ca. 2 mm, glabrous; lobes broadly triangular, ca. 0.7 mm, glabrous, apex acute. Corolla pinkish in bud, white when open, funnelform, ca. 6 mm in diam., glabrous; tube 4–5 mm; lobes recurved, broadly ovate, ca. 2 mm, apex rounded, margin papillose-ciliate. Stamens longer than corolla, inserted at apex of corolla tube; filaments ca. 2 mm; anthers purple-reddish, elliptic, ca. 0.8 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, ellipsoid, 5–7  $\times$  4–5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca. 5  $\times$  4 mm, with 1 deep ventral groove, apex rounded. Fl. May–Jul, fr. Jul.

Bamboo forests, *Abies* forests; 1600–3800 m. NW and W Yunnan [N Myanmar].

**35. *Viburnum taitoense*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 136. 1911.

台东荚蒾 tai dong jia mi

*Viburnum tubulosum* P. S. Hsu.

Shrubs, evergreen, to 2 m tall. Bark gray-brownish. Branchlets of current year purple-brownish, densely or sparsely stellate-pubescent; branchlets of previous year gray-yellowish or gray-whitish, terete, glabrous, with conspicuously raised lenticels. Winter buds lanceolate, with 2 pairs of separate scales; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 6–10(–15)

mm, stellate-pubescent; leaf blade green when young, becoming intense green and lustrous adaxially, oblong, oblong-lanceolate, or ovate-oblong, 5–9 × 2–3 cm, thickly papery or slightly leathery, abaxially stellate-pubescent in axils of veins, adaxially glabrous, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, branched, anastomosing near margin, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, inconspicuous adaxially, not lobed, base broadly cuneate or subrounded, without glands, margin serrate except at base, apex shortly acute or subrounded. Flowers appearing after leaves; inflorescence paniculate, terminal, ca. 3 × 2 cm; rays opposite, decussate; first node of inflorescence with 2 rays, few flowered, stellate-pubescent, without large sterile radiant flowers; peduncles ca. 2 cm, slender; bracts and bracteoles late deciduous, leaflike, greenish, linear-lanceolate, stellate pubescent. Flowers on rays of 1st and 2nd orders, not fragrant; pedicels 3–4 mm. Calyx reddish; tube tubular-campanulate, ca. 2 mm, glabrous or sparsely stellate-pubescent; lobes triangular, ca. 1 mm, with few stellate ciliate hairs, apex obtuse. Corolla white, funnelform, ca. 6 mm in diam., glabrous; tube 5–9 mm; lobes spreading, ovate to suborbicular, 2–3 mm, apex rounded, margin entire. Stamens shorter than corolla, inserted at apex of corolla tube; filaments very short; anthers yellow-whitish, oblong, ca. 1 mm. Styles long, slender, obviously exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid-ellipsoid, 7–9 × ca. 6 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca. 7 × 5 mm, with a deep ventral groove, apex rounded. Fl. Mar–Apr, fr. Sep–Nov.

• Rocky scrub, streamsides of mountain valleys; 1600–3000 m. N Guangxi, S Hunan, E Taiwan.

**36. *Viburnum tengyuehense*** (W. W. Smith) P. S. Hsu, *Acta Phytotax. Sin.* 11: 72. 1966.

腾越荚蒾 *teng yue jia mi*

Shrubs, deciduous, to 7 m tall. Bark light brown. Branchlets of current year stellate-pubescent, glabrescent; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales pubescent outside. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, ca. 1 cm, stellate-pubescent, glabrescent; leaf blade green when young, elliptic-oblong or ovate-oblong, 7–11 × 2.5–5 cm, thickly papery, abaxially sometimes stellate-pubescent in axils of veins, adaxially glabrous, midvein raised abaxially, lateral veins 5–10-jugate, pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base broadly cuneate to obtuse, without glands, margin serrate except at base, apex shortly acuminate to shortly cuspidate. Flowers appearing after leaves; inflorescence paniculate, terminal or at apices of short lateral branchlets with 1 pair of leaves, 2.5–3 × 3–3.5 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, yellow-brownish stellate-pubescent, without large sterile radiant flowers; peduncles 1.5–5 cm; bracts persistent, leaflike, greenish, ovate-lanceolate, sparsely hairy; bracteoles scalelike. Flowers on rays of 2nd and 3rd orders, not fragrant, sessile or shortly pedicellate. Calyx green; tube tubu-

lar, ca. 2.5 mm, glabrous; lobes triangular, ca. 0.7 mm, glabrous, apex ± acute. Corolla white, rotate, ca. 4.5 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, broadly ovate, ca. 2 × 1.8 mm, ca. 2 × as long as tube, apex obtuse, margin entire. Stamens nearly as long as corolla, inserted at apex of corolla tube; filaments ca. 2 mm; anthers yellow-whitish, ellipsoid, ca. 1 mm. Styles equaling or slightly exceeding calyx lobes; stigmas slightly 2-lobed. Fruit maturing red, oblong or ovoid-ellipsoid, 5–6 × 3.5–5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca. 4 × 3.5 mm, with a deep, broad ventral groove, both ends rounded. Fl. Apr–Jun, fr. Jul–Nov.

• Forests; 1500–2300 m. Guizhou, Yunnan [?Myanmar].

- 1a. Leaves with 5- or 6-jugate lateral veins; serrations acute ..... 36a. var. *tengyuehense*  
 1b. Leaves with 6–10-jugate lateral veins; serrations obtuse ..... 36b. var. *polyneurum*

**36a. *Viburnum tengyuehense* var. *tengyuehense***

腾越荚蒾(原变种) *teng yue jia mi* (yuan bian zhong)

*Viburnum brachybotryum* Hemsley var. *tengyuehense* W. W. Smith, *Notes Roy. Bot. Gard. Edinburgh* 9: 137. 1916; *V. oblongum* P. S. Hsu; *V. oblongum* var. *tengyuehense* (W. W. Smith) P. S. Hsu.

Leaves with 5- or 6-jugate lateral veins, serrations acute.

• Forests; 1500–2200 m. Guizhou, Yunnan.

**36b. *Viburnum tengyuehense* var. *polyneurum*** (P. S. Hsu) P. S. Hsu, *Fl. Reipubl. Popularis Sin.* 72: 60. 1988.

多脉腾越荚蒾 *duo mai teng yue jia mi*

*Viburnum oblongum* var. *polyneurum* P. S. Hsu, *Acta Phytotax. Sin.* 13(1): 114. 1975.

Leaves with 6–10-jugate lateral veins, serrations obtuse. Fl. Apr–Jun, fr. Jul.

• Forests; ca. 2300 m. Guizhou (Weining), S Yunnan (Wenshan).

**37. *Viburnum trabeculosum*** C. Y. Wu ex P. S. Hsu, *Acta Phytotax. Sin.* 17(2): 79. 1979.

横脉荚蒾 *heng mai jia mi*

Trees, deciduous, to 8 m tall. Bark light brown. Branchlets of current year gray-brownish, glabrous, with dispersed lenticels; branchlets of previous year brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales yellow-brownish, glabrous, apex acute. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, robust, 2.5–5 cm, glabrous; leaf blade purplish green when young, oblong-elliptic or rhombic-elliptic to oblong, sometimes ovate-orbicular, 14–20 × 6–10 cm, papery, abaxially stellate-pubescent in axils of veins, adaxially glabrous and lustrous, midvein raised abaxially, lateral veins 7- or 8-jugate, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base cuneate to subtruncate, without glands, margin remotely serrate

except at base, apex shortly acuminate. Flowers appearing with leaves; inflorescence paniculate, pyramidal, 4–20 × 4–7 cm; rays opposite, decussate; first node of inflorescence with 2 rays, lax, densely gray-yellowish stellate-pubescent, without large sterile radiant flowers; peduncles 4.5–6 cm; bracts caducous, leaflike, greenish, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays from 1st to 4th orders, not fragrant, shortly pedicellate. Calyx green; tube tubular, ca. 2 mm, glabrous; lobes ovate or ovate-triangular, ca. 1/4 as long as calyx tube, glabrous, apex rounded or obtuse. Corolla ?funnel-form, unknown. Fruit initially turning red, maturing purple-reddish, slightly compressed, ca. 7 mm, base rounded, apex rounded, glabrous; pyrenes obovoid, ca. 6 mm, with a deep ventral groove, apex rounded. Fl. May, fr. Sep.

- Forests, scrub; 2000–2400 m. S Yunnan.

**38. *Viburnum yunnanense*** Rehder in Sargent, *Trees & Shrubs* 2: 106. 1908.

云南荚蒾 yun nan jia mi

Shrubs, deciduous, to 3 m tall. Bark light brown. Branchlets of current year yellow-brownish stellate-pubescent; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds small, ovoid, with 2 pairs of separate scales; scales yellow-brownish, stellate-pubescent, apex obtuse. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green or reddish, slender, 1–2 cm, yellow-brownish tomentose; leaf blade pur-

plish green when young, becoming dark green adaxially, broadly elliptic, broadly elliptic-oblong, or oblong-obovate, 3–9.5 × 2.5–4.5 cm, papery, abaxially pubescent, with dispersed red-brownish scalelike tiny glands, adaxially pubescent, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, rarely branched, anastomosing near margin, slightly raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base rounded to acuminate, sometimes ± truncate, without glands, margin serrate except at base, apex obtuse to rounded. Flowers appearing after leaves; inflorescence a compound corymblike panicle, terminal or at apices of lateral branchlets with 1-jugate leaves, 3–4 × 4.5–6 cm; rays opposite, decussate; first node of inflorescence with 2 rays, dense, yellow-brownish tomentose, without large sterile radiant flowers; peduncles (3–)4–6 cm; bracts and bracteoles caducous, leaflike, green-whitish, linear to linear-lanceolate, densely yellow-brownish stellate-tomentose. Flowers on rays of 3rd order, not fragrant, sessile. Calyx green; tube tubular-campanulate, ca. 2 mm, with red-brownish tiny glands; lobes broadly ovate or ovate-triangular, ca. 0.7 mm, glabrous, apex obtuse. Corolla white, rotate, 2.5–5 mm in diam., glabrous; tube 1.5–2 mm; lobes spreading, orbicular, ca. 2 mm, slightly exceeding tube, apex rounded, margin entire. Stamens exceeding corolla lobes, inserted at apex of corolla tube; filaments ca. 2.5 mm; anthers yellow-whitish, globose, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit unknown. Fl. Jun.

- Scrub on mountain slopes; 2300–2900 m. Yunnan.

**5. *Viburnum* sect. *Tomentosa*** (Maximowicz) Nakai, *J. Coll. Sci. Imp. Univ. Tokyo* 42(2): 27. 1921 [*“Tomentosi”*].

蝶花组 die hua zu

*Viburnum* subser. *Tomentosa* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Pétersbourg* 26: 476. 1880.

Winter buds with a pair of adnate scales. Inflorescence a compound umbel-like cyme, pedicellate, with large sterile radiant flowers. Corolla rotate. Fruit turning red, maturing black or red; pyrenes with 1 broad ventral groove; albumen solid.

Two species: temperate Asia; two species (one endemic) in China.

Recent phylogenetic work shows that this small and homogeneous section is sister to *Viburnum* sect. *Solenotinus*, even if it is classically expected to be related to *V.* sect. *Pseudotinus*.

**39. *Viburnum hanceanum*** Maximowicz, *Bull. Acad. Imp. Sci. Saint-Pétersbourg* 26: 487. 1880.

蝶花荚蒾 die hua jia mi

Shrubs, deciduous, to 2 m tall. Bark light brown. Branchlets of current year yellow-brown or rusty stellate-pubescent; branchlets of previous year purple-brown, terete, sparsely pubescent or subglabrous, with dispersed, small, raised lenticels. Winter buds lanceolate-triangular, with a pair of adnate scales; scales yellowish brown stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 6–15 mm, yellow-brown or rusty stellate-pubescent; leaf blade green when young, orbicular-ovate, suborbicular, or elliptic, sometimes obovate, 4–8 × 2.5–5.5 cm, papery, both surfaces yellow-brown stellate-pubescent, midvein raised abaxially, lateral veins 5–(7)–9-jugate, pinnate, arched, branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly conspicuous abaxially, slightly impressed adaxially, not lobed, base rounded, broadly

cuneate, or cordate, without glands, margin serrate, apex rounded or slightly mucronate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 5–7 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, gradually glabrescent upward from peduncle, with 2–5 large sterile radiant flowers; peduncles 2–4 cm; bracts caducous, leaflike, green, lanceolate, sparsely hairy; bracteoles scalelike. Flowers on rays of 2nd and 3rd orders, not fragrant, sessile or shortly pedicellate. Sterile flowers: calyx like fertile flowers; corolla white, 2–3 cm in diam., irregularly 4- or 5-lobed; lobes obovate; stamens and pistils not developed. Fertile flowers: calyx green; tube obconical, ca. 1.5 mm, glabrous; lobes ovate, ca. 0.5 mm, glabrous, apex obtuse; corolla yellow-white, rotate, ca. 3 mm in diam., glabrous; tube ca. 2 mm; lobes spreading, ovate, ca. 1/2 as long as tube, apex obtuse, margin entire; stamens subequaling corolla, inserted near base of corolla; filaments ca. 1.5 mm; anthers yellow, oblong, ca. 1 mm; styles slightly exceeding calyx lobes; stigmas 3-lobed. Fruit maturing red, ovoid-orbicular, 5–6 × ca. 4 mm, base rounded,

apex rounded, glabrous; pyrenes compressed, ellipsoid, ca.  $4 \times 3.5$  mm, with a broad ventral groove, both ends rounded. Fl. Mar–May, fr. Aug–Sep.

• Scrub; 200–800 m. Fujian, Guangdong, Guangxi, ?Guizhou, Hunan, S Jiangxi.

**40. *Viburnum plicatum*** Thunberg, Trans. Linn. Soc. London 2: 332. 1794.

粉团 fen tuan

Shrubs, deciduous, to 3 m tall. Bark light brown. Branchlets of current year densely or sparsely yellowish brown stellate-pubescent; branchlets of previous year gray-brownish or gray-blackish, terete, sparsely pubescent or subglabrous, with dispersed, small, rounded lenticels. Winter buds lanceolate-triangular, with a pair of adnate scales; scales sparsely yellowish brown stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–2 cm, thinly stellate-pubescent; leaf blade green when young, broadly ovate, orbicular-obovate, or obovate, rarely suborbicular,  $4\text{--}12 \times (2\text{--})3\text{--}7$  cm, papery, abaxially densely tomentose or sometimes only hairy on lateral veins, adaxially sparsely adpressed pubescent, more densely so on midvein, midvein raised abaxially, lateral veins  $6\text{--}12(-17)$ -jugate, pinnate, slightly arched, branched, ending in teeth, conspicuously raised abaxially, often deeply impressed adaxially, veinlets transverse, slightly raised abaxially, slightly impressed adaxially, not lobed, base rounded or broadly cuneate, very slightly cordate, without glands, margin irregularly serrate, apex rounded or abruptly narrowed and slightly mucronate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, globose or flattened, at apices of short lateral branchlets with 1 pair of leaves, 5–10 cm in diam.; rays whorled; first node of inflorescence with 3–8 rays, dense, minutely or densely yellowish brown stellate-pubescent, totally composed of large sterile flowers, or of fertile flowers yet with 6–8 large sterile radiant flowers; peduncles 1.5–4 cm; bracts caducous, leaflike, green, lanceolate, 1.5–6 mm, sparsely hairy; bracteoles scalelike. Flowers on rays of 4th order, not fragrant, sessile or shortly pedicellate. Sterile flowers: calyx like fertile flowers; corolla white, rotate, 1.5–4 cm in diam.; lobes obovate or suborbicular, sometimes only 4, often unequal in size with 1 very small lobe, apex rounded; stamens and pistils not developed. Fertile flowers: calyx green or reddish; tube obconical, ca. 1.5 mm, glabrous or stellate-hairy; lobes triangular, ca. 0.5 mm, glabrous, apex  $\pm$  acute; corolla yellow-white, rotate, 2–3 mm in diam., glabrous; tube 1–1.5 mm; lobes spreading or slightly recurved, broadly ovate, ca. as long as wide, apex rounded, margin entire; stamens exceeding corolla, inserted near base of corolla; filaments 3–4.5 mm; anthers yellow, oblong or suborbicular, ca. 1 mm; styles slightly exceeding calyx lobes; stigmas 3-lobed. Fruit initially turning red, maturing black, broadly ovoid-orbicular or obovoid-orbicular,  $5\text{--}6.5 \times 3\text{--}4$  mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid,  $4\text{--}5.5 \times 2.5\text{--}3$  mm, with a broad ventral groove, both ends obtuse. Fl. Apr–

May, fr. Aug–Sep.  $2n = 18, 72$ .

Mixed forests, thickets; also cultivated; 200–3000 m. Anhui, Fujian, N Guangdong, NE Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

- 1a. Lateral veins  $10\text{--}12(-17)$ -jugate; inflorescence with 6–8 rays, minutely yellowish brown stellate-pubescent; calyx tube glabrous ..... 40a. var. *plicatum*
- 1b. Lateral veins  $6\text{--}9$ -jugate; inflorescence with 3–5 rays, densely yellowish brown stellate-pubescent; calyx tube stellate-hairy ..... 40b. var. *formosanum*

**40a. *Viburnum plicatum* var. *plicatum***

粉团(原变种) fen tuan (yuan bian zhong)

*Viburnum plicatum* var. *dilatatum* Lindley; *V. plicatum* var. *plenum* Miquel; *V. plicatum* f. *rotundifolium* (Rehder) Rehder; *V. tomentosum* Thunberg f. *plenum* (Miquel) Rehder; *V. tomentosum* var. *plenum* (Miquel) Rehder; *V. tomentosum* var. *plicatum* (Thunberg) Maximowicz; *V. tomentosum* f. *rotundifolium* (Rehder) Rehder; *V. tomentosum* var. *rotundifolium* Rehder; *V. tomentosum* f. *sterile* (K. Koch) Zabel; *V. tomentosum* var. *sterile* K. Koch.

Lateral veins  $10\text{--}12(-17)$ -jugate. Inflorescence with 6–8 rays, minutely yellowish brown stellate-pubescent, consisting of totally large sterile radiant flowers. Calyx tube glabrous.

Mixed forests, thickets; also cultivated; 200–1800 m. Anhui, Fujian, N Guangdong, NE Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

Two forms may be recognized as follows. The typical form (f. *plicatum*) has its inflorescence composed totally of large sterile radiant flowers and is known from cultivation only, while f. *tomentosum* Rehder (J. Arnold Arbor. 26: 77. 1945; *Viburnum tomentosum* Thunberg in Murray, Syst. Veg., ed. 14, 295. 1784, not Lamarck (1779); *V. plicatum* f. *lanceatum* (Rehder) Rehder; *V. plicatum* var. *lanceatum* (Rehder) Rehder; *V. plicatum* f. *latifolium* Miquel; *V. plicatum* var. *tomentosum* Miquel; *V. tomentosum* var. *lanceatum* Rehder), the wild-related taxon, has its inflorescence composed of fertile flowers yet with 4–6 large sterile radiant flowers. The latter occurs in mixed forests and thickets at 200–1800 m in Anhui, Fujian, N Guangdong, NE Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, and Zhejiang.

**40b. *Viburnum plicatum* var. *formosanum*** Y. C. Liu & C. H. Ou, Quart. J. Chin. Forest. 12(1): 136. 1979.

台湾蝴蝶戏珠花 tai wan hu die xi zhu hua

Lateral veins  $6\text{--}9$ -jugate. Inflorescence with 3–5 rays, densely yellowish brown stellate-pubescent, composed of fertile flowers yet with 3–5 large sterile radiant flowers. Calyx tube stellate-hairy.

• Mixed forests; 1800–3000 m. N Taiwan.

**6. *Viburnum* sect. *Megalotinus*** (Maximowicz) Rehder in Sargent, Trees & Shrubs 2: 112. 1908.

大叶组 da ye zu

*Viburnum* subser. *Megalotinus* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 476. 1880.

Winter buds with 1 or 2 pairs of separate scales, rarely naked. Inflorescence a compound umbel-like cyme, pedicellate, with large sterile radiant flowers. Corolla rotate, campanulate, or tubular. Fruit maturing red or black; pyrenes with 1 or 2 shallow dorsal grooves and 1–3 shallow ventral grooves; albumen solid.

About 18 species: subtropical Asia; nine species (four endemic) in China.

Kern (Reinwardtia 1. 112. 1951) and H. Hara (Ginkgoana 5: 181–182. 1983) recognized four subsections on the basis of corolla shape, stamen aestivation, pubescence, and leaf margin indentation. In recent phylogenetic work, this section is represented by a single species, *Viburnum cylindricum*, which is sister to Old World members of *V.* sect. *Odontotinus*.

**41. *Viburnum amplifolium*** Rehder in Sargent, *Trees & Shrubs* 2: 112. 1908.

广叶荚蒾 guang ye jia mi

Shrubs, deciduous, to 4 m tall. Bark gray-brownish. Branchlets of current year yellowish green or yellowish brown stellate-pubescent; branchlets of previous year yellowish brown, terete, glabrous, with sparse, dispersed, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales yellowish green or yellowish brown stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1.2–2 cm, yellowish green or yellowish brown stellate-pubescent; leaf blade yellowish green when young, becoming intense yellow-green adaxially when dry, ovate to elliptic-ovate, (4–)6–12(–14) × (2–)4–7(–8.5) cm, papery, both surfaces verrucose, abaxially stellate-pubescent only on veins, adaxially forklike pubescent, more densely so on midvein, immediately glabrescent, midvein raised abaxially, lateral veins 7–9-jugate, pinnate, slightly arched, branched, mostly ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, parallel, conspicuous abaxially, inconspicuous adaxially, not lobed, base rounded to cuneate, without glands, margin serrate, apex acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of lateral short branchlets with 1-jugate leaves, 3–6 cm in diam.; rays whorled; first node of inflorescence with 6 or 7 rays, dense, yellowish green or yellowish brown stellate-pubescent, without large sterile radiant flowers; peduncles 3–5.5 cm, slender; bracts caducous, leaflike, yellowish green, linear-lanceolate, stellate pubescent; bracteoles scalelike. Flowers on rays of 2nd order, not fragrant, sessile. Calyx yellowish green; tube tubular, ca. 0.5 mm, glabrous; lobes narrowly ovate, ca. 2/3 as long as tube, sparsely stellate-pubescent, ciliolate, apex rounded or obtuse. Corolla white, rotate, ca. 3 mm in diam., glabrous; tube less than 1 mm; lobes spreading, orbicular-ovate, ca. 1 mm, apex obtuse, margin entire. Stamens subequalling corolla, inserted near base of corolla; filaments ca. 2 mm, ca. 1.5 × as long as anthers; anthers yellow, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, obovoid-oblong, ca. 8 × 5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, ca. 7 × 4 mm, with 1 shallow dorsal groove and 2 shallow ventral grooves, apex rounded. Fl. May–Jun, fr. Sep–Oct.

• Mixed forests, scrub; 1000–1700(–2000) m, SE Yunnan.

**42. *Viburnum cylindricum*** Buchanan-Hamilton ex D. Don, *Prodr. Fl. Nepal*. 142. 1825.

水红木 shui hong mu

*Viburnum coriaceum* Blume; *V. crassifolium* Rehder; *V. cylindricum* Buchanan-Hamilton ex D. Don var. *crassifolium* (Rehder) C. K. Schneider.

Shrubs or small trees, evergreen, to 8(–15) m tall. Bark light brown. Branchlets of current year greenish, glabrous, or initially sparsely stellate-pubescent; branchlets of previous year gray-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds lanceolate-triangular, with a pair of separate scales; scales glabrous or stellate pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–3.5(–5) cm, glabrous or stellate-pubescent; leaf blade green when young, elliptic to oblong or ovate-oblong, 8–16(–24) × 3–10 cm, leathery, abaxially usually glabrous, with dispersed reddish or yellow tiny glandular dots (sometimes compressed to appear like lepidote scales), adaxially glabrous, midvein raised abaxially, lateral veins 3–5(–8)-jugate, pinnate, arched, rarely branched, anastomosing near margin, or some ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuous abaxially, inconspicuous adaxially, not lobed, base gradually angustate to rounded, with 1 to several glands on both sides of midvein near base, margin entire or irregularly shallowly dentate, apex acuminate or acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 4–10(–18) cm in diam.; rays whorled; first node of inflorescence usually with 7 rays, lax, glabrous or stellate-pubescent, sometimes with tiny glands, without large sterile radiant flowers; peduncles 1–6 cm; bracts usually caducous, leaflike, whitish green, linear-lanceolate, ca. 3 × < 1 mm, glabrous; bracteoles scalelike. Flowers usually on rays of 3rd order, not fragrant, sessile or shortly pedicellate. Calyx greenish; tube ovoid-orbicular or obconical, ca. 1.5 mm, sometimes with tiny glandular dots; lobes very small and inconspicuous, glabrous, apex rounded. Corolla white or reddish, campanulate, 4–6 mm, with tiny lepidote glands; tube 3–5 mm; lobes erect, orbicular-ovate, ca. 1 mm, apex rounded, margin entire. Stamens longer than corolla, inserted near base of corolla; filaments 3–4 mm; anthers purple, oblong, 1–1.8 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit initially turning red, maturing blue-black, ovoid, ca. 5 mm, base rounded, apex rounded, glabrous; pyrenes compressed ovoid, ca. 4 × 3.5–4 mm, with 2 shallow dorsal grooves and 1 shallow ventral groove, apex rounded. Fl. Jun–Jul, fr. Aug–Oct. 2n = 18.

Sparse forests, scrub; 500–3300 m. Gansu (Wenxian), N Guangdong, Guangxi, Guizhou, W Hubei, W Hunan, Sichuan, SE Xizang, Yunnan [Bhutan, India, Indonesia, N Myanmar, Nepal, Pakistan, Thailand, Vietnam].

**43. *Viburnum inopinatum*** Craib, *Bull. Misc. Inform. Kew* 1911: 385. 1911.

厚绒荚蒾 hou rong jia mi

Shrubs or small trees, evergreen, to 10 m tall. Bark gray-brownish. Branchlets of current year yellow-white or yellow-brown stellate-tomentose; branchlets of previous year gray-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds lanceolate, with a pair of separate scales; scales densely yellowish brown stellate pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules 2, caducous; petiole green, slender, 2–5 cm, yellow-white or yellow-brown stellate-tomentose; leaf blade yellowish green when young, elliptic-oblong to oblong-lanceolate, (12–)15–20(–25) × (4–)5–10(–11.5) cm, leathery, abaxially thickly tomentose and mixed with glandular dots, adaxially yellow-brown stellate-tomentose, later only hairy on midvein, with 1 to several large impressed glands on both sides of midvein near base, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, raised abaxially, slightly impressed adaxially, not lobed, base cuneate to obtuse, with 0–2 circular glands on both sides of midvein near base, margin entire or sometimes slightly dentate at apex, apex acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 12–20 cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, to 6.5 cm, lax, densely yellowish brown stellate-pubescent, without large sterile radiant flowers; peduncles robust, (1–)1.5–2 cm, rarely absent; bracts caducous, leaflike, yellowish green, linear-lanceolate, stellate pubescent; bracteoles scalelike. Flowers on rays from 3rd to 6th orders, not fragrant, sessile. Calyx yellowish green; tube obconical, ca. 1 mm, stellate-tomentose; lobes ovate-triangular, very small, ca. 0.25 mm, ciliate, apex obtuse. Corolla white, rotate, orbicular in bud, ca. 3.5 mm in diam., glabrous; tube 1–1.5 mm; lobes spreading, ovate, ca. 1 mm, slightly shorter than tube, apex rounded, margin entire. Stamens obviously exceeding corolla, inserted at base of corolla; filaments filiform, folded in bud, ca. 5 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid-globose to ellipsoid, 4–5 × 3–4 mm, base rounded, apex acute, yellow-brown forklike pubescent or stellate-pubescent; pyrenes compressed, ellipsoid, ca. 4 × 3 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. Apr–May, fr. Jun–Oct.

Dense forests; 700–1400 m. SW Guangxi, S Yunnan [Laos, Myanmar, Thailand, N Vietnam].

**44. *Viburnum laterale*** Rehder in Sargent, Pl. Wilson. 1: 311. 1912.

侧花荚蒾 *ce hua jia mi*

Shrubs, deciduous, total size unknown. Bark gray-brownish. Branchlets of current year brownish, glabrous; branchlets of previous year gray-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1–2 cm, glabrous; leaf blade green when young, ovate, elliptic, ovate-oblong, or narrowly elliptic-oblong, 7–12 × 4–7 cm, papery, abaxially glabrous,

adaxially lustrous, midvein raised abaxially, lateral veins 6–9-jugate, pinnate, arched, rarely branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base rounded or broadly cuneate, without glands, margin serrate, apex acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of lateral short branchlets with 1-jugate leaves, 4–5 cm in diam.; rays whorled; first node of inflorescence with 4 or 5 rays, dense, glabrous, without large sterile radiant flowers; peduncles 5–6 cm, slender; bracts and bracteoles late deciduous or persistent, leaflike, green, linear-lanceolate, ca. 3 × < 1 mm, glabrous. Flowers on rays of 2nd and 3rd orders, not fragrant, sessile or shortly pedicellate. Calyx greenish; tube oblong-ovoid, ca. 1 mm, glabrous; lobes triangular-ovate, very small, glabrous, apex ± acute or obtuse. Corolla white, rotate, ca. 3 mm in diam., glabrous; tube ca. 4 mm; lobes spreading, ovate, ca. as long as tube, apex rounded, margin entire. Stamens exceeding corolla, inserted at apex of corolla tube; filaments ca. 3 × as long as anthers; anthers yellow, ellipsoid, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit unknown. Fl. Jun.

• ?Forests; 800–900 m. Fujian.

This species is known only from the type collection.

**45. *Viburnum leiocarpum*** P. S. Hsu, Acta Phytotax. Sin. 11: 76. 1966.

光果荚蒾 *guang guo jia mi*

Shrubs or small trees, evergreen, to 10(–15) m tall. Bark gray-brownish. Branchlets of current year sparsely yellow-brownish stellate-pubescent or glabrescent; branchlets of previous year black-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds lanceolate-triangular, with a pair of separate scales; scales sparsely yellow-brownish stellate pubescent or glabrescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 2.5–5 cm, sparsely pubescent; leaf blade yellowish green when young, elliptic-oblong to obovate-oblong, 10–18(–25) cm, thickly papery, abaxially sparsely pubescent on midvein and lateral veins, with or without glandular spots, adaxially lustrous, sparsely pubescent only on midvein, or stellate-pubescent or forklike pubescent throughout, with or without raised dots, midvein raised abaxially, lateral veins 5–7-jugate, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuously raised abaxially, slightly impressed adaxially, not lobed, base cuneate to obtuse, with 0 or 1 circular gland on both sides of midvein near base, margin entire, slightly involute when dry, apex abruptly and shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, ca. 9 cm in diam.; rays whorled; first node of inflorescence with 4 or 5 rays, 2–3 cm, lax, sparsely yellow-brown stellate-pubescent, without large sterile radiant flowers; peduncles 1.5–3 cm; bracts caducous, leaflike, yellowish green, linear-lanceolate, stellate pubescent; bracteoles scalelike. Flowers on rays from 3rd to 6th orders, not fragrant, sessile or shortly pedicellate. Calyx yellowish green; tube tubular-obconic-

cal, ca. 1 mm, glabrous; lobes broadly triangular, very small, glabrous, apex rounded. Corolla white, rotate, ca. 3.5 mm in diam., glabrous; tube 1–1.5 mm; lobes spreading, orbicular-ovate, ca. 1 mm, slightly shorter than tube, apex rounded, margin entire. Stamens obviously exceeding corolla, inserted at base of corolla; filaments slightly compressed, folded in bud, ca. 5 mm; anthers yellow-whitish, oblong, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid-globose, 5–7 × ca. 5 mm, base rounded, apex acute, glabrous; pyrenes broadly ellipsoid, ca. 6 × 5 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. May–Jul, fr. Aug–Oct.

- Forests; 1000–2200 m. Hainan, SE Yunnan.

- 1a. Leaves adaxially sparsely pubescent only on midvein, and without raised dots, abaxially without glandular dots ..... 45a. var. *leiocarpum*  
 1b. Leaves adaxially stellate-pubescent or forklike pubescent throughout, and with raised dots, abaxially with glandular dots ..... 45b. var. *punctatum*

#### 45a. *Viburnum leiocarpum* var. *leiocarpum*

光果荚蒾(原变种) guang guo jia mi (yuan bian zhong)

Leaves abaxially without glandular dots, adaxially sparsely pubescent only on midvein, and without raised dots.

- Forests; 1000–1600 m. Hainan, SE Yunnan.

#### 45b. *Viburnum leiocarpum* var. *punctatum* P. S. Hsu, Acta Phytotax. Sin. 11: 77. 1966.

斑点光果荚蒾 ban dian guang guo jia mi

Leaves abaxially with glandular dots, adaxially stellate-pubescent or forklike pubescent throughout, and with raised dots.

- Dense forests; 1500–2200 m. SE Yunnan.

#### 46. *Viburnum lutescens* Blume, Bijdr. 655. 1826.

淡黄荚蒾 dan huang jia mi

*Viburnum monogynum* Blume; *V. sundaicum* Miquel.

Shrubs, evergreen, to 8(–11) m tall. Bark gray-brownish. Branchlets of current year sparsely yellow-brownish stellate-pubescent, glabrescent; branchlets of previous year gray-whitish or brown, terete, glabrous, with sparse, small, rounded lenticels. Winter buds ovoid-lanceolate, with a pair of separate scales; scales stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1–2 cm, glabrous; leaf blade green when young, broadly elliptic to oblong or oblong-obovate, 7–15 × 3–4.5 cm, subleathery, abaxially very sparsely stellate-pubescent, glabrescent, adaxially glabrous, midvein raised abaxially, lateral veins 5- or 6-jugate, pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised abaxially, inconspicuous adaxially, not lobed, base narrowed and ± decurrent, without glands,

margin serrate except at base, apex shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like or panicle-like cyme, terminal, 4–7 cm in diam.; rays whorled; first node of inflorescence with 4–6 rays, unequal in length, lax, stellate-pubescent, without large sterile radiant flowers; peduncles 2–5 cm; bracts caducous, leaflike, green, linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays of 2nd and 3rd orders, fragrant, shortly pedicellate. Calyx greenish; tube obconical, ca. 1.5 mm, glabrous; lobes triangular-ovate, slightly shorter than calyx tube, glabrous, apex obtuse. Corolla white, rotate, ca. 5 mm in diam., glabrous; tube ca. 1.5 mm; lobes spreading, broadly ovate, subequaling tube, apex obtuse, margin entire. Stamens slightly exceeding corolla, inserted at base of corolla; filaments ca. 3 mm; anthers yellow, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit initially turning red, maturing black, broadly ellipsoid, 6–8(–10) × 3–4 mm, base rounded, apex acute, glabrous; pyrenes broadly ellipsoid or oblong-obovoid, ca. 6 × 3 mm, with 2 dorsal grooves and 1 broad, deep ventral groove, apex rounded. Fl. Feb–Apr, fr. Aug–Dec.

Forests, thickets, sandy places along riversides; 200–1000 m. ?Fujian, Guangdong, Guangxi, ?Hainan [India, Indonesia, Malaysia, Myanmar, Vietnam].

#### 47. *Viburnum punctatum* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 142. 1825.

鳞斑荚蒾 lin ban jia mi

Shrubs or small trees, evergreen, to 9 m tall. Bark light brown. Branchlets of current year with dense brown lenticels, initially with lepidote scales, glabrescent; branchlets of previous year gray-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds naked, lanceolate, with lepidote scales. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–1.5 cm, with lepidote scales; leaf blade green when young, becoming olive-green and lustrous adaxially, oblong-elliptic or oblong-ovate, rarely oblong-obovate, (5–)8–14(–18) × 3.5–5.5(–7.5) cm, leathery, abaxially with lepidote scales, midvein raised abaxially, lateral veins 5–7-jugate, pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base broadly cuspidate, without glands, margin entire or sometimes irregularly dentate in upper part, apex acute, sometimes caudate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 7–10 cm in diam.; rays whorled; first node of inflorescence with 4 or 5 rays, lax, with lepidote scales, without large sterile radiant flowers; peduncles absent or very short; bracts persistent, greenish, linear-lanceolate, with sparse lepidote scales; bracteoles scalelike. Flowers on rays of 3rd and 4th orders, not fragrant, shortly pedicellate. Calyx greenish; tube obconical, ca. 1.5 mm, with sparse lepidote scales; lobes broadly ovate, short, glabrous, apex rounded or obtuse. Corolla white, rotate, 6–8 mm in diam., glabrous; tube ca. 4 mm; lobes spreading, broadly ovate, 2–3 mm, apex rounded, margin entire. Stamens subequaling corolla, inserted near base of corolla; filaments 3–4 mm; anthers yellow, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stig-

mas capitate. Fruit initially turning red, maturing black, broadly ellipsoid, compressed, 8–15(–18) × 6–10 mm, base rounded, apex rounded, glabrous; pyrenes compressed, with 2 dorsal grooves and 3 shallow ventral grooves, both ends rounded. Fl. Mar–Apr, fr. May–Oct.  $2n = 18$ .

Dense forests, forest margins; 200–1900 m. Guangdong, Guangxi, Guizhou, Hainan, SW Sichuan, Yunnan [?Bhutan, Cambodia, India, Indonesia, N Myanmar, Nepal, Thailand, Vietnam].

- 1a. Corolla ca. 6 mm in diam.;  
fruit 8–10 × 6–8 mm ..... 47a. var. *punctatum*  
1b. Corolla ca. 8 mm in diam.;  
fruit 14–15(–18) × ca. 10 mm ..... 47b. var. *lepidotulum*

**47a. *Viburnum punctatum* var. *punctatum***

鳞斑荚蒾(原变种) lin ban jia mi (yuan bian zhong)

*Viburnum acuminatum* Wallich ex Candolle.

Corolla ca. 6 mm in diam. Fruit 8–10 × 6–8 mm.

Dense forests, forest margins; 700–1900 m. Guizhou, SW Sichuan, Yunnan [?Bhutan, Cambodia, India, Indonesia, N Myanmar, Nepal, Thailand, Vietnam].

**47b. *Viburnum punctatum* var. *lepidotulum* (Merrill & Chun) P. S. Hsu, Acta Phytotax. Sin. 13(1): 121. 1975.**

大果鳞斑荚蒾 da guo lin ban jia mi

*Viburnum lepidotulum* Merrill & Chun, Sunyatsenia 2: 22. 1934.

Corolla ca. 8 mm in diam. Fruit 1.4–1.5(–1.8) × ca. 1 cm.

- Mixed forests; 200–900 m. W Guangdong, Guangxi, Hainan.

**48. *Viburnum pyramidatum* Rehder in Sargent, Trees & Shrubs 2: 93. 1908.**

锥序荚蒾 zhui xu jia mi

Shrubs or small shrubs, evergreen, to 7 m tall. Bark gray-brownish. Branchlets of current year brownish, sparsely lenticellate; branchlets of previous year gray-yellowish, terete, subglabrous, with sparse, small, rounded lenticels. Winter buds ovoid-lanceolate, with a pair of separate scales; scales yellow-brown stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1.5–3 cm, yellow-brown stellate-tomentose; leaf blade yellowish green when young, ovate-oblong to oblong or broadly elliptic, 8–16(–20) × 4–8 cm, thickly papery, abaxially yellow-brown stellate-tomentose, adaxially lustrous, glabrous throughout except on midvein sparsely stellate-pubescent, midvein raised abaxially, lateral veins 6- or 7-jugate, pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous or slightly conspicuous abaxially, inconspicuous adaxially, not lobed, base narrowed or subrounded, without glands, margin serrate, apex acuminate. Flowers appearing after leaves; inflorescence a pyramidal panicle, terminal, 5–10 × 5–10 cm; rays whorled; first node of inflorescence with 4–6 rays, dense, densely yellowish brown stellate-pubescent, without large ster-

ile radiant flowers; peduncles 2–4 cm; bracts caducous, leaflike, green, linear-lanceolate, stellate pubescent; bracteoles scalelike. Flowers on rays of 3rd order, not fragrant, sessile or shortly pedicellate. Calyx yellowish green; tube obconical, ca. 1.5 mm, glabrous; lobes triangular, ca. 1/3 as long as calyx tube, sparsely ciliate, apex obtuse. Corolla white, rotate, ca. 4 mm in diam., sparsely stellate-pubescent; tube ca. 1 mm; lobes spreading, ovate, ca. 2 × as long as tube, apex rounded, margin entire. Stamens slightly shorter than corolla, inserted at base of corolla; filaments ca. 2 mm; anthers yellow, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing intense red, oblong or broadly ellipsoid to obovoid-oblong, 7–10 × 4–5 mm, base rounded, apex acute, glabrous; pyrenes slightly compressed, oblong, ca. 7 × 4 mm, with 2 deep dorsal grooves and 1 shallow ventral groove, apex rounded. Fl. Nov–Dec, fr. Mar–Oct.

Sparse forests, scrub; 100–1400 m. SW Guangxi, SE Yunnan [N Vietnam].

**49. *Viburnum ternatum* Rehder in Sargent, Trees & Shrubs 2: 37. 1907.**

三叶荚蒾 san ye jia mi

*Viburnum chaffanjonii* H. Léveillé.

Shrubs or small trees, deciduous, to 6 m tall. Bark gray-brownish. Branchlets of current year brownish, yellow stellate-pubescent; branchlets of previous year black-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds lanceolate-triangular, with a pair of separate scales; scales yellow stellate-pubescent. Leaves in whorls of 3, or opposite on relatively slender branchlets; stipules 2, persistent, lanceolate, 4–5 mm, pubescent; petiole green, slender, 2–6 cm, stellate-pubescent; leaf blade green when young, ovate-elliptic or elliptic to oblong-obovate, sometimes obovate-lanceolate, 8–24 × 4–7(–9.5) cm, papery, abaxially stellate-pubescent and mixed with forklike or simple hairs only on midvein and lateral veins, adaxially usually sparsely forklike pubescent, more densely so on midvein, glabrescent, with large glandular spots on both sides of midvein at base, midvein raised abaxially, lateral veins 6- or 7-jugate, pinnate, arched, rarely branched, anastomosing near margin, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuously raised abaxially, slightly impressed adaxially, not lobed, base cuneate, with 0 or 1 circular gland on both sides of midvein near base, margin entire or dentate at apex, apex acute or shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 12–14(–18) cm in diam.; rays whorled; first node of inflorescence with 5–7(–10) rays, lax, sparsely stellate-pubescent, without large sterile radiant flowers; peduncles nearly absent; bracts caducous, greenish, linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays from 2nd to 6th orders, not fragrant, sessile or shortly pedicellate. Calyx greenish; tube obconical, ca. 1.8 mm, glabrous; lobes very small and inconspicuous, ciliate, apex rounded. Corolla white, rotate, ca. 3 mm in diam., glabrous; tube 1–1.5 mm; lobes spreading, suborbicular, ca. 1.3 mm, slightly shorter than tube, apex rounded, margin entire. Stamens much exceeding corol-

la, inserted near base of corolla; filaments folded in bud, ca. 6 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, broadly ellipsoid-oblong, ca.  $7 \times 5$  mm, base rounded, apex acute, glabrous; pyrenes compressed, broadly ellipsoid-oblong

or ovoid,  $5-6 \times 3-4$  mm, with 2 shallow dorsal grooves and 1 ventral groove, apex rounded. Fl. Jun–Jul, fr. Sep.

• Forests; 600–1400 m. Guizhou, SW Hubei, NW Hunan, Sichuan, Yunnan.

**7. *Viburnum* sect. *Odontotinus*** Rehder in Sargent, *Trees & Shrubs* 2: 113. 1908.

齿叶组 *chi ye zu*

Winter buds with 2 or 3 pairs of separate scales. Inflorescence a compound umbel-like cyme, usually pedicellate, without large sterile radiant flowers. Corolla rotate or campanulate-rotate. Fruit maturing red, rarely maturing black; pyrenes with 1 or 2 deep or shallow dorsal grooves, and 1–3 ventral grooves, endocarp solid.

About 30 species; temperate Asia and North America, only one species in the European Caucasus; 22 species (15 endemic) in China.

H. Hara (*Ginkgoana* 5: 229–267. 1983) recognized three subsections: *Viburnum* subsect. *Odontotinus* for Asiatic species with entire leaves, *V.* subsect. *Dentata* (Maximowicz) H. Hara for North American species, and *V.* subsect. *Lobata* (Oersted) H. Hara for species with 3–5-lobed leaf blades. Recent phylogenetic work shows that this section is polyphyletic, with two distinct clades. The first one consists of New World species together with South American species from *V.* sect. *Oreiotinus* (Oersted) Benth. & J. D. Hooker and a second clade for Old World species. This Old World clade can be further split into species with 3–5-lobed leaf blades (“*Lobata*” clade) and the remaining species (“*Succodontotinus*” clade). Old World *V.* sect. *Odontotinus* are sister to *V. cylindricum* (i.e., *V.* sect. *Megalotinus*).

**50. *Viburnum betulifolium*** Batalin, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 13: 371. 1894.

桦叶荚蒾 *hua ye jia mi*

*Viburnum adenophorum* W. W. Smith; *V. betulifolium* var. *flocculosum* (Rehder) P. S. Hsu; *V. dasyanthum* Rehder; *V. flavescens* W. W. Smith; *V. formosanum* (Hance) Hayata f. *morrisonense* (Hayata) Nakai; *V. formosanum* var. *taihasense* (Hayata) Nakai [“*taishanense*”]; *V. hupehense* Rehder; *V. hupehense* subsp. *septentrionale* P. S. Hsu; *V. lobophyllum* Graebner; *V. lobophyllum* var. *flocculosum* Rehder; *V. lobophyllum* var. *silvestrii* Pampanini; *V. luzonicum* Rolfe var. *morrisonense* (Hayata) S. S. Ying; *V. morrisonense* Hayata; *V. ovatifolium* Rehder; *V. taihasense* Hayata; *V. willeianum* Graebner; *V. wilsonii* Rehder; *V. wilsonii* var. *adenophorum* (W. W. Smith) Handel-Mazzetti.

Shrubs or small trees, deciduous, to 5(–7) m tall. Bark light brown. Branchlets of current year purple-brownish, glabrous or yellow-brownish stellate-pubescent; branchlets of previous year purple-brown or black-brown, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales  $\pm$  hairy outside. Leaves always opposite, not clustered at apices of branchlets; stipules 2, persistent, subulate, small; petiole green, slender, 1–2(–3.5) cm, sparsely long hairy or glabrous; leaf blade green when young, broadly ovate to rhombic-ovate or broadly obovate, rarely elliptic-oblong,  $3.5-8.5(-12) \times 3-5.5(-9)$  cm, thickly papery or slightly leathery, abaxially pubescent on midvein and lateral veins and stellate-pubescent in vein axils, or stellate-pubescent throughout, with or without glandular dots, adaxially glabrous or pubescent on midvein, midvein raised abaxially, lateral veins (4 or) 5 or 6(or 7)-jugate, pinnate, straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base broadly cuneate to rounded, rarely truncate, with 0–3 circular glands on both sides of midvein near base, margin crenate above 1/3–1/2 from

base, apex abruptly and shortly acuminate to acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal or at apices of lateral short branchlets with 1 pair of leaves, 5–12 cm in diam.; rays whorled; first node of inflorescence usually with 7 rays, dense, usually densely or sparsely yellow-brown stellate-pubescent, without large sterile radiant flowers; peduncles usually less than 1 cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, sparsely hairy. Flowers on rays from 3rd to 5th orders, not fragrant, shortly pedicellate or sessile. Calyx green; tube tubular-obconical, ca. 1.5 mm, with yellow-brown glandular dots and sparsely or densely stellate-pubescent; lobes broadly ovate-triangular, ca. 1.5 mm, ciliate, apex obtuse. Corolla white, rotate, ca. 4 mm in diam., glabrous or stellate-pubescent; tube 1–2 mm; lobes spreading, orbicular-ovate, exceeding tube, apex rounded, margin entire. Stamens usually exceeding corolla, inserted at base of corolla; filaments 4–5 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, subglobose, ca. 6 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid,  $3.5-5 \times 3-4$  mm, with 2 deep dorsal grooves, and 1–3 ventral grooves, apex acute. Fl. Jun–Jul, fr. Sep–Oct.  $2n = 18^*, 20^*, 22^*$ .

• Forests, scrub; 1300–3500 m. Anhui, Gansu, Guangxi, Guizhou, W Henan, W Hubei, S Ningxia, S Shaanxi, Sichuan, Taiwan, SE Xizang, Yunnan, NW Zhejiang.

This is a most polymorphic species, perhaps including many geographic races. There exists a very complicated variation pattern among the different geographic races in the absence or presence and density of the pubescence on the winter bud, calyx tube, and corolla, and in the size of the corolla and fruit, in the texture and shape of the leaf, in the presence or absence of pubescence on the adaxial leaf surface, and in the presence or absence of glandular dots and of stellate pubescence on the abaxial leaf surface. Thus, it is very difficult to identify the different geographic races. These features may be used to recognize *Viburnum hupehense*, *V. lobophyllum*, or *V. wilsonii* among others.

*Viburnum betulifolium* f. *aurantiacum* Rehder (*J. Arnold Arbor.* 9: 116. 1928) is a yellow/orange-fruited variant described from Chinese material.

**51. *Viburnum chunii*** P. S. Hsu, Acta Phytotax. Sin. 11: 82. 1966.

金腺荚蒾 jin xian jia mi

*Viburnum chunii* subsp. *chengii* P. S. Hsu; *V. chunii* var. *piliferum* P. S. Hsu.

Shrubs, evergreen, to 2 m tall. Bark gray-brownish. Branchlets of current year quadrangular, glabrous or yellow-brown adpressed pubescent; branchlets of previous year gray-brownish, slightly quadrangular, glabrous, with dispersed, small, rounded lenticels. Winter buds lanceolate, with 2 pairs of separate scales; scales yellow-brown adpressed pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole reddish purple, slender, 4–8 mm, sparsely or densely yellow-brown adpressed pubescent; leaf blade yellowish green when young, ovate-rhombic to rhombic or elliptic-oblong, 5–7(–11) × 2–4 cm, thickly papery to thinly leathery, abaxially glabrous or stellate-pubescent in vein axils, with denser glandular dots, adaxially often with dispersed golden or dark glandular dots, midvein raised abaxially, lateral veins 3–5-jugate, lowest pair sometimes elongating to upper part of blade, thus appearing ± triplinerved, pinnate, arched, rarely branched, anastomosing near margin, slightly raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous or slightly conspicuous abaxially, inconspicuous adaxially, not lobed, base cuneate, without glands, margin entire, usually remotely serrate above middle part, apex caudate-acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 1.5–2 cm in diam.; rays whorled; first node of inflorescence with 4 or 5 rays, dense, sparsely or densely yellow-brown adpressed hairy and with glandular dots, without large sterile radiant flowers; peduncles 5–18 mm; bracts and bracteoles persistent, leaflike, green, linear to linear-lanceolate, glabrous. Flowers on rays of 1st order, not fragrant, shortly pedicellate. Calyx green; tube campanulate, ca. 1 mm, glabrous; lobes ovate-triangular, very short, glabrous, apex obtuse. Corolla reddish in bud, later white, campanulate, ca. 4 mm in diam., glabrous; tube ca. 2.5 mm; lobes spreading, broadly obovate, 1–2 mm, apex rounded, margin entire. Stamens slightly shorter than corolla, inserted at base of corolla; filaments ca. 2 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, globose, (7–) 8–9(–10) mm in diam., base rounded, apex acute, glabrous; pyrenes compressed, ovoid, 5–8(–9) × 5–6 mm, without conspicuous grooves, apex acute. Fl. May, fr. Nov–Dec.

• Dense or sparse forests, scrub; 100–1900 m. S Anhui, Fujian, Guangdong, Guangxi, SE Guizhou, N Hunan, Jiangxi, SE Sichuan, Zhejiang.

**52. *Viburnum corylifolium*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 174. 1858.

榛叶荚蒾 zhen ye jia mi

*Viburnum barbigerrum* H. Léveillé; *V. dunnianum* H. Léveillé.

Shrubs, deciduous, to 2 m tall. Bark light brown. Branchlets of current year yellowish brown, densely bristlelike hairy; branchlets of previous year brown, terete, sparsely hairy or sub-

glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, with 2 pairs of separate scales; scales densely bristlelike hairy. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 0.5–1 cm, densely yellowish brown bristlelike hairy; leaf blade yellowish green when young, ovate or broadly obovate, 3.5–6 × 2–4.5 cm, papery, abaxially yellowish brown bristlelike hairy, usually with dispersed yellowish transparent glandular dots, adaxially sparingly simple hairy, midvein raised abaxially, lateral veins 6–8-jugate, pinnate, straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base rounded to obtuse or slightly cordate, with 0–2 circular glands on both sides of midvein near base, margin serrate, apex abruptly narrowed, acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short branchlets with a pair of leaves, 5–7 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, densely yellowish brown bristlelike hairy, without large sterile radiant flowers; peduncles 1.5–2 cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate or sessile. Calyx green; tube tubular, ca. 1.2 mm, with simple hairs; lobes ovate, ca. 0.5 mm, ciliate, apex obtuse. Corolla white, rotate, 5–8 mm in diam., stellate-pubescent; tube ca. 1 mm; lobes spreading, orbicular-ovate, exceeding tube, apex rounded, margin entire. Stamens exceeding corolla, inserted at base of corolla; filaments 4–5 mm; anthers yellow-whitish, broadly elliptic, small, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid, ca. 8 × 6 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, ca. 6 × 5 mm, with 2 shallow dorsal grooves, and 3 shallow ventral grooves, apex rounded. Fl. Mar–Apr, fr. May–Sep.

Forests, scrub; ca. 2100 m. Guangxi, NE Guizhou, Hubei, S and W Shaanxi, Sichuan, Xizang, Yunnan [NE India].

**53. *Viburnum dalzielii*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 137. 1916.

粤赣荚蒾 yue gan jia mi

Shrubs, deciduous, to 3 m tall. Bark light brown. Branchlets of current year with dense yellow-brown stellate bristlelike hairs; branchlets of previous year gray-brown, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, with 2 pairs of separate scales; scales with dense yellow-brown stellate bristlelike hairs. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1(–2) cm, with dense yellow-brown stellate bristlelike hairs; leaf blade yellowish green when young, ovate-lanceolate or ovate-elliptic, 8–17 × 4–7 cm, papery to thickly papery, both surfaces glabrous throughout except midvein and lateral veins yellow-brown bristlelike hairy, midvein raised abaxially, lateral veins 8–12-jugate, pinnate, straight or slightly arched, rarely branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base shallowly cordate or subrounded, with 0–2 circular glands on both sides of midvein near base, margin remotely denticulate, entire or slightly crenate at base, apex long acuminate or abruptly caudate. Flow-

ers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 5–6 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, lax, with dense yellow-brown stellate bristlelike hairs, without large sterile radiant flowers; peduncle 1–4 cm; bracts and bracteoles deciduous, leaflike, green, linear-lanceolate, hairy. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate or sessile. Calyx yellowish green; tube obconical, ca. 1.5 mm, with yellow-brown stellate bristlelike hairs; lobes triangular-ovate, very short, ca. 0.5 mm, ciliate, apex obtuse. Corolla white, rotate, ca. 4 mm in diam., outside with few yellow-brown stellate bristlelike hairs; tube ca. 1.5 mm; lobes spreading, suborbicular, slightly exceeding tube, apex rounded, margin entire. Stamens slightly exceeding corolla, inserted at base of corolla; filaments ca. 3 mm; anthers yellow-whitish, elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid-ellipsoid, compressed, 8–10 × 6–7 mm, base rounded, apex rounded, glabrous; pyrenes ovoid, 7–8 × 5–6 mm, with 2 dorsal grooves and 3 ventral grooves, apex rounded. Fl. May, fr. Aug–Nov.

- Thickets, forests; 400–1100 m. Guangdong, Jiangxi.

**54. *Viburnum dilatatum*** Thunberg in Murray, Syst. Veg., ed. 14, 295. 1784.

莢蒾 jia mi

*Viburnum brevipes* Rehder; *V. dilatatum* var. *fulvotomentosum* (P. S. Hsu) P. S. Hsu; *V. dilatatum* var. *macrophyllum* P. S. Hsu; *V. fulvotomentosum* P. S. Hsu.

Shrubs, deciduous, to 5 m tall. Bark light brown. Branchlets of current year grayish brown, densely bristlelike hairy and stellate-pubescent; branchlets of previous year dark purple-brown, terete, sparsely hairy or subglabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, 3–5 mm, acute, with 2 pairs of separate scales; scales densely bristlelike hairy and stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, (2–) 10–30 mm, stellate pubescent or simple hairs less than 1 mm; leaf blade green when young, broadly obovate, obovate, or broadly ovate, 3–10(–13) × 2–7(–11) cm, papery, abaxially yellowish forklike pubescent and stellate-pubescent, usually with dispersed yellowish or nearly colorless transparent glandular dots, adaxially adpressed hairy, midvein raised abaxially, lateral veins 6–8-jugate, pinnate, straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, not lobed, base rounded to obtuse or slightly cordate, sometimes cuneate, with 1–3 circular glands on both sides of midvein near base, margin serrate, apex acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short branchlets with a pair of leaves, 4–10 cm in diam.; rays whorled; first node of inflorescence with 5 rays, dense, densely bristlelike hairy and stellate-pubescent, without large sterile radiant flowers; peduncles 1–2(–4) cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays of 3rd and 4th orders, fragrant, shortly pedicellate or sessile. Calyx green; tube narrowly tubular, ca. 1 mm, stellate-pubescent; lobes ovate, ca. 0.5 mm, ciliate, apex

obtuse. Corolla white, rotate, 5–8 mm in diam., stellate-pubescent; tube ca. 1.5 mm; lobes spreading, orbicular-ovate, 1.5–2.5 mm, ca. as long as wide, apex rounded, margin entire. Stamens conspicuously exceeding corolla, inserted at base of corolla; filaments 4–6 mm; anthers yellow-whitish, broadly elliptic, small, ca. 1 mm. Styles exceeding calyx lobes; stigmas 3-lobed. Fruit maturing red, ellipsoid-ovoid, 6–8 × 4.5–6.5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, 5–6 × 4–5 mm, with 2 shallow dorsal grooves, and 3 shallow ventral grooves, apex rounded. Fl. May–Jul, fr. Sep–Nov. *2n* = 18\*.

Sparse forests, forest margins, scrub; 100–1000 m. Anhui, Fujian, N Guangdong, N Guangxi, Guizhou, S Hebei, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**55. *Viburnum erosum*** Thunberg in Murray, Syst. Veg., ed. 14, 295. 1784.

宜昌莢蒾 yi chang jia mi

Shrubs, deciduous, to 3 m tall. Bark light brown. Branchlets of current year densely stellate-pubescent and mixed with simple long hairs; branchlets of previous year gray-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales densely yellowish brown stellate-pubescent and mixed with simple long hairs. Leaves always opposite, not clustered at apices of branchlets; stipules 2, subulate, small, persistent, or absent; petiole green, robust, 3–5 mm, with coarse short hairs; leaf blade yellowish green when young, ovate-lanceolate, ovate-oblong, narrowly ovate, elliptic, or oblong-lanceolate, 3.5–6 × 1.5–3.5 cm, papery, abaxially densely stellate-pubescent, adaxially glabrous or sparsely stellate-pubescent, midvein raised abaxially, lateral veins 7–10(–14)-jugate, pinnate, straight or slightly arched, rarely branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed or sometimes almost 3-lobed, base rounded, broadly cuneate, or slightly cordate, or sometimes shallowly 2-lobed, with 0 or 1 circular gland on both sides of midvein near base, margin serrate, apex acute or acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short lateral branchlets with a pair of leaves, 2–4 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, densely stellate-pubescent and mixed with simple long hairs, without large sterile radiant flowers; peduncle 1–2.5 cm; bracts and bracteoles deciduous, leaflike, green, linear-lanceolate, hairy. Flowers on rays of 2nd and 3rd orders, not fragrant, often long pedicellate. Calyx yellowish green; tube tubular, ca. 1.5 mm, stellate-pubescent; lobes ovate-triangular, ca. 0.5 mm, ciliate, apex obtuse. Corolla white, rotate, ca. 6 mm in diam., glabrous or subglabrous; tube ca. 2 mm; lobes spreading, orbicular-ovate, ca. 2 mm, apex rounded, margin entire. Stamens slightly shorter to longer than corolla, inserted at base of corolla; filaments ca. 2.5 mm; anthers yellow-whitish, suborbicular, ca. 0.7 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, broadly ovoid, 6–7(–9) mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, ca. 6 × 5 mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. Apr–May, fr. Aug–Oct.

Forests, scrub; 300–1800(–2300) m. Anhui, Fujian, N Guangdong, N Guangxi, Guizhou, Henan, Hubei, Hunan, S Jiangsu, Jiangxi, S Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

- 1a. Leaves undivided, margin serrate ..... 55a. var. *erosum*  
 1b. Leaves often shallowly 2-lobed at base, margin large dentate ..... 55b. var. *taquetii*

### 55a. *Viburnum erosum* var. *erosum*

宜昌荚蒾(原变种) yi chang jia mi (yuan bian zhong)

*Viburnum erosum* var. *atratacarpum* P. S. Hsu; *V. erosum* var. *hirsutum* Pampanini; *V. erosum* subsp. *ichangense* (Hemsley) P. S. Hsu; *V. erosum* var. *ichangense* Hemsley; *V. erosum* var. *laeve* Franchet & Savatier; *V. erosum* var. *setchuenense* Graebner; *V. ichangense* (Hemsley) Rehder; *V. ichangense* var. *atratacarpum* (P. S. Hsu) T. R. Dudley & S. C. Sun; *V. luzonicum* Rolfe var. *matsudae* (Hayata) Liu & Liao; *V. matsudae* Hayata; *V. villosifolium* Hayata.

Leaves undivided, margin serrate.

Forests, scrub; 300–1800(–2300) m. Anhui, Fujian, N Guangdong, N Guangxi, Guizhou, Henan, Hubei, Hunan, S Jiangsu, Jiangxi, S Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

### 55b. *Viburnum erosum* var. *taquetii* (H. Léveillé) Rehder in Sargent, Pl. Wilson. 1: 311. 1912.

裂叶宜昌荚蒾 lie ye yi chang jia mi

*Viburnum taquetii* H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 443. 1911; *V. erosum* var. *punctatum* Franchet & Savatier; *V. erosum* f. *taquetii* (H. Léveillé) Sugimoto; *V. erosum* var. *taquetii* (H. Léveillé) P. S. Hsu; *V. meyer-waldeckii* Loesener.

Leaves often shallowly 2-lobed at base, margin large dentate.

Forests, scrub; 600–700 m. Shandong (Qingdao) [Japan, Korea].

### 56. *Viburnum foetidum* Wallich, Pl. Asiat. Rar. 1: 49. 1830.

臭荚蒾 chou jia mi

Shrubs, deciduous, erect or climbing, to 4 m tall. Bark light brown. Branchlets of current year yellow-brownish stellate-pubescent; branchlets of previous year purple-brown, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds oblong-ovoid, with 2 pairs of separate scales; scales ovate-lanceolate, stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules often absent; petiole reddish purple, robust, 5–10 mm, stellate-pubescent; leaf blade brownish green when young, ovate or elliptic to oblong-rhombic or obovate, 4–10 × 1.5–2.5 cm, papery to thickly papery, abaxially stellate-pubescent on midvein and lateral veins, rarely densely stellate-tomentose, adaxially densely pubescent on midvein but glabrous elsewhere, midvein raised abaxially, lateral veins 2–4-jugate, lowest pair often elongating to upper part of blade, thus appearing triplinerved, pinnate, arched, branched, ending in teeth, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, conspicuously raised abaxially, slightly impressed adaxially, not lobed or sometimes almost 3-lobed, base cuneate to rounded, with 0 or 1 circular gland on both sides of midvein near base, margin subentire

or large dentate, apex acute to shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of lateral branchlets, 5–8 cm in diam.; rays whorled; first node of inflorescence with 4–8 rays, dense, stellate-pubescent and with red-brown glandular dots, without large sterile radiant flowers; peduncles (0.5–)2–5 cm; bracts and bracteoles late deciduous or persistent, leaflike, green, linear-lanceolate, sparsely hairy. Flowers usually on rays of 2nd order, not fragrant, shortly pedicellate or sessile. Calyx green; tube tubular, ca. 1.5 mm, stellate-pubescent; lobes ovate-triangular, very short, ca. 0.3 mm, stellate-pubescent, apex acute. Corolla white, rotate, ca. 5 mm in diam., sparsely pubescent; tube 2–2.5 mm; lobes spreading, orbicular-ovate, ca. 1.5 mm, exceeding tube, apex rounded, margin very minutely glandular ciliate. Stamens equaling or slightly exceeding corolla, inserted at base of corolla; filaments ca. 3 mm; anthers yellow-whitish, elliptic, less than 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid-ellipsoid, compressed, 6–8 × 4–5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, ca. 6 × 4 mm, with 2 shallow dorsal grooves, and 3 shallow ventral grooves, apex rounded. Fl. May–Aug, fr. Aug–Oct.  $2n = 16$ .

Forests, scrub; 600–3100 m. N Guangdong, N Guangxi, Guizhou, ?Henan, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, NE India, Laos, Myanmar, N Thailand].

- 1a. Leaves obovate, margin large dentate in upper part ..... 56c. var. *ceanothoides*  
 1b. Leaves ovate or elliptic to oblong-rhombic, margin shallowly dentate or subentire.  
 2a. Branchlets not obviously elongated; peduncles (0.5–)2–5 cm ..... 56a. var. *foetidum*  
 2b. Branchlets elongated; peduncles very short to 2 cm at most, or absent ..... 56b. var. *rectangulatum*

### 56a. *Viburnum foetidum* var. *foetidum*

臭荚蒾(原变种) chou jia mi (yuan bian zhong)

Branchlets not obviously elongated. Leaves ovate or elliptic to oblong-rhombic, margin shallowly dentate or subentire. Peduncles (0.5–)2–5 cm.

Scrub at forest margins; 1200–3100 m. S and SE Xizang [Bangladesh, Bhutan, NE India, Laos, Myanmar, N Thailand].

### 56b. *Viburnum foetidum* var. *rectangulatum* (Graebner) Rehder in Sargent, Trees & Shrubs 2: 114. 1908.

直角荚蒾 zhi jiao jia mi

*Viburnum rectangulatum* Graebner, Bot. Jahrb. Syst. 29: 588. 1901; *Hedyotis yunnanensis* H. Léveillé; *Oldenlandia yunnanensis* (H. Léveillé) Chun; *V. foetidum* var. *malacotrichum* Handel-Mazzetti; *V. foetidum* var. *penninervium* Handel-Mazzetti; *V. foetidum* var. *premnaceum* (Wallich ex Candolle) Hooker & Thomson; *V. pallidum* Franchet; *V. parvilimbium* Merrill; *V. premnaceum* Wallich ex Candolle; *V. rectangulare* Graebner ex Hayata; *V. touchanense* H. Léveillé.

Branchlets elongated. Leaves ovate or elliptic to oblong-rhombic, margin shallowly dentate or subentire. Peduncles very short to 2 cm at most, or absent.  $2n = 18^*$ .

• Forests, scrub; 600–2400 m. N Guangdong, N Guangxi, Guizhou, ?Henan, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan.

**56c. *Viburnum foetidum* var. *ceanothoides*** (C. H. Wright) Handel-Mazzetti, Symb. Sin. 7: 1038. 1936.

珍珠荚蒾 zhen zhu jia mi

*Viburnum ceanothoides* C. H. Wright, Bull. Misc. Inform. Kew 1896: 23. 1896; *Premna valbrayi* H. Léveillé; *V. ajugifolium* H. Léveillé.

Branchlets  $\pm$  elongated. Leaves obovate, margin large dentate in upper part. Peduncles 1–2.5(–8) cm.

• Dense forests, scrub; 900–2600 m. W Guizhou, SW Sichuan, Yunnan.

**57. *Viburnum fordiae*** Hance, J. Bot. 21: 321. 1883.

南方荚蒾 nan fang jia mi

*Viburnum hirtulum* Rehder.

Shrubs or small trees, deciduous, to 5 m tall. Bark light brown. Branchlets gray-brown or black-brown, yellow or yellow-brown stellate-tomentose; branchlets of previous year purple-brownish, terete, glabrous or with yellowish brown hairs, with dispersed, small, rounded lenticels. Winter buds ovoid, with 2 pairs of separate scales; scales dark yellow or yellow-brown stellate-tomentose. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 5–15 mm, dark yellow or yellow-brown stellate-tomentose; leaf blade yellowish green when young, broadly ovate or rhombic-ovate, 4–7(–9)  $\times$  2.5–5 cm, papery to thickly papery, abaxially densely stellate-pubescent, adaxially with dispersed red-brown glandular dots, stellate-pubescent or forklike pubescent, midvein raised abaxially, lateral veins 5–7(–9)-jugate, pinnate, straight or slightly arched, branched, ending in teeth, raised abaxially, slightly impressed adaxially, veinlets transverse, inconspicuous on both surfaces, not lobed, base rounded to obtuse or broadly cuneate, rarely cuneate, with 0 or 1 circular gland on both sides of midvein near base, margin often denticulate except at base, apex obtuse or shortly acute to shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal or at apices of lateral branchlets, with a pair of leaves, 3–8 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, lax, densely dark yellow or yellow-brown stellate-tomentose, without large sterile radiant flowers; peduncle 1–3.5 cm or very rarely nearly absent; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays of 3rd and 4th orders, not fragrant, sessile or shortly pedicellate. Calyx yellowish green; tube obconical, ca. 1.5 mm, dark yellow or yellow-brown stellate-tomentose; lobes triangular, ca. 0.5 mm, stellate-pubescent, apex obtuse. Corolla white, rotate, (3.5–)4–5 mm in diam., outside stellate pubescent; tube ca. 1 mm; lobes spreading, ovate, ca. 1.5 mm, exceeding tube, apex rounded, margin entire. Stamens equaling or slightly exceeding corolla, inserted at base of corolla; filaments

ca. 2 mm; anthers yellow-whitish, suborbicular, small, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid, 6–7 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, ca. 6  $\times$  4 mm, with 1 dorsal groove and 2 ventral grooves, apex rounded. Fl. Apr–May, fr. Oct–Nov.

• Sparse forests, scrub; 100–1000 m. S Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Yunnan, S Zhejiang.

In Fl. Yunnan. (5: 391. 1991), “*Viburnum hirsutum* Rehder” was inadvertently written instead of *Viburnum hirtulum* Rehder as a synonym.

**58. *Viburnum formosanum*** (Hance) Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 132. 1911.

台中荚蒾 tai zhong jia mi

Shrubs or small trees, deciduous, to 4 m tall. Bark light brown. Branchlets of current year densely yellow-brown stellate-pubescent or glabrous; branchlets of previous year gray-black, terete, glabrous, with sparse, small, rounded lenticels. Winter buds ovoid, with 2 pairs of separate scales; scales yellow-brown stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 5–15 mm, sparsely or densely stellate-pubescent; leaf blade green when young, ovate, 5–10  $\times$  3–5 cm, thickly papery, abaxially sparsely adpressed hairy on midvein and lateral veins, sparsely stellate-pubescent in vein axils, adaxially shiny, sparsely adpressed hairy only on midvein, midvein raised abaxially, lateral veins 7- or 8-jugate, pinnate, straight or slightly arched, rarely branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base rounded or slightly cordate; with 0 or 1 circular gland on both sides of midvein near base, margin serrate except at base, apex abruptly caudate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short lateral branchlets, with a pair of leaves, 3–4 cm in diam.; rays whorled; first node of inflorescence with 4 or 5 rays, dense, sparsely or densely stellate-pubescent, without large sterile radiant flowers; peduncle 1–1.5 cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays of 2nd order, not fragrant, shortly pedicellate. Calyx yellowish green; tube tubular, ca. 1.5 mm, stellate-pubescent or glabrous; lobes broadly ovate, ca. 0.5 mm, ciliolate, apex obtuse. Corolla white, rotate, ca. 4.5 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, obovate, ca. 1.5 mm, exceeding tube, apex rounded, margin slightly erose. Stamens equaling or slightly longer than corolla, inserted at base of corolla; filaments ca. 2.5 mm; anthers yellow-whitish, elliptic-ovoid, ca. 0.7 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid, ca. 8 mm, base rounded, apex rounded, glabrous; pyrenes compressed, oblong-ovoid, ca. 6 mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. Apr–May, fr. Aug–Oct.

• Forests, scrub; 100–1100 m. N Fujian, N Guangdong, Guangxi, S Hunan, Jiangxi, Sichuan, Taiwan, S Zhejiang.

1a. Calyx tube glabrous ..... 58c. subsp. *leiogynum*

1b. Calyx tube stellate-pubescent.

- 2a. Young branchlets glabrous;  
petioles sparsely simple  
hairy; inflorescence sparsely  
stellate-pubescent ..... 58a. subsp. *formosanum*
- 2b. Young branchlets, petioles,  
and inflorescences densely  
yellow-brown stellate  
pubescent ..... 58b. var. *pubigerum*

**58a. *Viburnum formosanum* subsp. *formosanum***

台中莢蒾(原亞種) tai zhong jia mi (yuan ya zhong)

*Viburnum erosum* Thunberg var. *formosanum* Hance, Ann. Sci. Nat., Bot., sér. 5, 5: 216. 1866; *V. dilatatum* Thunberg var. *formosanum* (Hance) Maximowicz; *V. formosanum* f. *subglabrum* (Hayata) Nakai; *V. luzonicum* Rolfe var. *formosanum* (Hance) Rehder; *V. luzonicum* f. *oblongum* Kanehira & Sasaki; *V. luzonicum* var. *oblongum* (Kanehira & Sasaki) Li; *V. luzonicum* f. *subglabrum* (Hayata) Kanehira & Sasaki; *V. subglabrum* Hayata.

Young branchlets glabrous. Petiole sparsely simple hairy. Inflorescence sparsely stellate-pubescent. Calyx tube stellate-pubescent.

• Forests. Taiwan.

**58b. *Viburnum formosanum* var. *pubigerum* P. S. Hsu, Ann. Bot. Fenn. 44: 154. 2007.**

毛枝台中莢蒾 mao zhi tai zhong jia mi

Young branchlets, petioles, and inflorescences densely yellow-brown stellate pubescent. Calyx tube stellate-pubescent.

• Sparse or dense forests, scrub; 100–1000 m. N Guangdong, S Hunan, Jiangxi.

**58c. *Viburnum formosanum* subsp. *leiogynum* P. S. Hsu, Acta Phytotax. Sin. 11: 81. 1966.**

光萼莢蒾 guang e jia mi

Young branchlets and petioles glabrous or stellate-pubescent. Inflorescence stellate-pubescent. Calyx tube glabrous.

• Forests; 700–1100 m. N Fujian, Guangxi, Sichuan, S Zhejiang.

**59. *Viburnum hainanense* Merrill & Chun, Sunyatsenia 5: 193. 1940.**

海南莢蒾 hai nan jia mi

*Viburnum tsangii* Rehder; *V. tsangii* f. *xanthocarpum* Rehder.

Shrubs, evergreen, to 3 m tall. Bark gray-brownish. Branchlets of current year quadrangular, yellow-brown stellate-pubescent; branchlets of previous year purple-brownish or gray-brownish, slightly quadrangular, glabrous, with dispersed, small, rounded lenticels. Winter buds lanceolate, with 2 pairs of separate scales; scales yellow-brown stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole reddish purple, slender, 3–6(–10) mm, yellow-brown stellate-pubescent; leaf blade yellowish green when young, oblong, broadly oblong-lanceolate, or elliptic, 3.5–

7(–10) × 1.5–4 cm, subleathery, adaxially slightly shiny, both surfaces glabrous or stellate-pubescent on midvein and lateral veins, with black or castaneous-brown glandular dots, midvein raised abaxially, lateral veins 4- or 5-jugate, lowest pair elongating to upper part of blade, thus appearing triplinerved, pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, impressed adaxially, veinlets subtransverse, conspicuous adaxially, inconspicuous abaxially, not lobed, base broadly cuneate or sometimes rounded, without glands, margin entire or remotely dentate above middle part, apex shortly acuminate or acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 2–4 cm in diam.; rays whorled; first node of inflorescence with (3 or)4 or 5 rays, ca. 1 cm, dense, yellow-brown stellate-pubescent, or mixed with forklike or simple hairs, without large sterile radiant flowers; peduncles 4–10 mm or nearly absent; bracts caducous, leaflike, green, linear-lanceolate, stellate pubescent; bracteoles scalelike. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate. Calyx green; tube obconical, ca. 1 mm, sparsely stellate-pubescent; lobes broadly ovate, very short, sparsely ciliate, apex obtuse, ciliate. Corolla white, rotate, ca. 4 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, suborbicular, subequaling tube, apex rounded, margin entire. Stamens erect, exceeding corolla, inserted at base of corolla; filaments ca. 2 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, compressed ovoid, ca. 6 mm in diam., base rounded, apex acute, glabrous; pyrenes compressed, orbicular, raised on dorsal side, deeply impressed on ventral side, apex rounded. Fl. Apr–Jul, fr. Aug–Dec.

Forests, scrub; 600–1400 m. S Guangdong, S Guangxi, Hainan [N Vietnam].

**60. *Viburnum hengshanicum* Tsiang ex P. S. Hsu in Chen et al., Observ. Fl. Hwangshan. 178. 1965.**

衡山莢蒾 heng shan jia mi

Shrubs, deciduous, to 2.5 m tall. Bark light brown. Branchlets of current year grayish brown, glabrous; branchlets of previous year gray-white, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, 8–10 mm, acute, with 2 pairs of separate scales; scales outer ones ca. 1/2 as long as inner ones. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, (1–)2–4.5 cm, glabrous; leaf blade green when young, broadly ovate or orbicular-ovate, rarely obovate, 9–14(–18) × 5–13 cm, papery, abaxially sparsely adpressed hairy on midvein and lateral veins or glabrous and stellate-pubescent in vein axils, adaxially glabrous, midvein raised abaxially, lateral veins 5–7-jugate, lowest pair elongating to upper part of blade, thus appearing ± triplinerved, pinnate, straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base rounded or shallowly cordate, sometimes truncate, without glands, margin remotely irregularly dentate, apex abruptly and shortly acuminate or abruptly narrowed and long mucronate, sometimes (2 or)3-lobed. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 5(–9) cm in diam.; rays

whorled; first node of inflorescence with (6 or) 7 rays, dense, pubescent, without large sterile radiant flowers; peduncles (5–) 6–10(–12.5) cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, sparsely hairy. Flowers on rays of 3rd and 4th orders, not fragrant, shortly pedicellate or sessile. Calyx green; tube cylindric, ca. 1 mm, glabrous; lobes broadly ovate, ca. 1.5 mm, ciliate, apex obtuse. Corolla white, rotate, ca. 5 mm in diam., glabrous; tube ca. 1.2 mm; lobes spreading, suborbicular, ca. 1 mm, apex rounded, margin entire. Stamens obviously exceeding corolla, inserted at base of corolla; filaments 4–5 mm; anthers yellow-whitish, broadly oblong-elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit maturing red, narrowly orbicular to orbicular, ca. 9 × 6 mm, base rounded, apex rounded, glabrous; pyrenes compressed, obovoid, 6–8 × 5–6 mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. May–Jul, fr. Sep–Oct.

• Forests, thickets; 600–1300 m. Anhui, Guangxi, Guizhou, Hunan, N Jiangxi, NW Zhejiang.

**61. *Viburnum integrifolium*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 132. 1911.

全叶荚蒾 *quan ye jia mi*

*Viburnum foetidum* Wallich f. *integrifolium* (Hayata) Nakai; *V. foetidum* var. *integrifolium* (Hayata) Kanehira & Hatusima.

Shrubs, deciduous, to 4 m tall. Bark light brown. Branchlets of current year gray-brown, quadrangular, yellowish stellate-pubescent, glabrescent, with small lenticels; branchlets of previous year gray-yellowish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds oblong-ovoid, with 2 pairs of separate scales; scales ovate-lanceolate, glabrescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 5–10 cm, stellate-pubescent; leaf blade green when young, black-brown when dry, oblong or oblong-lanceolate to linear-lanceolate, 5–11 × 1.5–2.8 cm, thickly papery, abaxially with dispersed small brown dots, both surfaces glabrous, midvein raised abaxially, lateral veins 4–6-jugate, pinnate, arched, rarely branched, anastomosing near margin, raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base cuneate, without glands, margin irregularly repand, not dentate, apex abruptly narrowed and long caudate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal or at apices of branchlets with 1 pair of leaves, 2.5–5 cm in diam.; rays whorled; first node of inflorescence with 5 rays; rays of different orders slender, dense, stellate-pubescent and with red-brown glandular dots, without large sterile radiant flowers; peduncles 2–2.5 cm; bracts and bracteoles caducous, green, linear-lanceolate, membranous, glabrous. Flowers on rays of 2nd and 3rd orders, not fragrant, long pedicellate or sessile. Calyx green; tube tubular, ca. 1 mm, with few red-brown glandular dots; lobes ovate, ca. 0.8 mm, glabrous, apex acute. Corolla white, rotate, ca. 4 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, ovate, ca. 1.2 mm, exceeding tube, apex rounded, margin entire. Stamens subequalling corolla, inserted at base of corolla; filaments ca. 3 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles not exceeding calyx

lobes; stigmas capitate. Fruit maturing red, ovoid, ca. 7.5 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, ca. 6 × 4 mm, raised on dorsal side, slightly impressed on ventral side, apex rounded. Fl. Jun, fr. Aug–Sep.

• Mountains; 1600–2000 m. Taiwan.

**62. *Viburnum kansuense*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 372. 1894.

甘肃荚蒾 *gan su jia mi*

Shrubs, deciduous, to 3 m tall. Bark light brown. Branchlets of current year pale brown, glabrous; branchlets of previous year gray or gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, with 2 pairs of separate scales; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules 2, subulate, small, persistent, or absent; petiole green, slender, 1–2.5(–4.5) cm, glabrous; leaf blade green when young, broadly ovate to oblong-ovate or obovate, 3–8 × 3–7 cm, papery, abaxially adpressed long hairy, densely stellate-pubescent in vein axils, adaxially sparsely stellate-pubescent throughout or only on veins, midvein raised abaxially, 3–5-palmatinerved, veins straight or slightly arched, branched, ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, inconspicuous on both surfaces, 3–5-lobed, base truncate to subcordate or broadly cuneate, with 0 or 1 circular gland on both sides of midvein near base, middle lobe largest, margin irregularly dentate, apex acuminate or acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 2–4 cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, dense, pubescent, without large sterile radiant flowers; peduncle 2.5–3.5 cm; bracts and bracteoles deciduous, leaflike, green, linear-lanceolate, hairy. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate or sessile. Calyx purple-red; tube obconical, ca. 1 mm, glabrous; lobes ovate-triangular, ca. 0.5 mm, glabrous, apex obtuse. Corolla reddish, rotate, ca. 6 mm in diam., glabrous; tube ca. 2 mm; lobes spreading, suborbicular, ca. 2.5 × 2.5 mm, slightly exceeding tube, apex rounded, margin slightly erose. Stamens slightly longer than corolla, inserted at base of corolla; filaments ca. 2.5 mm; anthers red-brown, globose, ca. 0.8 mm. Styles slightly exceeding calyx lobes; stigmas 2-lobed. Fruit maturing red, ellipsoid or subglobose, 8–10(–12) × 7–8 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid, 7–9 × ca. 5 mm, with 2 shallow dorsal grooves and 3 shallow ventral grooves, apex rounded. Fl. Jun–Jul, fr. Sep–Oct.

• *Abies* forests, mixed forests; 2400–3600 m. Gansu, Shaanxi, Sichuan, Xizang, Yunnan.

**63. *Viburnum lancifolium*** P. S. Hsu, Acta Phytotax. Sin. 11: 81. 1966.

披针形荚蒾 *pi zhen xing jia mi*

Shrubs, evergreen, to 2 m tall. Bark light brown. Branchlets of current year purplish brown, yellow-brown stellate-pubescent, or mixed with forklike or simple hairs, terete; branchlets of previous year gray-brownish, terete, glabrous, with sparse, small, rounded lenticels. Winter buds ovoid-lanceolate,

with 2 pairs of separate scales; scales ovate-lanceolate, stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 8–15(–25) mm, yellow-brown stellate-pubescent, or mixed with forklike or simple hairs; leaf blade green when young, oblong-lanceolate to lanceolate, 9–19(–27) × 1–4 cm, papery, abaxially yellow-brown stellate-pubescent, or mixed with forklike or simple hairs, adaxially shiny, without glands, midvein raised abaxially, lateral veins 7–12-jugate, lowest pair sometimes elongating to upper part of blade, thus appearing nearly triplinerved, pinnate, slightly arched, rarely branched, ending in teeth or anastomosing near margin, raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, inconspicuous adaxially, not lobed, base rounded or obtuse, without glands, margin remotely serrate above 1/3 from base, apex long acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, ca. 4 cm in diam., to 5 cm at fruiting stage; rays whorled; first node of inflorescence with 5 rays, dense, yellow-brown stellate-pubescent, or mixed with forklike or simple hairs, without large sterile radiant flowers; peduncles 1.5–4 cm, slender; bracts and bracteoles caducous, green, linear-lanceolate, membranous, sparsely ciliate. Flowers on rays of 3rd and 4th orders, not fragrant, sessile or shortly pedicellate. Calyx green; tube tubular, ca. 1 mm, yellow-brown stellate-pubescent, or mixed with forklike or simple hairs; lobes broadly ovate or broadly triangular-ovate, ca. 1/2 as long as tube, glabrous, apex obtuse, slightly ciliate. Corolla white, rotate, ca. 4 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, orbicular-ovate, slightly exceeding tube, ca. 1.8 mm wide, apex obtuse, margin entire. Stamens slightly exceeding corolla, inserted at base of corolla; filaments ca. 3 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate, 3-lobed. Fruit maturing red, subglobose, 7–8 mm in diam., base rounded, apex rounded, glabrous; pyrenes compressed, often slightly rectangular, 5–6 × 5–6 mm, raised and without groove on dorsal side, impressed on ventral side, with 2 shallow grooves, apex rounded. Fl. Apr–May, fr. Jul–Oct.

• Sparse forests, forest margins, scrub, sometimes bamboo forests; 200–600 m. Fujian, ?Guangdong, Jiangxi, Zhejiang.

**64. *Viburnum longiradiatum*** P. S. Hsu & S. W. Fan, Acta Phytotax. Sin. 11: 78. 1966.

长伞梗荚蒾 cháng sǎn gēng jiǎ mǐ

Shrubs or small trees, deciduous, to 4 m tall. Bark light brown. Branchlets of current year brown, with dense, yellow-greenish, simple, long hairs; branchlets of previous year purple-brown, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, with 2 pairs of separate scales; scales with dense, yellow-green, simple, long hairs. Leaves always opposite, not clustered at apices of branchlets; stipules subulate, ca. 2 mm, caducous, or absent; petiole green, slender, 1–3 cm, with dense, yellow-green, simple, long hairs; leaf blade yellowish green when young, ovate, broadly ovate, obovate-orbicular, or oblong, 5–10 × 4–5.5 cm, papery, abaxially stellate-pubescent, adaxially with sparse, simple hairs, later only hairy on veins, midvein raised abaxially, lateral veins (6 or) 7–9-jugate,

pinnate, straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base broadly obtuse to rounded, with 0–2 circular glands on both sides of midvein near base, margin crenate, apex abruptly narrowed and caudate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 4–8(–14) cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, lax, with yellow-green, simple, long hairs, without large sterile radiant flowers; peduncle 1.5–4 cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate or sessile. Calyx green; tube cylindric, ca. 2 mm, with simple hairs; lobes triangular to orbicular, ca. 0.5 mm, ciliate, apex obtuse. Corolla white or reddish, rotate, ca. 6 mm in diam., outside with simple hairs; tube ca. 2 mm; lobes spreading, ovate, ca. 3 mm, exceeding tube, apex rounded, margin entire. Stamens exceeding corolla, inserted at base of corolla; filaments ca. 3 × as long as anthers; anthers yellow-whitish, elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, ellipsoid-ovoid, 7–10 × 6–7 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ellipsoid-ovoid, ca. 7.5 × 5 mm, with 2 dorsal grooves and 3 ventral grooves, base rounded to broadly cuneate, apex acute. Fl. May–Jun, fr. Jul–Sep.

• Forests, scrub; 900–2300 m. Sichuan, Yunnan.

**65. *Viburnum luzonicum*** Rolfe, J. Linn. Soc., Bot. 21: 310. 1884.

吕宋荚蒾 lǚ sòng jiǎ mǐ

*Viburnum foochowense* W. W. Smith; *V. formosanum* (Hance) Hayata f. *mushanense* (Hayata) Nakai; *V. luzonicum* var. *mushanense* (Hayata) Kanehira & Sasaki; *V. mushanense* Hayata; *V. parvifolium* W. W. Smith (1917), not Hayata (1911); *V. smithianum* H. L. Li; *V. smithii* F. P. Metcalf.

Shrubs or small trees, deciduous, to 3 m tall. Bark light brown. Branchlets of current year yellow-brown stellate-pubescent; branchlets of previous year dark purple-brownish, terete, sparsely stellate-pubescent, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, with 2 pairs of separate scales; scales yellow-brown stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, usually 3–10(–15) mm, yellow-brown stellate-pubescent; leaf blade yellowish green when young, ovate, elliptic-ovate, or ovate-lanceolate to oblong, sometimes subrhombic, 4–9(–11) × 2–5 cm, papery to thickly papery, abaxially sparsely stellate-pubescent or forklike pubescent, adaxially with transparent glandular dots and forklike pubescent on midvein, midvein raised abaxially, lateral veins 5–9-jugate, pinnate, straight or slightly arched, rarely branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base broadly cuneate to subrounded, with 0–2 circular glands on both sides of midvein near base, margin serrate, ciliate, apex acuminate to acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, usually at apices of short lateral branchlets with a pair of leaves or terminal on

branchlets, 3–5 cm in diam.; rays whorled; first node of inflorescence with 5 rays, dense, yellow-brown stellate-pubescent, or mixed with forklike or simple hairs, without large sterile radiant flowers; peduncle usually very short or nearly absent, very rarely to 1.5 cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays of 3rd and 4th orders, not fragrant, sessile or shortly pedicellate. Calyx yellowish green; tube ovoid-orbicular, ca. 1 mm, yellow-brown stellate-pubescent; lobes ovate-lanceolate, ca. 0.5 mm, ciliate, apex obtuse. Corolla white, rotate, 4–5 mm in diam., outside stellate-pubescent; tube ca. 1.5 mm; lobes spreading, ovate, exceeding tube, apex rounded, margin entire. Stamens shorter or slightly longer than corolla, inserted at base of corolla; filaments ca. 2 mm; anthers yellow-whitish, broadly elliptic, ca. 0.8 mm. Styles slightly exceeding calyx lobes; stigmas indistinctly 3-lobed. Fruit maturing red, ovoid, 5–6 mm, base rounded, apex rounded, glabrous; pyrenes very compressed, ovoid, 4–5 × 3–4 mm, with 3 shallow dorsal grooves and 2 shallow ventral grooves, base truncate, apex acute. Fl. Apr–Jun, fr. Aug–Oct.

Sparse forests, scrub, roadsides; 100–700 m. Fujian, Guangdong, Guangxi, SE Jiangxi, Taiwan, Yunnan, S Zhejiang [?Indonesia, Malaysia, Philippines].

**66. *Viburnum melanocarpum*** P. S. Hsu in Chen et al., *Observ. Fl. Hwangshan*. 181. 1965.

黑果荚蒾 *hei guo jia mi*

Shrubs, deciduous, to 3.5 m tall. Bark light brown. Branchlets of current year grayish black, sparsely yellowish stellate-pubescent; branchlets of previous year red-brown, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-oblong, ca. 6 mm, with 2 pairs of separate scales; scales densely yellow-white pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules 2, subulate, ca. 3 mm, caducous, or absent; petiole green, slender, 1–2(–4) cm, sparsely yellowish stellate-pubescent; leaf blade green when young, obovate, orbicular-obovate, or broadly elliptic, rarely rhombic-elliptic, 6–10(–12) × 3–6 cm, papery, abaxially sparsely adpressed long hairy on midvein and lateral veins and sparsely stellate-pubescent in vein axils, adaxially shiny, often stiffly hairy on midvein, later subglabrous, midvein raised abaxially, lateral veins 6- or 7-jugate, pinnate, straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base rounded, shallowly cordate, or broadly cuneate, with 0 or 1 circular gland on both sides of midvein near base, margin denticulate, apex often abruptly and shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short branchlets with 1 pair of leaves, ca. 5 cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, with dispersed small glandular dots, without large sterile radiant flowers; peduncles 1.5–3 cm, slender; bracts and bracteoles deciduous, leaflike, green, lanceolate, glabrous. Flowers on rays of 2nd and 3rd orders, not fragrant, shortly pedicellate or sessile. Calyx green; tube tubular-obconical, ca. 1.5 mm, sparsely stellate-pubescent or glabrous; lobes broadly ovate, ca. 1.5 mm, glabrous, apex obtuse. Corolla white, rotate, ca. 5 mm in diam., glabrous; tube 1–2 mm; lobes spreading, broadly ovate, slightly

exceeding tube, apex rounded, margin entire. Stamens exceeding or slightly shorter than corolla, inserted at base of corolla; filaments ca. 4 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate. Fruit initially turning dark purple-red, maturing black, shiny, ellipsoid, 8–10 mm, base rounded, apex rounded, glabrous; pyrenes compressed, ovoid, ca. 8 × 6 mm, longitudinally raised on ventral side, apex rounded. Fl. Apr–May, fr. Sep–Oct.

• Forests, scrub; ca. 1000 m. Anhui, Henan, S Jiangsu, Jiangxi, Zhejiang.

**67. *Viburnum mullaha*** Buchanan-Hamilton ex D. Don, *Prodr. Fl. Nepal*. 141. 1825.

西域荚蒾 *xi yu jia mi*

Shrubs or small trees, deciduous, to 4 m tall. Bark light brown. Branchlets of current year densely gray-brown stellate-tomentose, mixed with long hairs, or subglabrous; branchlets of previous year purple-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, ca. 5 mm, with 2 pairs of separate scales; scales adpressed pubescent outside. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1–2.5 cm, densely stellate-pubescent; leaf blade green when young, ovate to ovate-lanceolate, 3.5–10 × 1.8–6 cm, papery, abaxially densely stellate-pubescent, or only so in vein axils, adaxially with sparse, simple, forklike, or stellate hairs, or hairy only on midvein, midvein raised abaxially, lateral veins 5- or 6(–8)-jugate, pinnate, arched, branched, ending in teeth, raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base broadly cuneate to rounded or slightly cordate, with 0 or 1 circular gland on both sides of midvein near base, margin remotely serrate except at base, apex caudate-acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, ca. 6 cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, dense, gray-brown stellate-tomentose, mixed with long hairs, without large sterile radiant flowers; peduncle (0.4–)1.5–2.5 cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, hairy. Flowers on rays from 2nd to 4th order, not fragrant, sessile or shortly pedicellate. Calyx green; tube obconical, ca. 1 mm, outside sparsely or densely stellate-pubescent and with dense glandular dots; lobes triangular-ovate, very small, stellate-pubescent, apex obtuse. Corolla white, rotate, 4–5 mm in diam., outside sparsely or densely stellate-pubescent; tube ca. 1.5 mm; lobes spreading, orbicular-ovate, subequaling tube, apex rounded, margin entire. Stamens shorter than corolla, inserted at base of corolla; filaments ca. 1.5 mm; anthers yellow-whitish, elliptic, ca. 1 mm. Styles very short, shorter than calyx lobes; stigmas capitate. Fruit maturing red, broadly ellipsoid, 5–7 mm in diam., base rounded, apex rounded, glabrous; pyrenes ovoid, 4–6 mm, with 2 shallow dorsal grooves and 1 shallow ventral groove, apex rounded. Fl. Jul, fr. Sep–Oct.  $2n = 18^*$ .

Needle-leaved and broad-leaved mixed forests; 2200–2700 m. Xizang, Yunnan [Bhutan, India, Kashmir, Nepal].

1a. Branchlets of current year and abaxial surfaces of young leaves stellate-

tomentose; calyx tube and corolla  
outside densely stellate-pubescent ..... 67a. var. *mullaha*

- 1b. Branchlets of current year subglabrous;  
leaves abaxially stellate-pubescent only  
in vein axils and hairy only on midvein;  
calyx tube and corolla outside very  
sparsely pubescent ..... 67b. var. *glabrescens*

**67a. *Viburnum mullaha* var. *mullaha***

西域荚蒾(原变种) xi yu jia mi (yuan bian zhong)

*Viburnum involucratum* Wallich ex Candolle; *V. stellulatum* Wallich ex Candolle; *V. stellulatum* var. *involucratum* (Wallich ex Candolle) C. B. Clarke; *V. thaiyongense* W. W. Smith.

Branchlets of current year and abaxial surfaces of young leaves stellate-tomentose. Calyx tube and corolla densely stellate-pubescent outside.

Needle-leaved and broad-leaved mixed forests; 2300–2700 m. S and SE Xizang, NW Yunnan (Gongshan) [India, Nepal].

**67b. *Viburnum mullaha* var. *glabrescens*** (C. B. Clarke) Kitamura, Fauna Fl. Nepal Himal. 1: 235. 1955.

少毛西域荚蒾 shao mao xi yu jia mi

*Viburnum stellulatum* var. *glabrescens* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 4. 1880.

Branchlets of current year subglabrous. Leaves stellate-pubescent only in vein axils and hairy only on midvein on abaxial surface. Calyx tube and corolla very sparsely pubescent outside.

Mixed forests; 2200–2700 m. Xizang [Bhutan, E India, Kashmir, Nepal].

**68. *Viburnum parvifolium*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 134. 1911.

小叶荚蒾 xiao ye jia mi

*Viburnum yamadae* Bartlett & Yamamoto.

Shrubs, deciduous, to 2 m tall. Bark light brown. Branchlets of current year densely yellow-brownish stellate-pubescent, with minute brownish glandular dots; branchlets of previous year dark brown, terete, glabrous, with dispersed, bright, rounded lenticels. Winter buds oblong-ovoid, with 2 pairs of separate scales; scales ovate-lanceolate, stellate-pubescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole reddish purple, robust, 4–6 mm, densely stellate-pubescent, with minute brownish glandular dots; leaf blade green when young, oblong or orbicular, very rarely ovate, 0.8–3 × 0.7–2 cm, thickly papery, abaxially sparsely stellate-pubescent and with minute brownish glandular dots, more densely hairy on veins, adaxially stellate-pubescent only on veins, midvein raised abaxially, lateral veins 3- or 4-jugate, lowest pair elongating to upper part of blade, thus appearing ± triplinerved, pinnate, arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base broadly cuneate to rounded, without glands, margin remotely serrate except at base, apex rounded or slightly acute.

Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal or at apices of branchlets with 1 pair of leaves, ca. 2.5 cm in diam., to 6 cm at fruiting stage; rays whorled; first node of inflorescence with 5 rays, dense, densely stellate-pubescent and with minute brownish glandular dots, without large sterile radiant flowers; peduncle ca. 5 mm; bracts and bracteoles caducous, greenish brown, linear-lanceolate, membranous, sparsely ciliate. Flowers on rays of 1st and 2nd orders, not fragrant, sessile or shortly pedicellate. Calyx green; tube tubular, ca. 1 mm, with few hairs and brownish glandular dots; lobes broadly triangular, ca. 1/2 as long as tube, glabrous, with minute brownish glandular dots, apex obtuse. Corolla white, rotate, 5–6 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, orbicular, ca. 2 mm, exceeding tube, apex rounded, margin entire. Stamens subequaling corolla, inserted at base of corolla; filaments ca. 2.5 mm; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles exceeding calyx lobes; stigmas capitate, 3-lobed. Fruit maturing red, compressed, oblong or orbicular, 8–10 × 5–7 mm, base rounded, apex rounded, glabrous or with glandular dots; pyrenes compressed, ovoid, ca. 6.5 × 4 mm, ventral side slightly impressed and with 1 shallow groove, apex slightly mucronate. Fl. Jun–Jul, fr. Nov.

• Mountains; 2200–3300 m. Taiwan.

**69. *Viburnum sempervirens*** K. Koch, Hort. Dendrol. 300. 1853.

常绿荚蒾 chang lü jia mi

Shrubs, evergreen, to 4 m tall. Bark gray-brownish. Branchlets of current year quadrangular, yellowish or gray-yellowish sparsely or densely stellate-pubescent or subglabrous; branchlets of previous year purple-brownish or gray-brownish, slightly quadrangular, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales ovate-lanceolate, glabrescent. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole reddish purple, robust, 5–15 mm, glabrous or stellate-pubescent; leaf blade green when young, black to black-brown or gray-black when dry, elliptic to elliptic-ovate, rarely broadly ovate, sometimes oblong or oblanceolate, 4–12(–16) × 2.5–5(–6.5) cm, leathery, abaxially with tiny brown glandular dots throughout, often sparsely adpressed pubescent on midvein and lateral veins, adaxially shiny, midvein raised abaxially, lateral veins 3–6-jugate, lowest pair elongating to upper part of blade, thus appearing ± triplinerved, pinnate, slightly arched, branched, ending in teeth or anastomosing near margin, conspicuously raised abaxially, deeply impressed adaxially, veinlets transverse, inconspicuous or slightly conspicuous abaxially, inconspicuous adaxially, not lobed, base acuminate to obtuse, sometimes subrounded, without glands, margin entire or serrate in upper part, apex acute or shortly acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 3–5 cm in diam.; rays whorled; first node of inflorescence with (4 or) 5 rays, dense, glabrous, subglabrous, or densely stellate-pubescent, with red-brown glandular dots, without large sterile radiant flowers; peduncles less than 1 cm, or nearly absent; bracts caducous, leaflike, green, linear to linear-lanceolate, glabrous; bracteoles scalelike. Flowers on rays of 3rd and 4th orders, not fragrant, shortly pedicellate or sessile. Calyx green; tube tubu-

lar-obconical, ca. 1 mm, glabrous; lobes broadly ovate, shorter than tube, glabrous, apex obtuse, slightly ciliate. Corolla white, rotate, ca. 4 mm in diam., glabrous; tube ca. 1 mm; lobes spreading, suborbicular, subequalling tube, apex rounded, margin entire. Stamens slightly exceeding corolla, inserted at base of corolla; filaments ca. 3 × as long as anthers; anthers yellow-whitish, broadly elliptic, ca. 1 mm. Styles slightly exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid, ca. 8 mm, base rounded, apex rounded, glabrous; pyrenes compressed, orbicular, 3–6 mm in diam., obviously or slightly convex on dorsal side, concave or not on ventral side, apex rounded. Fl. Apr–May, fr. Jul–Dec.

• Sparse or dense forests, scrub; 100–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, ?Hainan, S Hunan, Jiangxi, SE Sichuan, Yunnan, Zhejiang.

- 1a. Young branchlets, petioles, and inflorescences glabrous or sparsely stellate-pubescent; pyrenes dorsally convex, ventrally obviously concave, 3–5 mm in diam. .... 69a. var. *sempervirens*
- 1b. Young branchlets, petioles, and inflorescences densely stellate-pubescent; pyrenes dorsally slightly convex, ventrally not obviously concave, ca. 6 mm in diam. .... 69b. var. *trichophorum*

#### 69a. *Viburnum sempervirens* var. *sempervirens*

常绿荚蒾(原变种) chang lǜ jiā mi (yuan bian zhong)

*Viburnum nervosum* Hooker & Arnott (1833), not D. Don (1825); *V. venulosum* Benth.

Young branchlets, petioles, and inflorescences glabrous or sparsely stellate-pubescent. Pyrenes convex dorsally, obviously concave ventrally, 3–5 mm in diam.

• Sparse or dense forests, scrub; 100–1800 m. Guangdong, Guangxi, Jiangxi.

#### 69b. *Viburnum sempervirens* var. *trichophorum* Handel-Mazzetti, Beih. Bot. Centralbl., Abt. B, 56: 465. 1937.

具毛常绿荚蒾 jù mao chang lǜ jiā mi

*Viburnum pinfaense* H. Léveillé.

Young branchlets, petioles, and inflorescences densely stellate-pubescent. Pyrenes slightly convex dorsally, not obviously concave ventrally, ca. 6 mm in diam.

• Forests, scrub; 100–1400 m. Anhui, Fujian, Guangdong, N Guangxi, Guizhou, S Hunan, Jiangxi, SE Sichuan, Yunnan, Zhejiang.

#### 70. *Viburnum setigerum* Hance, J. Bot. 20: 261. 1882.

茶荚蒾 chá jiā mi

*Viburnum bodinieri* H. Léveillé; *V. setigerum* var. *sulcatum* P. S. Hsu; *V. theiferum* Rehder.

Shrubs, deciduous, to 4 m tall. Bark light brown. Winter buds and leaves black, black-brown, or gray-black when dry. Branchlets of current year grayish yellow, glabrous; branchlets of previous year gray, gray-brown, or purple-brown, terete,

glabrous, with dispersed, small, rounded lenticels. Winter buds oblong, usually less than 5 mm, to 1 cm at most, with 2 pairs of separate scales, outer ones 1/3–1/2 as long as inner ones; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, slender, 1–1.5(–2.5) cm, sparsely adpressed long hairy or subglabrous; leaf blade green when young, ovate-oblong to ovate-lanceolate, rarely ovate to elliptic-ovate, 7–12(–15) × 3–5.5 cm, papery, abaxially yellowish adpressed long hairy only on midvein and lateral veins, adaxially long hairy, glabrescent, midvein raised abaxially, lateral veins 6–8-jugate, pinnate, straight, rarely branched, ending in teeth, conspicuously raised abaxially, slightly impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, not lobed, base rounded, with 1 or 2 circular glands on both sides of midvein near base, margin remotely serrate except at base, apex acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, often nodding, terminal, 2.5–4(–5) cm in diam.; rays whorled; first node of inflorescence usually with 5 rays, dense, glabrous or sparsely adpressed long hairy, without large sterile radiant flowers; peduncles 1–2.5(–3.5) cm; bracts and bracteoles deciduous, leaflike, green, lanceolate, glabrous. Flowers on rays of 3rd order, not fragrant, shortly pedicellate or sessile. Calyx green; tube tubular, ca. 1.5 mm, glabrous; lobes ovate, ca. 1 mm, glabrous, apex obtuse. Corolla white, rotate, 4–6 mm in diam., glabrous; tube 1–2 mm; lobes spreading, ovate, ca. 2.5 mm, exceeding tube, apex rounded, margin entire. Stamens subequalling corolla, inserted at base of corolla; filaments ca. 3 mm; anthers yellow-whitish, globose, very small, less than 1 mm. Styles not exceeding calyx lobes; stigmas capitate. Fruit maturing red, ovoid, 9–11 mm, base rounded, apex rounded, glabrous; pyrenes very compressed, ovoid, 8–10 × 5–7 mm, sometimes much smaller, occasionally ovoid-oblong, only 4–5 mm in diam., slightly impressed on ventral side, apex rounded. Fl. Apr–May, fr. Sep–Oct.  $2n = 18^*$ .

• Forests, scrub; (200–)800–1700 m. Anhui, N Fujian, N Guangdong, E Guangxi, Guizhou, Henan, W Hubei, Hunan, S Jiangsu, Jiangxi, S Shaanxi, E Sichuan, Taiwan, Yunnan, Zhejiang.

*Viburnum setigerum* f. *xanthocarpum* Rehder (J. Arnold Arbor. 12: 78. 1931) is a yellow/orange-fruited variant described from cultivated material of Chinese provenance.

#### 71. *Viburnum squamulosum* P. S. Hsu, Acta Phytotax. Sin. 13(1): 127. 1975.

瑶山荚蒾 yáo shān jiā mi

Shrubs, evergreen, total size unknown. Bark unknown. Branchlets of current year brownish, quadrangular, glabrous; branchlets of previous year black-brownish, slightly quadrangular, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid-lanceolate, with 2 pairs of separate scales; scales ?glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules absent; petiole green, robust, 1–1.5 cm, glabrous; leaf blade green when young, linear-lanceolate, 11–17 × 1.5–2 cm, thickly papery, abaxially glabrous, with red-brown glandular dots, adaxially shiny, with red-brown glandular dots, midvein raised abaxially, lateral veins ca. 6-jugate, pinnate, slightly arched, rarely branched, ending in teeth or anastomosing near margin, raised abaxially, slightly impressed adaxially,

ally, veinlets transverse, inconspicuous on both surfaces, not lobed, base cuneate to obtuse, without glands, margin irregularly serrate or subentire, apex long acuminate. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, to 6 cm in diam. at fruiting stage; rays whorled; first node of inflorescence with 5 rays, 1–2 cm, dense, glabrous, without large sterile radiant flowers; peduncles ca. 2 cm, slender, stellate-pubescent; bracts and bracteoles unknown, caducous. Flowers on rays of 2nd and 3rd orders, not fragrant, sessile or shortly pedicellate. Calyx green; tube broadly ovoid,

ca. 1 mm, glabrous; lobes broadly triangular-ovate, ca. 1/2 as long as tube, glabrous, apex obtuse. Corolla ?rotate, unknown. Styles exceeding calyx lobes; stigmas capitate, 3-lobed. Fruit color unknown, subglobose, 7–7 mm in diam., base rounded, apex rounded, glabrous or with glandular dots; pyrenes compressed, subquadrangular, ca. 5 × 5 mm, raised on dorsal side, impressed on ventral side, apex rounded. Fr. Aug.

• Dense forests. Guangxi (Yaoshan).

This species is known only from the type collection.

## 8. *Viburnum* sect. *Opulus* (Miller) Candolle, Prodr. 4: 328. 1830.

裂叶组 lie ye zu

*Opulus* Miller, Gard. Dict. Abr., ed. 4. 1754.

Winter buds with 2 pairs of separate scales. Inflorescence a compound umbel-like cyme, usually pedicellate, with or without large sterile radiant flowers. Corolla rotate. Fruit maturing red; pyrenes without grooves or with 2 shallow dorsal grooves and 1 broad ventral groove, albumen solid.

Three species: temperate Asia, Europe, and North America; two species in China.

Recent phylogenetic work shows that this section is monophyletic, sister to a large clade consisting of *Viburnum* sect. *Megalotinus*, *V.* sect. *Odontotinus*, *V.* sect. *Oreinothus* (Oersted) Benth & J. D. Hooker, and *V.* sect. *Tinus*.

**72. *Viburnum koreanum*** Nakai, J. Coll. Sci. Imp. Univ. Tokyo 42(2): 42. 1921.

朝鲜荚蒾 chao xian jia mi

Shrubs, deciduous, to 2 m tall. Bark light brown. Branchlets of current year green-brown, later gray-brown, glabrous; branchlets of previous year gray-brownish, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, with a pair of connate scales; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules 2, subulate; petiole green, slender, 0.5–2(–2.5) cm, sparsely pubescent, glabrescent; leaf blade green when young, suborbicular or broadly ovate, 3–13 × 2–10 cm, papery, abaxially with minute glandular dots and yellowish pubescent on veins and in vein axils, adaxially glabrous or sparsely pubescent when young, glabrescent, midvein raised abaxially, 3–5-palmatinerved, veins straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, 3(–5)-lobed, leaves at apices of branches sometimes undivided, base rounded, truncate, or shallowly cordate, with 1 gland on each side near petiole, margin irregularly dentate, apices of lobes acute. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, at apices of short branchlets, with a pair of leaves, 2–4 cm in diam.; rays whorled; first node of inflorescence with 5–7 rays, dense, 5–30-flowered, glabrous, often minutely gland-dotted, without large sterile radiant flowers; peduncle 1.5–4 cm, slender; bracts and bracteoles deciduous, leaflike, green, linear-lanceolate, glabrous. Flowers on rays of 1st order, not fragrant, very shortly pedicellate. Calyx green; tube obconical, ca. 1 mm, glabrous; lobes triangular, ca. 0.6 mm, glabrous, apex obtuse. Corolla white, rotate, 6–8 mm in diam., glabrous; tube ca. 1.2 mm; lobes spreading, ovate to elliptic, 2.5–3 mm, exceeding tube, apex rounded, margin entire. Stamens shorter than corolla, inserted near base of corolla; filaments 1–1.3 mm; anthers yellow-whitish, elliptic, 0.6–0.8

mm. Styles slightly exceeding calyx lobes; stigmas 2-lobed. Fruit maturing yellow-red or dark red, subellipsoid, 7–11 × 5–7 mm, base rounded, apex rounded, glabrous; pyrenes ovoid-oblong, ca. 7 × 5.5 mm, with 2 shallow dorsal grooves and 1 broad ventral groove, apex rounded. Fl. Jun–Jul, fr. Aug–Sep.

Needle-leaved forests, forest margins; ca. 1400 m. Jilin [Japan, Korea].

**73. *Viburnum opulus*** Linnaeus, Sp. Pl. 1: 268. 1753.

欧洲荚蒾 ou zhou jia mi

Shrubs, deciduous, to 6 m tall. Bark dark gray, thin or thick, corky or not. Branchlets of current year green-brownish, sometimes reddish, glabrous or pubescent, with conspicuously raised lenticels; branchlets of previous year yellowish or red-brown, terete, glabrous, with dispersed, small, rounded lenticels. Winter buds ovoid, stipitate, 4–6 mm, with 2 pairs of connate scales, inner scales membranous, base connate into a tube; scales glabrous. Leaves always opposite, not clustered at apices of branchlets; stipules 2, persistent, subulate, 1–5 mm; petiole green or reddish, robust, 1–5 cm, glabrous or pubescent, with 2–4 or more discoid glands near apex; leaf blade green when young, orbicular-ovate to broadly ovate or obovate, 6–12 × 5–10 cm, papery, abaxially spreading hairy especially on veins and vein axils, adaxially almost glabrous, midvein raised abaxially, 3-palmatinerved, veins straight or slightly arched, branched, ending in teeth, conspicuously raised abaxially, impressed adaxially, veinlets transverse, slightly raised abaxially, impressed adaxially, usually 3-lobed, leaves at apices of branches sometimes undivided, base rounded, truncate, or shallowly cordate, without glands, middle lobe often largest, margin irregularly dentate, apices of lobes acute, lateral lobes present, sometimes slightly spreading toward outside. Leaves on upper part of branchlets often narrow and longer, elliptic to oblong-lanceolate and not divided, margin sparsely crenate or shallowly 3-lobed; lobes entire or subentire, lateral lobes short,

middle lobes elongated. Flowers appearing after leaves; inflorescence a compound umbel-like cyme, terminal, 5–12 cm in diam.; rays whorled; first node of inflorescence with 6–8 rays, dense, glabrous or with simple hairs, with 5–10 large sterile radiant flowers, or totally composed of large sterile flowers; peduncle robust, 2–5 cm, glabrous or pubescent; bracts and bracteoles deciduous, leaflike, green, lanceolate, glabrous or sparsely hairy. Flowers on rays of 2nd and 3rd orders, not fragrant, very shortly pedicellate. Sterile flowers: calyx like fertile flowers, corolla white, 1.3–2.5 cm in diam., long pedicellate; lobes broadly obovate, apex rounded, unequally shaped; stamens and pistils not developed. Fertile flowers: calyx green; tube obconical, ca. 1 mm, glabrous; lobes triangular, ca. 0.6 mm, glabrous, apex obtuse; corolla white, rotate, 4–5 mm in diam., outside glabrous, inside pubescent; tube 1–2 mm; lobes spreading or reflexed, suborbicular, 1–1.5 mm, slightly unequal in size, apex rounded, margin entire; stamens conspicuously exceeding corolla, inserted near base of corolla; filaments ca. 4 mm; anthers yellow-whitish, or purple, ca. 1 mm; styles slightly exceeding calyx lobes; stigmas 2-lobed. Fruit initially turning yellow, maturing red, suborbicular, 8–10(–12) mm in diam., base rounded, apex rounded, glabrous; pyrenes compressed, subglobose, 7–9 mm in diam., without grooves, apex rounded. Fl. May–Jun, fr. Sep–Oct.  $2n = 18^*$ .

Forests, scrub, thickets; 1000–2200 m. Anhui, S Gansu, N Hebei, Heilongjiang, W Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, S Shaanxi, Shandong, Shanxi, Sichuan, NW Xinjiang, NW Zhejiang [Japan, Korea, Mongolia, Russia; Europe].

- 1a. Bark thin, not corky; inflorescence with 5–10 large sterile radiant flowers or totally composed of large sterile flowers, anthers yellow-white or stamens lacking (on sterile flowers) ..... 73a. subsp. *opulus*  
 1b. Bark thick, corky; inflorescence with 5–10 large sterile radiant flowers, anthers purple ..... 73b. subsp. *calvescens*

**73a. *Viburnum opulus* subsp. *opulus***

欧洲荚蒾(原亚种) ou zhou jia mi (yuan ya zhong)

Bark thin, not corky. Inflorescence with 5–10 large sterile radiant flowers or totally composed of large sterile flowers. Anthers yellow-white.

Forests; 1000–1600 m. NW Zhejiang [Russia; Europe].

A European horticultural form, *Viburnum opulus* f. *roseum* (Linnaeus) Hegi (Ill. Fl. Mitt.-Eur. 6(1): 243. 1914; *V. opulus* var. *roseum* Linnaeus, Sp. Pl. 1: 268. 1753; *V. opulus* var. *sterile* Candolle), is sometimes cultivated in China. Its bark is thin, not corky, and the inflorescence is totally composed of large sterile flowers lacking stamens.

**73b. *Viburnum opulus* subsp. *calvescens* (Rehder) Sugimoto, New Key Jap. Tr. 478. 1961.**

鸡树条 ji shu tiao

*Viburnum sargentii* Koehne var. *calvescens* Rehder, Mitt. Deutsch. Dendrol. Ges. 12: 125. 1903; *V. opulus* var. *calvescens* (Rehder) H. Hara; *V. opulus* f. *intermedium* (Nakai) Sugimoto; *V. opulus* f. *puberulum* (Komarov) Sugimoto; *V. opulus* var. *pubinerve* Makino; *V. opulus* var. *sargentii* (Koehne) Takeda; *V. pubinerve* Blume ex Nakai; *V. pubinerve* f. *calvescens* (Rehder) Nakai; *V. pubinerve* f. *intermedium* Nakai; *V. pubinerve* f. *puberulum* (Komarov) Nakai; *V. sargentii* Koehne; *V. sargentii* f. *calvescens* (Rehder) Rehder; *V. sargentii* f. *glabra* Komarov; *V. sargentii* f. *intermedium* (Nakai) H. Hara; *V. sargentii* var. *intermedium* (Nakai) Kitagawa; *V. sargentii* f. *puberulum* Komarov; *V. sargentii* var. *puberulum* (Komarov) Kitagawa.

Bark thick, corky. Inflorescence with 5–10 large sterile radiant flowers. Anthers purple.  $2n = 18$ .

Forests, scrub, thickets; 1000–2200 m. Anhui, S Gansu, N Hebei, Heilongjiang, W Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, S Shaanxi, Shandong, Shanxi, Sichuan, NW Zhejiang [Japan, Korea, Mongolia, Russia].

*Viburnum opulus* f. *flavum* (Rehder) H. Hara (Ginkgoana 5: 274. 1983; *V. sargentii* f. *flavum* Rehder, J. Arnold Arbor. 3: 224. 1922; *V. sargentii* var. *flavum* (Rehder) Rehder) is a yellow-fruited form of this taxon known from China, Korea, and Japan (rare).

## 2. **SAMBUCUS** Linnaeus, Sp. Pl. 1: 269. 1753.

接骨木属 jie gu mu shu

Yang Qiner (杨亲二); David E. Boufford

Shrubs, small trees, or perennial herbs, gynodioecious or hermaphroditic, deciduous, whole plant sometimes with extrafloral nectariferous glands. Branches smooth, striate, or warty, with stout pith. Leaves with or without stipules, imparipinnate, or incompletely bipinnate, rarely lacinate; leaflets serrate or divided, opposite or alternate. Inflorescences terminal, flat or convex corymbs or panicles, pedunculate or sessile. Flowers actinomorphic or sometimes dimorphic, sometimes with glandular nectaries, articulate with pedicel; bracts mostly absent; bracteoles 1 or absent. Calyx tube: limb 3–5-parted; corolla rotate, white, lobes 3–5. Stamens 5, inserted at base of corolla; filaments erect, filiform; anthers 2-celled, oblong, cells free, attached at middle. Ovary locules 3–5, ovules 1 per locule; style cushionlike; stigmas 3 or 5. Fruit berrylike, 3–5-seeded; seeds triquetrous or ellipsoid; embryo ca. as long as seed.

About ten species: temperate to subtropical regions and tropical mountains; four species (one endemic) in China.

See Bolli, Diss. Bot. 223: 1–227. 1994; Eriksson and Donoghue, Syst. Bot. 22: 555–573. 1997.

*Sambucus nigra* Linnaeus (Sp. Pl. 1: 269. 1753) is occasionally cultivated in China.

In some species, the vegetative parts of the plant when bruised and the flowers have a fetid odor.

- 1a. Perennial herbs or shrubs; lenticels absent or inconspicuous; young branches striate; inflorescences flat topped, umbellate cymes.

- 2a. All flowers hermaphroditic, rotate; lenticels inconspicuous or absent; lateral leaflets without glandular teeth; terminal leaflet narrowly cuneate, often decurrent and connected to next lower leaflet pair; pith of roots red or white; pyrenes rugose or smooth ..... 1. *S. adnata*
- 2b. Some flowers sterile, urceolate; lenticels inconspicuous; lateral leaflets with 2–4 glandular teeth below middle and at base; terminal leaflet rounded to cuneate at base, not or only slightly decurrent; pith of roots white; pyrenes tuberculate ..... 2. *S. javanica*
- 1b. Shrubs or small trees; lenticels conspicuous; young branches rounded; inflorescences and infructescences pyramidal paniculate cymes.
- 3a. Petiolules, foliar axis, and abaxial surface of leaflets glabrous ..... 3. *S. williamsii*
- 3b. Petiolules, foliar axis, and veins at base of abaxial surface of leaflets hairy ..... 4. *S. sibirica*

**1. *Sambucus adnata* Wallich ex Candolle, Prodr. 4: 322. 1830.**

血满草 xue man cao

*Sambucus schweriniana* Rehder.

Herbs, suffrutescent, or low shrubs, 1–2 m tall, rhizomatous. Pith of roots and rhizomes white or red. Stem herbaceous, obviously striate; pith white or red; lenticels absent. Leaves imparipinnate; stipules bladelike or linear; leaflets 3–5 pairs, narrowly elliptic to narrowly ovate or lanceolate, 4–15 × 1.5–2.5 cm, abaxially sparsely pubescent, more densely pubescent on veins, base obtuse and oblique, margin serrate, apex acuminate; terminal pair of leaflets often connate at base along rachis, sometimes connected also with terminal leaflet, remaining leaflets alternate or sometimes subopposite; stipules of leaflets reduced to urceolate glands. Inflorescences terminal, pedunculate, with 3–5 rays, umbellate cymes, 12–15 cm broad and tall, with dense yellow pubescence when young and ± glandular hairy. Flowers all normal, not reduced to glands, 4–5 mm in diam.; calyx urceolate, pubescent; corolla white; filaments dilated at base, anthers yellow; ovary locules 3; styles short or nearly absent; stigma 3-lobed. Fruit orange or red, becoming black on drying, globose, 3–4 mm in diam.; pyrenes ovoid, ca. 2 × 1.5 mm, rugose or smooth. Fl. May–Jul(–Sep), fr. Sep–Oct. 2n = 36\*.

Forests, thickets, streamsides, moist shaded mountain slopes, alpine grasslands; 1600–3600 m. Gansu, Guizhou, Hubei, Ningxia, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India (Darjeeling, Sikkim)].

**2. *Sambucus javanica* Blume, Bijdr. 657. 1825.**

接骨草 jie gu cao

*Ebulus chinensis* (Lindley) Nakai; *E. formosana* (Nakai) Nakai; *Sambucus argyi* H. Léveillé; *S. chinensis* Lindley; *S. chinensis* var. *formosana* (Nakai) H. Hara; *S. chinensis* var. *pinnatilobata* G. W. Hu; *S. formosana* Nakai; *S. formosana* var. *arborescens* Kanehira & Sasaki; *S. henriana* Samutina; *S. hookeri* Rehder; *S. javanica* var. *argyi* (H. Léveillé) Rehder; *S. javanica* subsp. *chinensis* (Lindley) Fukuoka.

Herbs, suffrutescent, or low shrubs, 1–2 m tall. Stem obviously striate; pith white; lenticels inconspicuous. Leaves imparipinnate; stipules leaflike or sometimes reduced to blue glands; lateral leaflets 2 or 3 pairs, alternate or opposite, narrowly ovate, 6–13 × 2–3 cm, adaxially sparsely pubescent when young, base obtuse and oblique, margin serrulate, often with 1 to several glandular teeth from below middle nearly to base, apex long acuminate; terminal leaflet ovate or obovate, base cuneate, sometimes connected with next lower leaflets, basal

pair of leaflets shortly petiolulate; stipules of leaflets absent. Inflorescences terminal, compound umbellate cymes, lax, pedunculate, with leaflike bracts at base of peduncle, with 3–5 slender rays, with sparse yellow pubescence. Some flowers modified into persistent urceolate nectaries. Flowers: calyx tube urceolate, lobes triangular; corolla white, connate at base; anthers yellow or purple; ovary locules 3; styles short or nearly absent; stigma 3-lobed. Fruit red, subglobose, 3–4 mm in diam.; pyrenes 3 or 4, ovoid, ca. 2.5 mm, verrucate. Fl. Apr–May(–Aug), fr. Aug–Sep.

Mountain slopes, forests, streamsides, grasslands; 300–2600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

*Sambucus javanica* often has abundant extrafloral nectaries on the petioles, branchlets, young stems, peduncle, and inflorescence branches.

**3. *Sambucus williamsii* Hance, Ann. Sci. Nat., Bot., sér. 5, 5: 217. 1866.**

接骨木 jie gu mu

*Sambucus barbinervis* Nakai; *S. buergeriana* (Nakai) Blume ex Nakai; *S. buergeriana* f. *cordifoliata* Skvortsov & W. Wang; *S. foetidissima* Nakai; *S. junmanica* J. J. Vassiljev; *S. latipinna* Nakai var. *pendula* Skvortsov; *S. manshurica* Kitagawa; *S. peninsularis* Kitagawa; *S. potaninii* J. J. Vassiljev; *S. racemosa* Linnaeus subsp. *manshurica* (Kitagawa) Voroschilov; *S. sieboldiana* (Miquel) Blume ex Schwerin var. *buergeriana* Nakai.

Shrubs or small trees, 5–6 m tall. Old branches reddish brown, with conspicuous, narrowly elliptic lenticels; pith brownish. Leaves imparipinnate; leaflets (1 or) 2- or 3(–5)-jugate; lateral leaflets ovate-orbicular or narrowly elliptic to oblong-oblancheolate, 5–15 × 1.2–7 cm, base cuneate or rounded, sometimes cordate, asymmetrical, margin irregularly serrate, sometimes with 1 to several glandular teeth at base or below middle, apex acute to acuminate or caudate; lowest pair of leaflets sessile or petiole to ca. 0.5 cm; terminal leaflet ovate or obovate, adaxially sparsely pubescent when young, glabrescent, petiolule ca. 2 cm, base cuneate, apex acuminate or caudate; stipules narrowly linear or reduced to bluish protrusions. Inflorescences terminal cymose panicles, 5–11 × 4–14 cm, pedunculate, sometimes sparsely pubescent, soon glabrescent. Flowers appearing simultaneously with leaves, dense; calyx tube urceolate, ca. 1 mm, lobes triangular-lanceolate, slightly shorter than tube; corolla pinkish in bud, white or yellowish when open; tube short; lobes oblong or narrowly ovate-orbicular, ca. 2 mm; stamens spreading, ca. as long as corolla lobes; filaments

slightly dilated at base; anthers yellow; ovary 3-loculed; styles short; stigmas 3-lobed. Fruit red, rarely bluish or purplish black, ovoid or subglobose, 3–5 mm in diam.; pyrenes 2 or 3, ovoid to ellipsoid, 2.5–3.5 mm, slightly rugose. Fl. Apr–May, fr. Sep–Oct.  $2n = 36^*$ .

• Mountain slopes, scrub, streamsides, roadsides, beside houses; 500–1600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang.

*Sambucus williamsii* was treated as a synonym of a highly variable, circumboreal *S. racemosa* Linnaeus by Bolli (Diss. Bot. 223: 187–197. 1994). The black fruit and dark green leaves (Bolli, loc. cit.) distinguish *S. williamsii* and *S. melanocarpa* A. Gray of W North America from other members of the *S. racemosa* complex. *Sambucus williamsii* also has a more pronounced fetid odor. Because of the high degree of variation and the pronouncement by Bolli (loc. cit.) that the variation within his circumscription of *S. racemosa* should be further evaluated in a geographic context through field, cytological, and biochemical methods, for the time being, we prefer to maintain *S. williamsii*, and, with less certainty, the following species, *S. sibirica*, as distinct.

**4. *Sambucus sibirica* Nakai, Bot. Mag. (Tokyo) 40: 478. 1926.**

西伯利亚接骨木 xi bo li ya jie gu mu

*Sambucus buergeriana* (Nakai) Blume ex Nakai var. *mi-*

*quellii* Nakai; *S. racemosa* Linnaeus subsp. *sibirica* (Nakai) H. Hara; *S. williamsii* Hance var. *miquelii* (Nakai) Y. C. Tang ex J. Q. Hu.

Shrubs, 2–4 m tall, densely branched. Bark reddish brown, longitudinally sulcate, with elliptic lenticels; pith brownish; young branches yellowish white hirsute, sometimes papillose. Leaflets 2-jugate, abaxially pale, adaxially green, ovate-lanceolate to lanceolate, 5–14 × 1.6–5.5 cm, midvein long hirsute, base cordate and oblique, margin irregularly acutely toothed, apex long acuminate; petiolule and leaf rachis yellow hirsute; stipules glandular. Inflorescence an erect cymose panicle, 3.5–5 cm; peduncle papillose. Flowers opening with leaves; calyx tube urceolate, ca. 1 mm, lobes triangular-lanceolate, slightly shorter than tube; corolla greenish or yellowish, lobes oblong; stamens yellowish brown; anthers yellow; ovary 3-loculed; styles short; stigmas 3-lobed. Fruit red, ovoid or subglobose, 3–5 mm in diam.; pyrenes 2 or 3, ovoid to ellipsoid, 2.5–3.5 mm, slightly rugose. Fr. Jul–Aug.  $2n = 18, 36, 38^*$ .

Rocky mountain slopes, rock crevices along rivers. Heilongjiang, Jilin, Liaoning, Xinjiang [Mongolia, Russia].

*Sambucus sibirica* should perhaps be included within *S. williamsii*. The differences separating them, i.e., young branches, petiolule, and leaf rachis slightly pubescent vs. glabrous in *S. williamsii*, are minor.

**3. *SINADOXA* C. Y. Wu, Z. L. Wu & R. F. Huang, Acta Phytotax. Sin. 19: 207. 1981.**

华福花属 hua fu hua shu

Hong Deyuan (洪德元); David E. Boufford

Herbs, perennial. Rhizomes erect. Roots fibrous. Stems 2–4, caespitose, glabrous. Basal leaves ca. 10; cauline leaves 2, opposite, both basal and cauline leaves ternate or biternate. Cymes with 3–5 flowers in an interrupted spike; lowest cymes long pedunculate, in axils of cauline leaves; flowers small. Calyx cup-shaped, fleshy, often 3-lobed; lobes saccate and closed, narrowly winged on ridge. Corolla rotate, 3- or 4-lobed; tube short. Fertile stamens equal to corolla lobes in number, inserted at throat of corolla, alternate with corolla lobes, 2-fid to base; anthers 1-celled, extrorse; staminodes equal to fertile ones in number, opposite to corolla lobes. Carpels 2; ovary ovoid-globose, semi-inferior, 1-loculed; ovules solitary, pendulous; styles absent; stigmas solitary, dotted.

• One species: China.

**1. *Sinadoxa corydalifolia* C. Y. Wu, Z. L. Wu & R. F. Huang, Acta Phytotax. Sin. 19: 208. 1981.**

华福花 hua fu hua

Herbs, perennial, caespitose, glabrous throughout. Stems 1–4, erect or ascending, green, 10–25 cm tall, 3–5 mm in diam. Basal leaves ca. 10, ternate-pinnate or biternate-pinnate; petiole to 10 cm; terminal leaflet ovate or ovate-oblong, 3–10 cm, irregularly lobed or pinnatifid to pinnatisect; segments 3-lobed to multi-lobed or cleft; lateral leaflets ovate, 1.5–2 cm, 3-lobed. Cauline leaves 2, opposite, ternate, 2.5–5 cm; petiole 1–2

cm; leaf blade ovate-deltoid; terminal leaflet ovate, 1.5–3.5 cm, irregularly lobed; lateral leaflets ovate-elliptic or ovate, 0.8–1.8 cm, 3- or 5–10-lobed. Spikes to 8 cm; flowers yellowish green. Calyx cup-shaped, fleshy, (2 or) 3(or 4)-lobed. Corolla yellowish brown, 2–3 mm in diam., 3- or 4-lobed; lobes oblong-ovate, inside glandular-punctate near top, base with a nectary. Fertile stamens 3 or 4; filaments filiform, ca. 1.5 mm; anthers yellow, spherical, ca. 0.5 mm in diam. Stigma solitary. Fl. Jun–Jul; fruit not seen.

• Rock shelters, moist ravines, alpine debris slopes; 3900–4800 m. S Qinghai (Nangqên, Yushu).

**4. *ADOXA* Linnaeus, Sp. Pl. 1: 367. 1753.**

五福花属 wu fu hua shu

Hong Deyuan (洪德元); David E. Boufford

*Moscatella* Adanson; *Moschatellina* Miller; *Tetradoxa* C. Y. Wu.

Herbs, perennial. Rhizomes creeping, filiform, terminated by a tuber; tuber white, giving rise to following year's plant. Stems 1

or 2, glabrous. Basal leaves 1–3, ternate to biternate; cauline leaves 2, opposite, rarely alternate; all leaves petiolate, 3-cleft or compound. Inflorescences cymes, terminal, in headlike clusters, or racemelike. Flowers yellowish green, sessile, 4- or 5-merous. Calyx shallowly cup-shaped; lobes of terminal flower 2, lobes of lateral flowers 3. Corolla rotate; tube short; lobes 3–6 in terminal flower, 4–6 in lateral flowers, lobes papillate adaxially. Fertile stamens 4 or 5, inserted on corolla tube; filaments 2-fid to middle or to base; anthers 1-celled, peltate, extrorse, longitudinally dehiscent; inner stamens reduced to glandular papillae. Ovary inferior to semi-inferior; carpels 4 or 5, locules 4 or 5; styles 4 or 5, connate at base; stigmas capitate. Fruit berrylike, fleshy.  $x = 9$ ,  $2n = 36, 54, 108$ .

Three or four species: circumpolar; three species (two endemic) in China.

- 1a. Inflorescence racemelike; basal leaves simple, 3-cleft; cauline leaves simple, 3-cleft; flowers 3–5, corolla of lateral flowers 4-merous, corolla of terminal flower 5-merous; pedicels 5–10 mm; filaments 2-fid to middle ..... 1. *A. omeiensis*
- 1b. Inflorescence a condensed capitate, several flowered cyme; basal leaves ternate or biternate; cauline leaves simple and 3-cleft or ternate; flowers 3–9, corolla of lateral flowers usually 5-merous, corolla of terminal flower 4-merous, subsessile or shortly pedicellate; filaments bifid to base.
  - 2a. Peduncle in flower and fruit straight, erect, ascending, or arching, held above leaves; corolla lobes broadly ovate to orbicular ..... 2. *A. moschatellina*
  - 2b. Peduncle in flower and fruit recurved or coiled, nearly always held below leaves; corolla lobes lanceolate to ovate ..... 3. *A. xizangensis*

**1. *Adoxa omeiensis*** H. Hara, J. Jap. Bot. 56: 271. 1981.

四福花 si fu hua

*Tetradoxa omeiensis* (H. Hara) C. Y. Wu.

Rhizomes not seen. Stems 10–20 cm tall. Basal leaves 1–3; petiole 3–12 cm; leaf blade ovate or deltoid-ovate, 1–3 × 1–3 cm, 3-cleft; segments narrowly ovate, 2–5-lobed, apex of lobes mucronate. Cauline leaves 2, opposite, similar to those of basal leaves; petiole 0.4–2 cm. Inflorescences racemelike, flowers 3–5; pedicels 0.5–1 cm; flowers yellowish green, 5–8 mm in diam. Calyx discoid, 4-lobed; lobes persistent, narrowly triangular-lanceolate, 2–3 mm. Corolla subrotate, 4- or 5-cleft; lobes narrowly ovate, 2.5–4 mm, inside densely glandular papillate, with papillate glands in center at base, apex acuminate. Outer (fertile) stamens 4, 0.4–1 mm; filaments incurved, divergent and stamens T-shaped apically; anthers ca. 0.6 mm. Styles slightly recurved; stigmas punctiform. Fl. May–Jun, fr. Aug.

• Wet places in forests, sometimes on rocks; ca. 2300 m. Sichuan (Emei Shan, Ya'an).

Donoghue et al. (Harvard Pap. Bot. 6: 459–479. 2001) recognized *Tetradoxa* as a distinct, monospecific genus.

**2. *Adoxa moschatellina*** Linnaeus, Sp. Pl. 1: 367. 1753.

五福花 wu fu hua

*Adoxa inodora* (Falconer ex C. B. Clarke) Nepomnja-szaja; *A. moschatellina* var. *inodora* Falconer ex C. B. Clarke.

Rhizomes 2.5–25 cm. Stems 8–15 cm tall, glabrous. Basal leaves 1–3; petiole 4–9 cm; leaflets broadly ovate or orbicular, 1–2 cm, 3-cleft; petiolules 0.6–1.2 cm. Cauline leaves 2, oppo-

site, 3-cleft or ternate, segments 3-lobed; petiole ca. 1 cm. Peduncle erect in flowers and fruit, inflorescence held above leaves. Inflorescences compact headlike cymes of 5–9 flowers. Flowers sessile or pedicels 0.5–1.5 mm, yellowish green, 4–7 mm in diam. Calyx lobes rectangular, broadly elliptic to ovate, 1.5–3 × ca. 1 mm, apex obtuse. Corolla lobes broadly ovate to orbicular or rectangular, 1.75–3.25 × 2–2.5 mm, apex rounded to obtuse. Ovary semi-inferior to inferior, 4- or 5-loculed. Fruit not seen. Fl. Apr–Jul, fr. Jul–Aug.  $2n = 36$ .

Rich soils, forests, forest margins, meadows; below 4000 m. Hebei, Heilongjiang, Liaoning, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [India, Japan, Korea, Nepal, Pakistan, Russia; NW Africa, Europe, North America].

**3. *Adoxa xizangensis*** G. Yao, Acta Phytotax. Sin. 30: 179. 1992.

西藏五福花 xi zang wu fu hua

Rhizomes 4–15 cm. Stems 5–10 cm tall, glabrous. Basal leaves 1–3, ternate to biternate; petiole of basal leaves 2–12 cm; leaflets elliptic, ovate, orbicular, or obovate, 1–2.5 × 1–3 cm, 3-cleft; petiolules 0.6–1.2 cm. Cauline leaves 2, opposite, ternate or rarely biternate, 3-cleft, segments 3-lobed, lobes apiculate; petiole 0.5–2 cm. Peduncle coiled in flower and fruit. Inflorescences often held at or below level of leaves, compact headlike cymes of 5–9 flowers. Flowers sessile or subsessile, yellowish green, 2.5–5 mm in diam. Calyx lobes lanceolate to narrowly rectangular, 1.2–2 × ca. 1 mm, apex obtuse. Corolla lobes lanceolate to ovate, ca. 2 × 0.9–1.2 mm. Fruit 5–8 mm in diam. Fl. Jun–Aug, fr. Jul–Sep.

• Stony or rocky limestone soils, forests, forest margins, meadows, shaded slopes; 3400–3900 m. Sichuan, Xizang, Yunnan.

## DIERVILLACEAE

锦带花科 jin dai hua ke

Yang Qiner (杨亲二)<sup>1</sup>; Fred R. Barrie<sup>2</sup>, Charles D. Bell<sup>3</sup>

Shrubs, deciduous. Winter buds with several scales. Leaves opposite, simple, margins serrate, estipulate. Inflorescence apical, axillary, or on short lateral shoots, cymose, flowers 2–6, or flowers solitary. Calyx tube narrowly cylindric; limb 5-lobed, incised to middle or base. Corolla 5-lobed, irregular or subregular; tube longer than limb. Stamens 5, inserted at middle of corolla tube; anthers included to exserted. Ovary inferior, with a globose gland on one side of upper part, 2-loculed; ovules numerous; style 1, slender, exserted; stigma capitate. Fruit a 2-valved dehiscent capsule; seeds numerous, small.

Two genera and ca. 15 species: E Asia and NE North America; one genus and two species in China.

Hu Jia-qi. 1988. *Weigela*. In: Hsu Ping-sheng, ed., Fl. Reipubl. Popularis Sin. 72: 131–134.

### 1. WEIGELA Thunberg, Kongl. Vetensk. Acad. Nya Handl. 1: 137, t. 5. 1780.

锦带花属 jin dai hua shu

Young branches slightly quadrangular, variously pubescent. Leaves petiolate or sessile. Flowers solitary or 2–6 in cymes, on lateral short branches borne on previous year's growth or at apices of branches. Calyx tube narrowly cylindric; limb 5-lobed, free to middle or nearly to base. Corolla white or pink to crimson, campanulate-funnelform; tube narrow basally, expanding abruptly; limb subregular, 5-lobed; anthers at mouth of tube or weakly exserted; style slender, strongly exserted; stigma capitate or 2-lobed. Fruit leathery or woody, central axis and style bases persistent; seeds wingless or narrowly winged.

About ten species: NE Asia; two species in China.

- 1a. Calyx divided to middle, lobes lanceolate; seeds wingless ..... 1. *W. florida*  
1b. Calyx divided nearly to base, lobes linear; seeds ± winged ..... 2. *W. japonica*

**1. *Weigela florida*** (Bunge) Candolle, Ann. Sci. Nat., Bot., sér. 2, 11: 241. 1839.

锦带花 jin dai hua

*Calysphyrum floridum* Bunge, Enum. Pl. Chin. Bor. 33. 1833; *Diervilla florida* (Bunge) Siebold & Zuccarini; *D. florida* f. *alba* Nakai; *D. praecox* Lemoine; *D. rosea* (Lindley) Walpers; *Weigela florida* f. *alba* (Nakai) C. F. Fang; *W. florida* f. *albiflora* Y. C. Chu; *W. florida* var. *praecox* (Lemoine) Y. C. Chu; *W. pauciflora* Candolle; *W. rosea* Lindley.

Shrubs 1–3 m tall. Young branches with 2 bilateral lines of short, minute hairs along internodes; bark gray; winter buds acute, scales 3 or 4, often smooth. Leaves sessile or with petiole to 3 mm; blade oblong or elliptic to obovate-elliptic, 5–10 cm, abaxially densely pubescent or tomentose, adaxially sparsely pubescent, more densely so on veins, base broadly cuneate to rounded, margin serrate, apex acuminate. Flowers solitary or in cymes; peduncles and pedicels glabrous to hirsute. Calyx ca. 2 cm; tube narrowly cylindric, ca. 1 cm, sparsely pubescent; lobes lanceolate, ca. 1 cm, unequal. Corolla purple-red or rose, 3–4 × ca. 2 cm, outside sparsely pubescent; lobes spreading, irregular, inside reddish; filaments shorter than corolla; anthers yellow. Ovary with a yellow-green gland in upper part; stigma 2-lobed. Fruit 1.5–2.5 cm, crowned with a short beak, sparsely pubescent; seeds wingless. Fl. Apr–Aug, fr. Oct. 2n = 36.

Mixed forests, scrub; 100–1500 m. ?Hebei, Heilongjiang, Henan, N Jiangsu, Jilin, Liaoning, Nei Mongol, Shaanxi, N Shandong, Shanxi [Japan, Korea].

**2. *Weigela japonica*** Thunberg, Kongl. Vetensk. Acad. Nya Handl. 1: 137. 1780.

半边月 ban bian yue

*Diervilla japonica* (Thunberg) Candolle.

Shrubs to 6 m tall. Petiole 8–12 mm, pubescent; leaf blade abaxially greenish, adaxially intense green, narrowly ovate to ovate-elliptic, rarely obovate, 5–15 × 3–8 cm, abaxially densely pubescent, adaxially sparsely pubescent, more densely so on veins, base broadly cuneate to rounded, margin serrate, apex acuminate to long acuminate. Flowers solitary or in threes in cymes. Calyx 1–1.2 cm, pubescent; tube 1–5 mm; lobes linear, 5–10 mm, pubescent. Corolla white or reddish, gradually turning red at anthesis, funnelform-campanulate, 2.5–3.5 cm, outside sparsely pubescent or subglabrous; base of tube narrowly tubular, abruptly enlarged above middle; lobes spreading, subregular, glabrous. Filaments white; anthers yellow-brown. Stigma discoid. Fruit 1.5–2 cm, crowned with a short beak, sparsely pubescent; seeds narrowly winged. Fl. Apr–May, fr. Aug–Sep.

Forests, scrub; 400–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, ?Hainan, Hubei, Hunan, Jiangxi, Sichuan, Zhejiang [Japan, Korea].

Chinese populations are often segregated as *Weigela japonica* var. *sinica* (Rehder) Bailey (Gent. Herb. 2: 49. 1929; *Diervilla japonica* var. *sinica* Rehder, Mitt. Deutsch. Dendrol. Ges. 22: 264. 1913) primarily on the shape of the corolla, in which the lower half is narrowly tubular. In the typical variety, found in Japan and Korea, the corolla expands abruptly nearer to the base.

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## CAPRIFOLIACEAE

忍冬科 ren dong ke

Yang Qiner (杨亲二)<sup>1</sup>; Sven Landrein<sup>2</sup>, Joanna Osborne<sup>2</sup>, Renata Borosova<sup>2</sup>

Shrubs or woody climbers, rarely small trees or herbs. Leaves opposite, rarely whorled, simple or pinnatifid, conduplicate or involute in veneration; interpetiolar stipules absent or rarely well developed. Inflorescence thyrsoid, axillary or terminal, compact or lax, cymes 1-, 2-, or 3-flowered; paired flowers sometimes with ovaries  $\pm$  fused. Cymes with a pair of bracts and 2 pairs of bracteoles, located at base of ovaries,  $\pm$  fused, occasionally accrescent in fruit, rarely absent. Flowers bisexual, actinomorphic or zygomorphic. Calyx 4- or 5-lobed. Corolla epigynous, gamopetalous; lobes 4 or 5, spreading, sometimes bilabiate, aestivation imbricate. Stamens (4 or) 5, didynamous, alternating with corolla lobes, sometimes exserted; anthers free, 2-celled, opening by longitudinal slits, introrse. Ovary inferior, carpels 2–8, fused; placenta axile; ovules 1 to many per locule, some of which can be abortive, pendulous; style solitary; stigmas capitate or lobed. Fruit a berry, a drupe with 2–5 pyrenes, or a leathery achene. Seeds 1 to many; embryo small, straight; endosperm copious.

Five genera and ca. 207 species: mostly in temperate regions of E Asia and E North America; five genera (one endemic) and 66 species (25 endemic) in China.

Following recent phylogenetic studies (Bell et al., Harvard Pap. Bot. 6(2): 481–499. 2001; Donoghue et al., Harvard Pap. Bot. 6(2): 459–479. 2001; W. H. Zhang et al., Molec. Phylogen. Evol. 26: 176–189. 2002), Caprifoliaceae is now thought to include Caprifoliaceae, Diervilleae, Linnaeae, Morinaceae, Dipsacaceae, and Valerianaceae. However, Blacklund and Pyck (Taxon 47: 657–661. 1998) preferred to retain Caprifoliaceae as a distinct family and raise Linnaeae and Diervilleae as new families, and this system is followed in the *Flora of China*.

Hsu Ping-sheng, Hu Jia-qi & Wang Han-jin. 1988. Caprifoliaceae (excluding *Sambucus* and *Viburnum*). In: Hsu Ping-sheng, ed., Fl. Reipubl. Popularis Sin. 72: 104–259.

### Key to flowering material

- 1a. Flowers single and opposite in a spike.
  - 2a. Ovaries 5-, 7-, or 8-locular, all locules with many ovules ..... 4. *Leycesteria*
  - 2b. Ovaries 4-locular, 2 locules with 1 fertile ovule, other 2 locules with many sterile ovules ..... 3. *Symphoricarpos*
- 1b. Flowers paired (rarely single and then pedunculate; rarely in threes and then bracteoles fused into a cupule) or in whorls of 6.
  - 3a. Flowers paired (rarely single and then pedunculate; rarely in threes and then bracteoles fused into a cupule) ..... 5. *Lonicera*
  - 3b. Flowers in whorls of 6.
    - 4a. Flowers 6 in a single whorl, with 2 pairs of tight involucre bracts forming a capitulum; capitula paniculate; shrubs with triplinerved leaves ..... 2. *Heptacodium*
    - 4b. Inflorescence different, if flowers in a capitulum then plant a climber with perfoliate involucre bracts and bilabiate flowers in 1–4 whorls.
      - 5a. Herbs; leaves pinnatifid, otherwise perfoliate ..... 1. *Triosteum*
      - 5b. Shrubs or climbers; leaves entire, not perfoliate (involucre bracts sometimes perfoliate).
        - 6a. Shrubs; flowers funnelform ..... 4. *Leycesteria*
        - 6b. Climbers; flowers bilabiate ..... 5. *Lonicera*

### Key to fruiting material

- 1a. Fruit a berry.
  - 2a. Shrubs; seeds minute and numerous; berries in a spike or in whorls of 6 ..... 4. *Leycesteria*
  - 2b. Shrubs or climbers; seeds few to numerous; berries usually paired, or if in whorls of 6 then climbers ..... 5. *Lonicera*
- 1b. Fruit a drupe with 1–4 pyrenes or a leathery achene.
  - 3a. Fruit a leathery achene with persistent and accrescent sepals; achenes in a single whorl of 6 and in a compact capitulum surrounded by 2 pairs of erect, tightly enclosing involucre bracts; leaves triplinerved .... 2. *Heptacodium*
  - 3b. Fruit a drupe with 2–5 pyrenes, calyx not accrescent; drupes in spikes or in lax whorls of 6 with spreading to reflexed involucre bracts; leaves with pinnate venation.
    - 4a. Herbs; drupes with 3–5 pyrenes, drupes in whorls of 6 ..... 1. *Triosteum*
    - 4b. Shrubs; drupes with 2 densely pilose pyrenes, drupes forming compact spikes ..... 3. *Symphoricarpos*

## 1. TRIOSTEUM Linnaeus, Sp. Pl. 1: 176. 1753.

薊子蘼屬 ting zi biao shu

*Triosteum* Miller.

Herbs, perennial, with underground rhizomes. Stem erect, with white pith becoming hollow. Leaves simple, opposite, obovate,

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entire, undulate to deeply pinnatifid. Inflorescence of sessile 6-flowered whorls; bracts and bracteoles lanceolate, shorter than flowers. Calyx 5-lobed, persistent. Corolla yellow-green, yellow, or purple; lobes 5, imbricate, bilabiate, upper lip 4-lobed, lower lip entire and recurved at anthesis. Nectary of compact glandular hairs, forming a bulge at base of corolla tube. Stamens 5, inserted in corolla tube; anthers introrse. Ovary 3–5-locular; ovule 1 per locule sometimes aborted, pendulous; style filiform; stigmas discoid, 3–5-lobed. Fruit a drupe, subglobose to pyriform,  $\pm$  fleshy; pyrenes 2–4, black, with a thick stony endocarp, sometimes ribbed; endosperm fleshy, embryo small.

About six species: C and E Asia, North America; three species in China.

- 1a. Inflorescence in axils of leaves, terminal axis vegetative; sepals well developed to 10 mm; drupes green, pyrenes ribbed ..... 3. *T. sinuatum*  
 1b. Inflorescence terminal, axillary buds vegetative; sepals minute to 1 mm; drupes white to red, pyrenes not ribbed.  
     2a. Leaves broadly perfoliate, usually entire ..... 1. *T. himalayanum*  
     2b. Leaves not perfoliate, usually pinnatifid ..... 2. *T. pinnatifidum*

**1. *Triosteum himalayanum*** Wallich in Roxburgh, Fl. Ind. 2: 180. 1824 [*"himalayanum"*].

穿心莲子藤 chuan xin ting zi biao

*Echium connatum* H. Léveillé; *Triosteum erythrocarpum* Harry Smith; *T. fargesii* Franchet; *T. himalayanum* var. *chinense* Diels & Graebner.

Herbs, perennial, 40–60 cm tall, branched below terminal inflorescence after anthesis, densely hirsute, glandular hairy, faintly aromatic. Leaves obovate-elliptic to obovate-oblong, ca.  $11 \times 7$  cm, abaxially long hirsute on veins, interspersed with glandular hairs, adaxially densely long hirsute, lower part narrowed to a broadly perfoliate base, margin entire or occasionally lobed, apex acute to acuminate. Inflorescence of 2–5 whorls, at apex of stem. Sepals to 1 mm. Corolla lobes purple-brown with paler flecks; tube yellow-green, ca. 1.5 cm, outside glandular hairy; tube curved at base and shallowly spurred, spur pointing downward to below apex of ovary. Drupe ripening from white to red, subglobose, 10–12 mm in diam., hirsute and glandular hairy, crowned with a persistent calyx. Pyrenes 3–5, without ribs. Fl. May–Jul, fr. Jul–Sep.

Mountain slopes, coniferous forests, streamsides, grasslands; 1800–4100 m. ?Henan, Hubei, Hunan, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

The names *Triosteum hirsutum* Wallich and *T. hirsutum* Roxburgh have sometimes been applied to this species. Some confusion has arisen from different print versions of Roxburgh, Fl. Ind. 2: 180. 1824. The original descriptions of *T. himalayanum* Wallich and *T. hirsutum* Roxburgh can be found in only one of these print versions. The other print version includes the description of *T. hirsutum* Wallich, which appears to be a printing error. *Triosteum hirsutum* Roxburgh is attributed to a specimen collected in Chittagong, Bangladesh, now the basionym of *Lasianthus hirsutus* in the Rubiaceae (see p. 192).

**2. *Triosteum pinnatifidum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 476. 1881.

莲子藤 ting zi biao

*Triosteum intermedium* Diels & Graebner; *T. rosthornii* Diels & Graebner.

Herbs, perennial, to 60 cm tall, branched below terminal inflorescence after anthesis, hirsute and glandular hairy. Leaves subsessile; leaf blade ca.  $11 \times 10$  cm, abaxially with domatia along main vein, adaxially sparsely hirsute, more densely so on veins and margin, base cuneate, pinnatifid to occasionally entire toward apex, deeply lobed to more than half width of leaf blade; lobes elliptic, acuminate. Inflorescence of 2 or 3 6-flowered whorls at apex of stem. Sepals ca. 2 mm. Corolla yellow-green, ca. 1 cm; lobes purple-brown with paler flecks; tube curved at base, glandular hairy. Drupe white, subglobose, ca. 12 mm, hirsute and glandular hairy, crowned with a persistent calyx. Pyrenes 3–5, without ribs. Fl. May–Jun, fr. Jul–Sep.  $2n = 18^*$ , 36.

Coniferous forests, sunny places on streamsides; 1800–2900 m. Gansu, Hebei, Henan, Hubei, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan [Japan].

**3. *Triosteum sinuatum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 15: 373. 1871.

腋花莲子藤 ye hua ting zi biao

Herbs, perennial, to 90 cm tall, unbranched, densely hirsute and glandular hairy. Leaf blade orbicular-ovate or oblong, ca.  $14 \times 7$  cm, lower third abruptly narrowed, sparsely to densely hirsute, ciliate and glandular on veins and margin, base amplexicaul to perfoliate, margin entire to sinuous or shallowly lobed, apex acuminate. Inflorescence of 2 or 3 6-flowered whorls, at apex of stem. Sepals lanceolate, 6–10 mm, subequaling ovary, outside densely glandular hairy. Corolla ca. 1 cm; lobes purple-brown with paler flecks; tube yellow-green with a shallow spur at base; spur pointing outward, not reaching apex of ovary. Stamens: 2 longer, other 3 subequal in length; anthers narrowly elliptic. Style filiform; stigmas exerted. Drupe sessile, greenish, dry, pyriform with persistent calyx, 1–1.5 cm in diam., densely glandular hairy. Pyrenes 3, with 5 or 6 prominent ribs. Fl. Jun, fr. Sep–Oct.  $2n = 18$ .

Forests, streamsides; 800–900 m. Jilin, Liaoning, Xinjiang [Japan, Russia (Primorsky Krai)].

## 2. HEPTACODIUM Rehder in Sargent, Pl. Wilson. 2: 617. 1916.

七子花属 qi zi hua shu

Shrubs or small trees, deciduous. Winter buds with several pairs of scales. Leaves opposite, entire, triplinerved, estipulate. Inflo-

rescence a terminal panicle composed of numerous capitula. Capitulum of a single sessile whorl of opposite 3-flowered cymes and a terminal bud of bracts and a whorl often not developed. Capitulum with 2 pairs of involucrel decussate bracts and 12 bracts (bracts of each cyme spatulate and often fused together, bracts of secondary flowers smaller and often missing). Involucrel bracts ovate and persistent in fruit, glabrous to sericeous, longer and covering bracts and ovaries. Sepals 5, slightly protruding from involucre. Corolla tubular-funnelform; tube strongly curved at base with a nectary inside and shallowly gibbous, 5-lobed and regular. Stamens 5, exserted; filaments inserted at middle of corolla tube. Ovary 3-locular, 2 locules with numerous sterile ovules, remaining locule with 1 fertile ovule. Stigmas discoid. Fruit a leathery achene, cylindrical, crowned with a persistent and enlarged calyx. Achene 1-seeded, pericarp membranous; endosperm fleshy.

● One species: China.

**1. *Heptacodium miconioides*** Rehder in Sargent, Pl. Wilson. 2: 618. 1916.

七子花 qī zǐ huā

*Heptacodium jasminoides* Airy Shaw.

Shrubs, to 7 m tall. Young branches red-brown, sparsely pubescent. Petiole ca. 10 mm; leaf blade ovate, 8–15 × 5–9 cm, leathery, abaxially sparsely pubescent on veins, base obtuse to subcordate, apex acuminate to long acuminate. Inflorescence a subpyramidal panicle of capitula, 5–15 × 5–9 cm. Capitulum

with involucrel bracts and bracts variously shaped, unequal in size, pair of involucrel bracts often emarginate. Flowers white, fragrant. Sepals 2–2.5 mm, equaling ovary at anthesis. Style hairy. Corolla 1–1.5 cm, densely adpressed hairy. Achene ca. 10 mm, protruding from involucre, striate, hirsute-sericeous; persistent calyx with spreading sepals to 7–10 mm; seeds 5–6 mm. Fl. Jul–Sep, fr. Sep–Nov.

● Cliffs, scrub, forests; 600–1000 m. Anhui, Hubei, Zhejiang.

This is a rare species.

### 3. *SYMPHORICARPOS* Duhamel du Monceau, *Traité Arbr. Arbust.* 2: 295. 1755.

毛核木属 mao hé mù shù

Shrubs, deciduous. Winter buds with several pairs of scales. Leaves opposite, entire or sometimes sinuous, shortly petiolate, estipulate. Flowers forming a spike at apices of lateral branches, sometimes solitary in axils of upper leaves. Calyx cupular, 4- or 5-lobed. Corolla reddish or white, campanulate to funnelform or hypocrateriform, 4- or 5-lobed, regular; tube slightly gibbous at base, inside long pubescent or glabrous. Stamens 4 or 5, inserted in corolla tube, included or slightly exserted; anthers introrse. Ovary 4-locular, 2 locules with several sterile ovules, remaining 2 each with 1 fertile ovule; style slender; stigmas capitate or slightly 2-lobed. Fruit a berrylike drupe, white, red, or bluish black, globose, ovoid, or ellipsoid; pyrenes 2, ovoid, ± compressed; seeds with endosperm, embryo small.

Sixteen species: 15 in North America and Mexico; one species (endemic) in China.

**1. *Symphoricarpos sinensis*** Rehder in Sargent, Pl. Wilson. 1: 117. 1911.

毛核木 mao hé mù

Shrubs erect, 1–2.5 m tall. Young branches glabrous to pubescent. Bark fibrous. Petiole 1–2 mm; leaf blade abaxially glaucescent, adaxially green, rhombic to ovate, 1.5–2.5 × 1.2–1.8 cm, both surfaces glabrous, lateral veins inconspicuous, base cuneate and narrowed to petiole, margin entire, apex obtuse to acute. Inflorescence a terminal, pedunculate spike of paired flowers at ends of axillary branches. Paired flowers 3–6, decussate, with conspicuous internodes; each flower with 1 small

subulate bract and 2 shorter ones. Sepals to 1 mm, glabrous, acute. Corolla white, campanulate, 5–7 mm; lobes ovate, slightly shorter than tube, both sides glabrous; tube slightly gibbous at base. Stamens inserted at middle of corolla tube, equaling or slightly exceeding corolla; anthers white, ca. 2 mm. Style 6–7 mm, glabrous; stigmas capitate. Drupe bluish black, pruinose, ovoid, ca. 7 mm, crowned with a short beak. Pyrenes 2, densely pilose. Fl. Jul–Sep, fr. Sep–Nov.

● Scrub; 600–2300 m. S Gansu, Guangxi, W Hubei, Shaanxi, E Sichuan, N Yunnan.

This is rather rare and local species.

### 4. *LEYCESTERIA* Wallich in Roxburgh, *Fl. Ind.* 2: 181. 1824.

鬼吹箫属 guǐ chuī xiāo shù

Shrubs, deciduous; branches hollow or with solid pith. Leaves simple, opposite, margin entire or serrate, occasionally sinuate; stipules present or absent. Inflorescence a spike or flowers in sessile whorls of 6, terminal or axillary, often with conspicuous leaflike involucrel bracts. Sepals 5. Corolla 5-lobed, white, pink, purple-red, or orange-yellow, funnelform, regular; tube gibbous at base. Stamens 5; anthers dorsifixed. Ovary 5-, 7-, or 8-locular, with numerous ovules per locule; style long, slender; stigmas peltate or capitate. Fruit a berry, with persistent calyx; seeds minute, numerous.

Five species: Sino-Himalayan region; four species in China.

1a. Inflorescence a spike with flowers in pairs.

- 2a. Interpetiolar stipules absent; petioles 5–10 mm; ovary glabrous, usually 7- or 8-locular ..... 3. *L. gracilis*  
 2b. Interpetiolar stipules present; petioles 2–4 mm; ovary pubescent at anthesis, usually 5-locular ..... 4. *L. glaucophylla*  
 1b. Inflorescence with flowers in whorls of 6.  
 3a. Interpetiolar stipules absent; branches hollow; abaxial leaf surfaces, petioles, and inflorescences sparsely adpressed pubescent or subglabrous ..... 1. *L. formosa*  
 3b. Interpetiolar stipules present; branches with solid pith; abaxial leaf surfaces, petioles, and inflorescences densely lanate ..... 2. *L. stipulata*

**1. *Leycesteria formosa*** Wallich in Roxburgh, Fl. Ind. 2: 182. 1824.

鬼吹箫 *gui chui xiao*

*Leycesteria formosa* var. *brachysepala* Airy Shaw; *L. formosa* var. *glandulosissima* Airy Shaw; *L. formosa* var. *stenosepala* Rehder; *L. limprichtii* H. Winkler; *L. sinensis* Hemsley.

Shrubs, 1–5 m tall. Branches hollow, branchlets, petioles, peduncles, bracts, and sepals adpressed pubescent and sometimes glandular hairy. Petiole 5–15 mm; leaf blade ovate to lanceolate, 4–13 × 2–6 cm, both surfaces glabrescent to sparsely adpressed pubescent, base cuneate to subcordate, margin entire to dentate, occasionally irregularly sinuate, apex acuminate to caudate. Inflorescence terminal or axillary; peduncle 6–30 mm. Whorls 1–10, each whorl composed of 2 opposite sessile, 3-flowered cymes subtended by green, purplish, or purple-red leaflike involucre bracts and bracts; involucre pair of bracts up to 2.5 cm, 4 outer bracts narrower and shorter, 8 inner bracts very small. Ovary oblong, 3–4 mm, densely glandular hairy. Calyx shortly fused at base, sometimes to half way; lobes lanceolate to linear, sometimes deltoid, 1–9 mm. Corolla white to pink, sometimes purple-red, funnelform, 1.2–1.8 cm, outside pubescent; lobes orbicular-ovate, ca. 5 mm. Stamens subequaling corolla. Ovary 5-locular; style slightly exceeding corolla, glabrous. Berry red, turning black-purple, ovoid or subglobose, with persistent calyx, 5–7 mm in diam.; seeds minute, numerous, brownish, broadly ellipsoid to oblong, slightly compressed, ca. 1 mm. Fl. (May–)Jun–Sep(–Oct), fr. (Aug–)Sep–Oct.  $2n = 18$ .

Forests, forest margins, scrub; 1100–3500 m. W Guizhou, W Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan; widely cultivated and naturalized in Australia, Europe, North America, and Pacific islands (New Zealand)].

The name *Leycesteria sinensis* was published by Hemsley in Hooker's Icon. Pl. (27: t. 2633. 1900). It is based on a single specimen collected by Henry (9692c) in Yunnan (mountains north of Mengtze, 2130 m) and does not appear to have been collected since then. This specimen has inflorescences with a single whorl, outer bracts broadly ovate, and calyx fused up to the middle with deltoid lobes; it falls within the variation of *L. formosa*.

**2. *Leycesteria stipulata*** (J. D. Hooker & Thomson) Fritsch in Engler & Prantl, Nat. Pflanzenfam. 4(4): 169. 1891.

绵毛鬼吹箫 *mian mao gui chui xiao*

*Lonicera stipulata* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 165. 1858; *Pentaptyxis stipulata* (J. D. Hooker & Thomson) J. D. Hooker ex C. B. Clarke.

Shrubs, ca. 3 m tall. Branches with solid pith. Branchlets, abaxial leaf surfaces, petioles, and inflorescences densely gray-

white lanate. Interpetiolar stipules conspicuous, suborbicular, 6–20 mm, persistent. Petiole 5–10 mm; leaf blade shiny adaxially, oblong-lanceolate, 8–15 × 3.5–7 cm, glabrescent adaxially, venation reticulate, midvein and lateral veins raised abaxially, veins conspicuously impressed adaxially, base rounded, margin slightly involute, remotely dentate, apex acuminate to long acuminate. Inflorescences axillary, shortly pedunculate, with 1–3 whorls of opposite 3-flowered cymes and 14 leaflike bracts and bracteoles per whorl; involucre bracts orbicular-ovate to lanceolate, 3–5 mm, exceeding or as long as ovaries. Corolla white, ca. 1 cm, outside tomentose, inside glabrous. Style glabrous. Berry ca. 1.9 cm, lanate to glabrescent; seeds brownish yellow, ellipsoid or subglobose, ca. 1 mm. Fl. Mar–Apr, fr. Oct–Nov.

Broad-leaved forests, grassy places; 1300–2000 m. Yunnan [Bhutan, India, Myanmar].

**3. *Leycesteria gracilis*** (Kurz) Airy Shaw, Hooker's Icon. Pl. 32: t. 3166. 1932.

纤细鬼吹箫 *xian xi gui chui xiao*

*Lonicera gracilis* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 39: 77. 1870.

Shrubs, 1.5–3 m tall. Branches hollow. Interpetiolar stipules absent; petiole 5–10 mm, glabrescent; leaf blade ovate-lanceolate, 7–12 × 2.5–6.5 cm, abaxially glaucous, sparsely pubescent on midvein and lateral veins, adaxially glabrous, base rounded to subcordate, margin slightly involute, remotely dentate, apex acuminate to caudate. Inflorescence a ± pendent axillary pedunculate spike of paired flowers; pairs 2–6, with 3 bracts per flower; involucre bracts ovate-lanceolate or lanceolate, 1/3–1/2 as long as ovaries, glandular ciliate. Ovary 5–6 mm, with a short beak at apex. Sepals connate and shallowly cupular in lower part; lobes linear-lanceolate to lanceolate, 1.5–2 mm, often glandular ciliate. Corolla white, funnelform, 1–2 cm, glabrous; lobes ovate to orbicular-ovate, 5–7 mm. Stamens slightly shorter than corolla. Ovary (5–)7- or 8(–10)-locular, with numerous ovules; style protruding from corolla. Berry red, turning blue-purple, oblong or ellipsoid, 1–1.3 cm; seeds numerous, subglobose, minute, ca. 1 mm in diam. Fl. (Sep–)Oct–Nov(–Dec), fr. (Mar–)Apr–May.

Forests, thickets; 2000–3800 m. Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

**4. *Leycesteria glaucophylla*** (J. D. Hooker & Thomson) C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 16. 1880.

西域鬼吹箫 *xi yu gui chui xiao*

*Lonicera glaucophylla* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 165. 1858; *Leycesteria glaucophylla* var. *thibetica* (H. J. Wang) J. F. Huang; *L. thibetica* H. J. Wang.

Shrubs, 1–2 m tall. Branches hollow. Interpetiolar stipules variously developed, reniform to suborbicular, 1–10 mm, abaxially densely pubescent; petiole 2–4 mm, pubescent; leaf blade ovate-lanceolate, 4–10 × 1–6 cm, abaxially densely gray-white pubescent, adaxially sparsely pubescent, base rounded, margin slightly involute, sparsely serrate, apex acuminate to caudate. Inflorescence a pedunculate spike of paired flowers; peduncle 5–20 mm, pairs 1 or 2, with 3 bracts per flower; 2 involucre bracts leaflike, ovate to lanceolate, 5–20 mm, as long as or longer than ovaries; bracts ovate. Ovary ca. 5 mm with a short beak at apex, densely long hairy, interspersed with shorter glandular hairs.

Sepals shortly fused at base; lobes lanceolate, 4–7 mm. Corolla greenish or pale yellow to white, funnelform, 1–2 cm, outside hairy; lobes ovate, ca. 4 mm. Stamens slightly shorter than corolla; filaments hairy in lower half. Ovary 5-locular, with numerous ovules; style as long as corolla and hairy in lower half. Berry yellow-green, ovoid-ellipsoid, ca. 1.5 × 1 cm, long strigose and shortly glandular hairy, 5-locular; seeds numerous, yellowish brown, ovoid, small, ca. 1 mm. Fl. Mar–Sep, fr. May–Nov.

Margins of *Tsuga* forests; 1800–2600 m. SE Xizang [Bhutan, India, Myanmar, Nepal].

## 5. LONICERA Linnaeus, Sp. Pl. 1: 173. 1753.

忍冬属 ren dong shu

*Caprifolium* Miller; *Euchylia* Dulac; *Xylosteon* Miller.

Shrubs erect or dwarf, rarely small trees, sometimes climbers, deciduous or evergreen. Branches hollow or solid with white or brown pith; winter buds with 1 to several pairs of scales, rounded or acutely 4-angular, inner scales sometimes accrescent and reflexed. Accessory buds sometimes present, occasionally terminal buds reduced and substituted by 2 lateral buds. Leaves opposite, rarely whorled, margin entire, rarely dentate or divided; leaves usually estipulate, occasionally with interpetiolar stipules or a swollen interpetiolar line; sometimes 1 or 2 pairs of leaves below inflorescence connate and forming involucre bracts. Inflorescence thyrsoid, terminal or axillary, cymes opposite and usually reduced to paired flowers, rarely 1-, sometimes 3-flowered. Inflorescence occasionally pedunculate; cymes sessile, sometimes forming a capitulum, or cymes pedunculate with a pair of bracts and 2 pairs of bracteoles; bracts usually small, sometimes leaflike; bracteoles usually free, sometimes ± fused and cupular occasionally enclosing ovaries, sometimes absent. Paired flowers with free or partially to completely fused ovaries. Calyx 5-lobed, rarely 4-lobed, sometimes truncate, base occasionally with a collarlike emergence. Corolla white, yellow, reddish, or purple-red, often changing color after anthesis, campanulate, funnelform, regularly or subregularly 5(or 4)-lobed, or bilabiate and upper lip 4-lobed; tube long or short, often shallowly to deeply gibbous on ventral side toward base, rarely spurred. Nectary of compact sessile glandular hairs on ventral side toward base of corolla tube, occasionally in 5 regular lines, rarely swollen at base of style. Stamens 5; anthers dorsifixed. Ovary 2 or 3(–5)-locular; style slender, hairy or glabrous; stigmas capitate. Fruit a berry, red, blue-black, black, green, or white sometimes pruinose, bracteoles occasionally accrescent in fruit and enclosing paired berries. Seeds 1 to numerous, smooth, pitted or granular, with rounded embryo.

About 180 species: N Africa, Asia, Europe, North America; 57 species (23 endemic) in China.

See Rehder, Rep. (Annual) Missouri Bot. Gard. 14: 27–232, t. 1–20. 1903.

The identities of *Lonicera confusa* var. *glabrocalyx* Miao & X. J. Liu (Acta Sci. Nat. Univ. Sunyatseni 28(4): 78. 1989), *L. fengkaiensis* Miao & X. J. Liu (Acta Sci. Nat. Univ. Sunyatseni 28(4): 78. 1989), *L. stenantha* Pojarkova var. *angustifolia* C. Y. Yang & J. H. Fan (J. Aug. 1st Agric. Coll. 18(2): 7. 1995), and *L. subrotundata* C. Y. Yang & J. H. Fan (J. Aug. 1st Agric. Coll. 18(2): 8. 1995) cannot be determined because of the unavailability of the type specimens for examination or the original publications. One North American species, *L. sempervirens* Linnaeus, is occasionally cultivated.

- 1a. Flowers in 3-flowered cymes forming whorls at ends of branches.
  - 2a. Involucre bracts not connate; cymes pedunculate ..... 14. *L. hypoleuca*
  - 2b. Involucre bracts usually connate; cymes sessile.
    - 3a. Corolla funnelform, lobes regular ..... 55. *L. subaequalis*
    - 3b. Corolla bilabiate.
      - 4a. Corolla 1.5–2.5 cm; bracts lanceolate ..... 56. *L. yunnanensis*
      - 4b. Corolla 5–9 cm; bracts ovate ..... 57. *L. tragophylla*
- 1b. Flowers paired (occasionally single), axillary, paniculate or forming thyrses at ends of branches; involucre bracts not connate.
  - 5a. Shrubs; corolla actinomorphic, tube not gibbous and nectary of compact sessile glandular hairs in 5 regular lines; branches with solid pith; accessory buds absent.
    - 6a. Style as long as or longer than corolla tube.
      - 7a. Anthers and stigmas exerted; branches often with leafless spinelike apex; berries pale violet to white; dwarf shrubs 30–60 cm tall ..... 5. *L. spinosa*
      - 7b. Anthers and stigmas not exerted; branches not spinelike at apex; berries blue-black with glaucous bloom; shrubs 200–400 cm tall ..... 3. *L. tomentella*
    - 6b. Style ca. 1/2 length of corolla tube.

- 8a. Leaves sometimes whorled; flowers at bases of branches; branches often becoming spinelike at apex; stems sympodial; ovary 3-locular ..... 4. *L. rupicola*
- 8b. Leaves not whorled; flowers on short lateral branches or along monopodial stems; branches not spinelike at apex; ovary 2-locular.
  - 9a. Ovaries fused above middle or throughout; corolla tubular-campanulate, lobes usually more than 1.5 mm; flowers 4- or 5-merous ..... 2. *L. angustifolia*
  - 9b. Ovaries free; corolla narrowly tubular, lobes usually ca. 1.5 mm; flowers 5-merous ..... 1. *L. tubuliflora*
- 5b. Shrubs or climbers; corolla zygomorphic (sometimes only at base), tube gibbous at base or not and nectary of compact sessile glandular hairs on ventral side toward base of corolla tube; branches solid or hollow; accessory buds often present.
  - 10a. Climbers, sometimes sprawling.
    - 11a. Corolla with a ca. 12 mm spur toward base, neighboring 2 ovaries connate ..... 42. *L. calcarata*
    - 11b. Corolla not spurred, sometimes shallowly gibbous, neighboring 2 ovaries free.
      - 12a. Corolla less than 3 cm.
        - 13a. Corolla tube broadly funnelform, shallowly gibbous toward base ..... 45. *L. acuminata*
        - 13b. Corolla tube narrowly funnelform, not gibbous.
          - 14a. Corolla densely yellow-brown strigose; leaves abaxially densely yellow-brown strigose, margins conspicuously ciliate ..... 46. *L. ferruginea*
          - 14b. Corolla with spreading or adpressed hairs and minute glandular hairs, glabrous, or strigose; leaves abaxially not densely yellow-brown strigose, margins not conspicuously ciliate ..... 47–51. *L. macrantha* species complex
      - 12b. Corolla more than 3 cm.
        - 15a. Bracts leaflike.
          - 16a. Bracts ovate to elliptic, 10–30 mm; leaves abaxially sparsely to densely hairy but not obscuring leaf surface ..... 44. *L. japonica*
          - 16b. Bracts linear-lanceolate, 5–14 mm; leaves abaxially white velutinous with indumentum obscuring leaf surface ..... 47–51. *L. macrantha* species complex
        - 15b. Bracts not leaflike, linear or subulate.
          - 17a. Corolla 9–12 cm, tube broadly funnelform; berries green when ripe ..... 53. *L. hildebrandiana*
          - 17b. Corolla 3–9 cm, tube narrowly funnelform; berries white, red, or black when ripe.
            - 18a. Corolla 5–9 cm; leaves glabrous; berries white or black ..... 52. *L. longiflora*
            - 18b. Corolla 3–7 cm; leaves abaxially hirsute mixed with short glandular hairs, pubescent, shortly white velutinous or glaucous with large sessile orange glands, occasionally subglabrous; berries white, red, or black.
              - 19a. Corolla 3–4.5 cm, lip less than 1/5 as long as tube; berries red ..... 54. *L. bournei*
              - 19b. Corolla 3–7 cm, lip more than 1/4 as long as tube; berries white or black ..... 47–51. *L. macrantha* species complex
    - 10b. Upright shrubs, sometimes compact or prostrate with upright shoots.
      - 20a. Branches with pith becoming brown and later hollow.
        - 21a. Peduncles 10 mm or less.
          - 22a. Calyx scarious and campanulate, splitting; corolla 1.2–1.5 cm; winter bud scales hairy inside ..... 41. *L. trichosantha*
          - 22b. Calyx not scarious, tubular at base but lobed at apex; corolla ca. 2 cm; winter bud scales glabrous inside ..... 40. *L. maackii*
        - 21b. Peduncle 10 mm or more.
          - 23a. Inner winter bud scales densely hairy and ciliate outside, ovaries  $\pm$  glandular hairy ..... 39. *L. chrysantha*
          - 23b. Inner winter bud scales glabrous to sparsely hairy outside, ovaries glabrous.
            - 24a. Upper corolla lip 4-lobed, 2 lateral lobes reaching base and spreading, tube shallowly gibbous toward base; leaf margin ciliate ..... 37. *L. tatarica*
            - 24b. Upper corolla lip 4-lobed, 2 lateral lobes reaching 1/2–3/4 and slightly spreading, tube deeply gibbous toward base; leaf margin sometimes dentate ..... 38. *L. ruprechtiana*
      - 20b. Branches with solid pith.
        - 25a. Bracteoles fused into a cupule enclosing ovaries at anthesis (note that this can give appearance of fused ovaries and absent bracteoles); bracteoles sometimes accrescent and enclosing paired berries in fruit.
          - 26a. Calyx forming a collarlike emergence at base; bracteoles not accrescent in fruit.
            - 27a. Corolla bilabiate; style stiffly hairy to apex; leaves usually with tufted hairs at base of midvein abaxially ..... 11. *L. gynochlamydea*
            - 27b. Corolla lobes regular; style villous at base only; leaves usually without tufted hairs at base of midvein abaxially ..... 12. *L. ligustrina*

- 26b. Calyx not forming a collarlike emergence at base; bracteoles accrescent in fruit sometimes enclosing paired berries.
- 28a. Inflorescence not terminal, paired flowers axillary; corolla lobes regular; cupule glabrous, tightly enclosing paired ovaries and forming a compound fruit ..... 10. *L. caerulea*
- 28b. Inflorescence terminal; corolla bilabiate; cupule pubescent, loosely enclosing paired berries, berries often exserted from cupule in fruit.
- 29a. Cupule usually glandular pubescent, accrescent to 1/2 length of berries; inflorescence terminal, of 3–8 whorls; winter buds glabrous inside; seeds shallowly pitted; leaf apex obtuse or rounded ..... 14. *L. hypoleuca*
- 29b. Cupule villous, enclosing paired berries, sometimes splitting at maturity; inflorescence terminal, of 1–3 whorls; winter buds densely villous inside; seeds deeply pitted with orange glands; leaf apex acuminate or acute ..... 13. *L. ferdinandi*
- 25b. Bracteoles absent or shorter than ovaries, free, fused in pairs, sometimes fused into a cupule but not enclosing ovaries.
- 30a. Winter bud acutely 4-angular.
- 31a. Ovaries free or fused only at base; bracteoles free or fused into a cupule; berries black ..... 31–33. *L. nigra* species complex
- 31b. Ovaries half to completely fused, bracteoles fused into a cupule; berries red or black.
- 32a. Peduncle to 7 mm; berries red ..... 30. *L. modesta*
- 32b. Peduncles 5–30 mm; berries red or black.
- 33a. Berries red; leaf blade ovate, 4–12 × 1.5–3.5 cm ..... 34–36. *L. maximowiczii* species complex
- 33b. Berries black; leaf blade usually obovate, 1–2.5 × 0.7–1.8 cm, abaxially often pruinose, apex retuse to obtuse ..... 31–33. *L. nigra* species complex
- 30b. Winter bud not acutely 4-angular.
- 34a. Ovaries connate to ca. 1/2 or more.
- 35a. Corolla with regular erect lobes; stamens inserted or partially exserted ..... 6–8. *L. tangutica* species complex
- 35b. Corolla bilabiate, lobes recurved; stamens fully exserted.
- 36a. Bracteoles present, free or sometimes fused into a cupule; inner winter bud scales long accrescent; peduncle 0.5–9 cm, usually thickened toward apex ..... 27–28. *L. alpigena* species complex
- 36b. Bracteoles absent; inner winter bud scales long accrescent or not; peduncle 0.5–1.5 cm, not thickened toward apex.
- 37a. Flowering Apr–Jun; inner winter bud scales not accrescent; berry globose ..... 9. *L. microphylla*
- 37b. Flowering Jan–Apr; inner winter bud scales long accrescent; berry oblong.
- 38a. Deciduous shrubs; leaves ovate to lanceolate, acute to acuminate, 3–8.5 cm ..... 15. *L. fragrantissima*
- 38b. Evergreen shrubs; leaves broadly obovate, obtuse and mucronate, 1–2 cm ..... 16. *L. mucronata*
- 34b. Ovaries free.
- 39a. Corolla hypocrateriform, densely hairy at mouth; style ca. 1/2 length of corolla tube; flowers appearing before leaves ..... 18. *L. setifera*
- 39b. Corolla not hypocrateriform; style subequaling or longer than corolla tube; flowers appearing before or after leaves.
- 40a. Corolla bilabiate.
- 41a. Bracteoles absent; bracts leaflike, ovate to lanceolate ..... 26. *L. humilis*
- 41b. Bracteoles present, free or fused in pairs or into a cupule; bracts linear-subulate.
- 42a. Prostrate shrubs with evergreen leathery leaves; corolla tube longer than lobes ..... 43. *L. crassifolia*
- 42b. Erect shrubs with deciduous leaves; corolla tube shorter than lobes.
- 43a. Bracteoles free or fused in pairs; peduncle 0.5–9 cm, usually thickened toward apex; leaves ovate-elliptic to ovate-lanceolate, longer than wide, apex apiculate to long acuminate ..... 27–28. *L. alpigena* species complex
- 43b. Bracteoles fused into a cupule shorter than ovaries; peduncle 0.7–1 cm, not thickened toward apex; leaves broadly rhombic, as long as wide, apex cuspidate and mucronate or obtuse ..... 29. *L. oblata*
- 40b. Corolla funnellform, lobes subregular.
- 44a. Cymes reduced to a single flower, sometimes with a second partially developed ..... 25. *L. subhispida*
- 44b. Cymes of paired flowers.
- 45a. Inner winter bud scales not accrescent and covered by a single outer pair of keeled scales; bracts usually 1 cm or more ..... 19–23. *L. hispida* species complex
- 45b. Inner winter bud scales accrescent; bracts usually 1 cm or less.

- 46a. Corolla lobes more than half as long as tube; anthers usually deep pink, exserted; berry globose ..... 17. *L. praeflorens*  
 46b. Corolla lobes less than half as long as tube; berry ellipsoid ..... 24. *L. elisae*

**1. *Lonicera tubuliflora*** Rehder in Sargent, Pl. Wilson. 1: 129. 1911.

管花忍冬 *guan hua ren dong*

Shrubs, deciduous, to 4 m tall. Branches with solid pith. Winter buds with several pairs of acute scales. Young branches puberulent and minutely glandular hairy. Petiole shorter than 1 mm; leaf blade glaucescent abaxially, oblong to oblong-ovate, 5–12 × 2–3 mm, base broadly cuneate to rounded, margin sparsely glandular ciliolate at base, apex obtuse. Paired flowers fragrant, axillary on upper or middle part of young branches; peduncle to 1 mm; bracts leaflike, linear-oblong, to 5 mm; bracteoles cupular, 1/2–2/3 as long as ovary, truncate. Neighboring 2 ovaries free, ca. 1.5 mm. Sepals triangular-ovate, less than 1 mm, glabrous or sometimes sparsely glandular ciliolate. Corolla white or yellowish, tubular; tube 8–10 mm, ca. 2 mm in diam., mouth slightly constricted at apex, inside villous and glandular at base; glandular hairs in 5 regular lines; lobes spreading, orbicular-ovate, ca. 1.5 mm. Filaments inserted in middle of corolla tube. Ovary 2-locular; style shorter than stamens and less than 1/2 length of corolla tube. Berry red or red-brown, ovoid or globose, ca. 4 mm in diam. Fl. Jun–Jul, fr. Sep.

- Scrub; 2100–3100 m. NW-Sichuan.

This species seems more closely related to *Lonicera angustifolia* than to *L. rupicola* var. *syringantha* as suggested by Rehder (in Sargent, Pl. Wilson. 1: 129. 1911).

**2. *Lonicera angustifolia*** Wallich ex Candolle, Prodr. 4: 337. 1830.

狭叶忍冬 *xia ye ren dong*

Shrubs, deciduous to 3 m tall, branched. Branches with solid pith. Winter buds with several pairs of acute scales. Leaves, petioles, and bracts (sometimes bracteoles and calyx lobes) often sparsely red-brown glandular ciliolate. Petioles 1–3 mm; leaf blade obovate to elliptic or ovate, 0.5–4.5 cm × 2–13 mm, abaxially glaucous, glabrous to pubescent, base cuneate, apex acute or obtuse to rounded and sometimes mucronate. Inflorescences axillary, paired flowers, and on lateral short branches; peduncle 1–30 mm; bracts leaflike, often exceeding calyx lobes in length; bracteoles fused and cupular, ca. 1/2 as long as or equaling ovaries, apex truncate or shallowly dentate. Neighboring 2 ovaries fused above middle or throughout. Calyx shallowly cupular; lobes ovate-triangular, often unequal. Corolla white to pink, often tinged purple-red, tubular-campanulate, 6–10 mm, outside glabrous to pubescent, 4- or 5-lobed; tube inside densely hairy at throat and densely glandular below; glandular hairs in 5 regular lines; tube with 1–5 ± conspicuous pouches halfway up; lobes orbicular-ovate, 1/4–1/3 as long as tube. Stamens and style included; anthers ca. 1 mm; filaments inserted slightly below throat. Ovary usually 2-locular; style not exceeding anthers; stigmas green, globose, mucilaginous. Berry red, suborbicular, 4–6 mm in diam.; calyx persistent; seeds brownish, ovoid to oblong, compressed, 2–3 mm. Fl. May–Jul, fr. Aug–Sep.

Scrub, forests, stony places along river valleys; 2400–4500(–4700) m. SW Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, N Myanmar, Nepal, Pakistan].

- 1a. Leaves 15–45 mm, apex acute or acuminate; peduncle 6–30 mm ..... 2a. var. *angustifolia*  
 1b. Leaves 5–15 mm, apex obtuse; peduncle to 5 mm ..... 2b. var. *myrtilus*

**2a. *Lonicera angustifolia* var. *angustifolia***

狭叶忍冬(原变种) *xia ye ren dong* (yuan bian zhong)

*Caprifolium angustifolium* (Wallich ex Candolle) Kuntze.

Leaves 15–45 mm, apex acute or acuminate. Peduncle 6–30 mm. 2n = 18.

Forests, scrub; 2700–4500 m. S Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal].

**2b. *Lonicera angustifolia* var. *myrtilus*** (J. D. Hooker & Thomson) Q. E. Yang, Landrein, Borosova & J. Osborne, **comb. nov.**

越桔叶忍冬 *yue ju ye ren dong*

Basionym: *Lonicera myrtilus* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 168. 1858; *Caprifolium parvifolium* Kuntze; *L. angustifolia* var. *rhododactyla* W. W. Smith; *L. minutifolia* Kitamura; *L. myrtilus* var. *cyclophylla* Rehder; *L. myrtilus* var. *depressa* Rehder.

Leaves 5–15 mm, apex obtuse. Peduncle to 5 mm. Fl. May–Jun(–Jul), fr. Aug–Sep.

Scrub, sparse forests, stony places along river valleys; 2400–4000 (–4700) m. SW Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, India (Assam), Kashmir, N Myanmar, Pakistan].

**3. *Lonicera tomentella*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 167. 1858.

毛冠忍冬 *mao guan ren dong*

Shrubs, deciduous, to 4 m tall. Branches with solid pith. Winter buds with several obtuse scales. Young branches lanate or villous. Petiole 1–3 mm; leaf blade gray-green or glaucous abaxially, ovate to lanceolate, 1–4 × 0.6–1.5 cm, abaxially pubescent or rarely subglabrous, more densely pubescent on mid-vein, sometimes with scattered orange-red minute glands abaxially, base cuneate to slightly cordate, margin revolute, apex obtuse to acute. Inflorescences axillary, paired flowers; peduncle 1–14 mm; bracts leaflike, ovate to linear-oblong, to 8 mm, longer than ovaries; bracteoles ± fused and cupular, up to 1/2 as long as ovary, glabrous. Neighboring 2 ovaries fused to more than half or free, ca. 2.5 mm, glabrous and glaucous. Sepals ovate, less than 1 mm, apex obtuse. Corolla white, tinged purplish red, tubular-funnelform, outside glabrous or pubescent; tube ca. 8 mm, inside pubescent and glandular at base; glandular hairs in 5 regular lines; lobes orbicular-ovate, ca. 2.5 mm.

Stamens inserted in upper part of corolla tube, unequal in length, not exerted. Ovary usually 3-locular; style as long as corolla tube; stigmas globose. Berry blue-black, with glaucous bloom, globose, ca. 6 mm in diam. Fl. Jun–Aug, fr. Sep.

Forests, scrub; 2000–3200 m. Xizang, NW Yunnan [Bhutan, NE India, Myanmar, Nepal].

- 1a. Leaves gray-green, densely pubescent;  
lateral veins usually 7 or 8 pairs ..... 3a. var. *tomentella*  
1b. Leaves glaucous, sparsely pubescent  
or glabrous; lateral veins usually  
4 or 5 pairs ..... 3b. var. *tsarongensis*

### 3a. *Lonicera tomentella* var. *tomentella*

毛冠忍冬(原变种) mao guan ren dong (yuan bian zhong)

*Caprifolium tomentellum* (J. D. Hooker & Thomson) Kuntze; *Lonicera tomentella* var. *conaensis* P. S. Hsu & Y. F. Huang.

Leaf blade gray-green abaxially, densely pubescent, lateral veins 7 or 8 pairs.

Forests, scrub; 2900–3000 m. Xizang, NW Yunnan [NE India].

**3b. *Lonicera tomentella* var. *tsarongensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 168. 1921.

察瓦龙忍冬 cha wa long ren dong

Leaf blade often glaucous abaxially, sparsely pubescent or glabrous, lateral veins 4 or 5 pairs.

• Forests, scrub; 2000–3200 m. SE Xizang, NW Yunnan.

**4. *Lonicera rupicola*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 168. 1858.

岩生忍冬 yan sheng ren dong

Shrubs, deciduous, erect or procumbent, to 2.5 m tall, sometimes only 10–20 cm tall at high elevations. Bark splitting. Branches with solid pith. Winter buds with several obtuse scales. Young branches white lanate or subglabrous, sometimes minutely glandular hairy; often leaves dropping at apex and leaving needlelike bare twigs. Leaves in whorls of 3 or opposite; petiole 1–3 mm; leaf blade linear-lanceolate to oblong, 0.5–3.7 × 0.1–1 cm, abaxially white lanate, sparsely pubescent, or glabrous, adaxially glabrous or rarely minutely glandular hairy, base cuneate to subcordate, margin revolute, apex acute to obtuse and slightly mucronate. Inflorescences axillary, paired flowers at bases of young branches; peduncle 0–3 mm; bracts, bracteoles, and margins of sepals minutely puberulent and glandular; bracts leaflike, linear-lanceolate, exceeding ovary; bracteoles cupular, sometimes lobed or rarely completely separate, ca. 1/2 as long as or equaling ovary. Neighboring 2 ovaries free, ca. 2 mm, glabrous. Sepals narrowly lanceolate to ovate-triangular, 2.5–3 mm. Flowers fragrant. Corolla white or pink to purple-red, tubular-funnelform; tube 8–10 mm, outside often puberulent and minutely glandular hairy, inside pubescent and glandular at base; lobes spreading, ovate, 2–4 mm. Stamens up to middle of corolla tube or slightly exceeding corolla tube, longer than style. Ovary usually 3-locular. Berry red, ellip-

soid, ca. 8 mm; seeds few, brownish, ellipsoid, compressed, ca. 4 mm. Fl. May–Aug, fr. Aug–Oct.

Alpine scrub and meadows, rock crevices, scree slopes, grasslands, forest margins, deserts; 2000–5000 m. Gansu, S Ningxia, Qinghai, Sichuan, Xizang, NW Yunnan [Bhutan, India, Nepal].

- 1a. Ecotype found in shifting sands, with short branches on long subterranean stems; young branches, petioles, and leaves minutely scabrid ..... 4c. var. *minuta*  
1b. Plants of alpine meadows, scree slopes, and forest margins, erect or procumbent.  
2a. Leaves abaxially usually white lanate, evergreen ..... 4a. var. *rupicola*  
2b. Leaves abaxially glabrous or sparsely lanate, deciduous ..... 4b. var. *syringantha*

### 4a. *Lonicera rupicola* var. *rupicola*

岩生忍冬(原变种) yan sheng ren dong (yuan bian zhong)

*Caprifolium rupicolum* (J. D. Hooker & Thomson) Kuntze; *Lonicera rupicola* subsp. *thibetica* (Bureau & Franchet) Y. C. Tang; *L. rupicola* var. *thibetica* (Bureau & Franchet) Zabel; *L. thibetica* Bureau & Franchet.

Plants erect or procumbent. Leaves evergreen, abaxially usually white lanate.

Alpine scrub and meadows, rock crevices, margins of scree slopes, grasslands at forest margins; 2100–5000 m. Gansu, S Ningxia, Qinghai, Sichuan, Xizang, NW Yunnan [India, Nepal].

**4b. *Lonicera rupicola* var. *syringantha*** (Maximowicz) Zabel in Beissner et al., Handb. Laubholzben. 462. 1903.

红岩生忍冬 hong hua yan sheng ren dong

*Lonicera syringantha* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 49. 1878; *L. codonantha* Rehder; *L. rupicola* f. *glabrata* Suessenguth; *L. rupicola* subsp. *syringantha* (Maximowicz) Y. C. Tang; *L. syringantha* var. *minor* Maximowicz; *L. syringantha* var. *wolfii* Rehder; *L. wolfii* (Rehder) K. S. Hao.

Plants erect or procumbent. Leaves deciduous, abaxially glabrous or sparsely lanate.

Scrub, forest margins, alpine meadows, scree slopes; 2000–4600 m. Gansu, S Ningxia, E Qinghai, Sichuan, Xizang, NW Yunnan [India].

*Lonicera codonantha* appears to be an intermediate form between var. *rupicola* and var. *syringantha*, which has sessile, abaxially villous leaves, and brown villous stems.

**4c. *Lonicera rupicola* var. *minuta*** (Batalin) Q. E. Yang, Landrein, Borosova & J. Osborne, **comb. et stat. nov.**

矮生忍冬 ai sheng ren dong

Basionym: *Lonicera minuta* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 170. 1892.

Ecotype with short branches on long subterranean stems; young branches, petioles, and leaves minutely scabrid. Fl. May–Jun, fr. Aug–Sep.

• Shifting sands of sand dunes; 3200–3800 m. W Gansu, Qinghai.

**5. *Lonicera spinosa*** (Decaisne) Jacquemont ex Walpers, Reper. Bot. Syst. 2: 449. 1843.

棘枝忍冬 *ji zhi ren dong*

*Xylosteon spinosum* Decaisne in Jacquemont, Voy. Inde 4(Bot.): 78. 1841; *Caprifolium spinosum* (Decaisne) Kuntze; *Lonicera albertii* Regel.

Shrubs, dwarf, to 60 cm tall, deciduous, often with spine-like, leafless branchlets. Bark splitting. Branches with solid pith. Winter buds with few scales. Leaves opposite; petiole ca. 1 mm; leaf blade linear to oblong, 4–15 × 1–2 mm, glabrous, base broadly cuneate to rounded, margin revolute, apex obtuse. Paired flowers fragrant, axillary at bases of lateral young branches; peduncle to 1 mm; bracts leaflike, longer than ovary; bracteoles cupular, more than 1/2 as long as ovary, apex subtruncate, often 2-lobed. Neighboring 2 ovaries free. Calyx cupular, ca. 1.5 mm; lobes ovate, apex obtuse. Corolla purplish red, later white, tubular-funnelform; tube ca. 10 mm, slender; lobes spreading, ovate-oblong, ca. 4 mm. Stamens inserted at mouth of corolla; anthers exserted. Style exserted. Berry pale violet to white, ellipsoid, ca. 5 mm. Fl. Jun–Jul, fr. Sep.

Scrub, scree slopes, often mixed with *Caragana* plants; 1700–4600 m. Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Tajikistan].

#### 6–8. *Lonicera tangutica* species complex

Shrubs, deciduous, to 1–4 m tall. Branches with solid pith. Winter buds with 2–4 pairs of scales. Petiole 1–5 mm; leaf blade obovate to lanceolate, 0.5–8.5 × 0.2–2.5 cm, both surfaces glabrous or pubescent, base cuneate, apex obtuse to acute. Inflorescences axillary, paired flowers; peduncle usually nodding, 0–3 cm, slender, glabrous, rarely pubescent; bracts narrow, sometimes leaflike, usually exceeding or rarely shorter than ovaries; bracteoles sometimes present, separate or fused, minute to 1/4 as long as ovaries, often ciliate. Neighboring 2 ovaries fused completely or at least to middle, elliptic or oblong, ca. 2 mm, glabrous or occasionally pubescent. Calyx cupular, to 2 mm, truncate or with ovate to triangular lobes, glabrous to pubescent, sometimes ciliate. Corolla white, yellow, or pink, sometimes tinged purple, tubular-funnelform, 8–13 mm; tube glabrous, occasionally with sparse stiff hairs, nectary swollen or gibbous on ventral side at base of corolla tube, sometimes forming a spur shorter than ovaries; lobes suberect, orbicular-ovate, 1–2 mm; mouth glabrous or with sparse spreading stiff hairs. Stamens inserted at middle of corolla tube; anthers partially exserted, glabrous or ciliate. Style exserted by 1–3 mm. Berries orange, red, purple, or black, 5–6 mm in diam.; seeds brownish, ovoid or oblong, 2–2.5 mm, smooth. Fl. May–Aug, fr. Jul–Sep.

Forests, forest margins, grasslands, scrub, mountains; 800–4500 m. Anhui, Gansu, Guizhou, Hebei, Henan, W Hubei, W Hunan, Ningxia, E Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, NW Yunnan [Bhutan, India (Sikkim), Nepal].

This is a highly variable species complex; further studies are needed for a satisfactory taxonomic treatment.

- 1a. Bracts ovate-lanceolate; berries black ..... 8. *L. kawakamii*  
1b. Bracts subulate to lanceolate or linear-lanceolate; berries orange to red.

- 2a. Young branches, leaves, peduncle, bracts, and flowers glabrous; peduncle shorter than 1 cm ..... 7. *L. litangensis*  
2b. Young branches, leaves, peduncle, bracts, and flowers ± hairy; peduncle longer ..... 6. *L. tangutica*

**6. *Lonicera tangutica*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 48. 1878.

唐古特忍冬 *tang gu te ren dong*

*Caprifolium tanguticum* (Maximowicz) Kuntze; *Lonicera aemulans* Rehder; *L. chlamydata* W. W. Smith; *L. chlamydophora* W. W. Smith (1913), not K. Koch (1851); *L. cylindriflora* Handel-Mazzetti; *L. fangii* S. S. Chien; *L. flavipes* Rehder; *L. glandulifera* S. S. Chien; *L. guebriantiana* Handel-Mazzetti; *L. hopeiensis* S. S. Chien; *L. inconspicua* Batalin; *L. kungeana* K. S. Hao; *L. longa* Rehder; *L. penduliflora* Pax & K. Hoffmann; *L. saccata* Rehder; *L. saccata* f. *calva* Rehder; *L. saccata* var. *tangiana* (S. S. Chien) P. S. Hsu & H. J. Wang; *L. saccata* f. *wilsonii* Rehder; *L. schneideriana* Rehder; *L. serpyllifolia* Rehder; *L. serreana* Handel-Mazzetti; *L. shensiensis* (Rehder) Rehder; *L. stenosphon* Franchet; *L. szechuanica* Batalin; *L. taipeiensis* P. S. Hsu & H. J. Wang; *L. tangiana* S. S. Chien; *L. tangutica* var. *glabra* Batalin; *L. trichogyne* Rehder; *L. trichogyne* var. *aequipila* Handel-Mazzetti; *L. trichopoda* Franchet; *L. trichopoda* var. *shensiensis* Rehder; *L. wulingensis* Nakai.

For description see under species complex. Distinguishing characters for this species are as follows: Young branches, leaves, peduncle, bracts, and flowers ± hairy; peduncle longer than 1 cm. Bracts subulate to lanceolate or linear-lanceolate; berries orange to red. Fl. May–Aug, fr. Jul–Sep.

Forests, grasslands on mountain slopes, scrub at streamsides; 800–4500 m. Anhui, Gansu, Guizhou, Hebei, Henan, W Hubei, W Hunan, Ningxia, E Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, NW Yunnan [Bhutan, India (Sikkim), Nepal].

**7. *Lonicera litangensis*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: 173. 1895.

理塘忍冬 *li tang ren dong*

*Lonicera farreri* W. W. Smith; *L. oresbia* W. W. Smith; *L. rockii* Rehder.

For description see under species complex. Distinguishing characters for this species are as follows: Young branches, leaves, peduncle, bracts, and flowers glabrous; peduncle shorter than 1 cm. Bracts subulate to lanceolate or linear-lanceolate; berries orange to red. Fl. May–Jun, fr. Aug–Sep.

Scrub, grasslands, forests, forest margins; 3000–4500 m. Sichuan, Xizang, NW Yunnan [Bhutan, India (Sikkim), Nepal].

**8. *Lonicera kawakamii*** (Hayata) Masamune, J. Soc. Trop. Agric. 3: 246. 1931.

玉山忍冬 *yu shan ren dong*

*Coprosma kawakamii* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 145. 1911.

For description see under species complex. Distinguishing characters for this species are as follows: Bracts ovate-lanceolate; berries black.

- Mountains; 3000–3900 m. Taiwan.

No specimens were seen; a photograph and illustration were seen in Fl. Taiwan (ed. 2, 4: 747, 1166; photo 376. 1998).

**9. *Lonicera microphylla*** Willdenow ex Schultes, Syst. Veg. 5: 258. 1819.

小叶忍冬 xiao ye ren dong

*Caprifolium microphyllum* (Willdenow ex Roemer & Schultes) Kuntze; *Lonicera oiwakensis* Hayata; *Xylosteon sieversianum* Ruprecht.

Shrubs, deciduous, 1–3 m tall. Branches with solid pith. Winter buds with 3–6 pairs of scales, rounded to acute. Petiole 1–2 mm; leaf blade abaxially often gray-white, sometimes with membranous domatia in vein axils, obovate to elliptic or oblong, 5–22 × 5–13 mm, both surfaces densely puberulent to subglabrous, base cuneate, apex obtuse or ± acute, sometimes mucronate. Inflorescences axillary, paired flowers; peduncles 5–12 mm, usually nodding; bracts subulate, exceeding ovaries, bracteoles absent. Neighboring 2 ovaries fused completely or at least to middle, glabrous. Calyx rimlike to lobed. Corolla bilabiate, white to yellow, sometimes tinged pink; tube 7–10 mm, outside hairy or glabrous, gibbous toward base on ventral side; lobes oblong, 3–7 mm, upper 4 lobes erect, lower one recurved. Stamens inserted at mouth of corolla, together with style exserted; filaments and style glabrous or with spreading hairs. Ovaries 3-locular, with 4 or 5 ovules per locule. Berry red or orange-yellow, globose, 5–6 mm in diam.; seeds yellowish brown, oblong or ovoid-ellipsoid, 2.5–3 mm, smooth. Fl. Apr–Jun(–Jul), fr. Jul–Aug(–Sep). 2*n* = 18.

Rocky slopes, grasslands, thickets, sparse forests, forest margins; 1100–3600(–4100) m. Gansu, W Hebei, ?Henan, Nei Mongol, Ningxia, Qinghai, Shanxi, Taiwan, Xinjiang, Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia].

**10. *Lonicera caerulea*** Linnaeus, Sp. Pl. 1: 174. 1753.

蓝果忍冬 lan guo ren dong

*Lonicera caerulea* var. *altaica* Pallas; *L. caerulea* var. *edulis* Turczaninow ex Herder; *L. caerulea* var. *tangutica* Maximowicz; *Xylosteon caeruleum* (Linnaeus) Dumont de Courset.

Shrubs, deciduous, to 2.5 m tall. Branches with solid pith. Bark flaking. Buds divaricate, sometimes with accessory ones. Winter buds with several pairs of scales, outer pair long acuminate and obscuring inner ones. Interpetiolar stipules sometimes reniform and fused to 6 mm; leaf blade ovate to oblong or obovate, 1–6 × 1–3 cm, both surfaces with sparse short hairs, more densely so and spreading hairy on midvein, sometimes subglabrous, base rounded, apex acute to obtuse. Inflorescences axillary, paired flowers; peduncle 2–10 mm; bracts linear, 2–3 × as long as ovaries; bracteoles glabrous, fused into a cupule tightly enclosing free ovaries. Corolla tubular-funnelform, 10–15 mm, outside puberulent, shallowly gibbous at base; lobes regular, 2–3 mm. Stamens exserted from corolla. Ovaries 2-loc-

ular; style exserted and glabrous. Cupule tightly fused around 2 berries, blue-black, pruinose, forming an elliptic to oblong-elliptic compound fruit, ca. 1.5 cm. Seeds brown, globose to ellipsoid, ca. 1.5 mm. Fl. May–Jun, fr. Aug–Sep.

Deciduous forests, scrub; 2600–3500 m. S Gansu, Hebei, Heilongjiang, ?Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shanxi, N Sichuan, Xinjiang, NW Yunnan [Japan, Korea, Mongolia, Russia; Europe, North America].

This is a very widely distributed and variable species. The berries are edible.

**11. *Lonicera gynochlamydea*** Hemsley, J. Linn. Soc., Bot. 23: 362. 1888.

蕊被忍冬 rui bei ren dong

*Caprifolium gynochlamydeum* (Hemsley) Kuntze.

Shrubs, deciduous, to 3–4 m tall. Branches with solid pith. Winter buds with several pairs of acute scales. Petiole 3–6 mm; leaf blade ovate to lanceolate, 5–11 × 1.5–3.5 cm, abaxially often densely white villous at base of midvein, occasionally with scattered dark purple glands at base, base rounded to cuneate, margin with short stiff hairs, apex long acuminate. Inflorescences axillary, paired flowers; peduncles 4–8 mm; bracts subulate, subequaling or exceeding ovaries; bracteoles fused, cupular, surrounding 2 neighboring free ovaries. Calyx forming a collarlike emergence at base; lobes triangular or lanceolate, glandular ciliate, apex obtuse to acute. Corolla bilabiate, white, pink, or purple-red, 8–12 mm, both sides with short hairs; tube slightly shorter than lobes, deeply gibbous at base. Stamens exserted; filaments sometimes hairy at base. Style shorter than stamens, stiffly hairy throughout. Cupule not accrescent; berries purple-red or white, 4–5 mm in diam., 1- or 2(–4)-seeded; seeds smooth. Fl. May, fr. Aug–Sep.

• Scrub, forests; 1200–1900(–3000) m. Anhui, Chongqing, Gansu, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

**12. *Lonicera ligustrina*** Wallich in Roxburgh, Fl. Ind. 2: 179. 1824.

女贞叶忍冬 nü zhen ye ren dong

Shrubs, evergreen, semievergreen, or deciduous, 1.5–2.5(–5) m tall. Winter buds with several pairs of acute scales. Young branches with stiff and upwardly curved hairs. Leaves ovate to lanceolate, 0.4–8 × 0.2–1.5 cm, leathery or papery, abaxially sometimes with minute black glands, adaxially usually shiny, glabrous or with sparse short hairs and reddish glandular hairs, midvein slightly impressed, flat or raised, sometimes stiffly hairy, base rounded to cuneate, apex acuminate to obtuse, sometimes mucronate. Inflorescences axillary, paired flowers; peduncle to 5 mm, pubescent; bracts lanceolate, 1.5–7 mm; bracteoles cupular, completely enclosing paired ovaries, sparsely glandular hairy. Neighboring 2 ovaries free. Calyx cupular, forming a collarlike emergence at base, overlapping apex of bracteoles; lobes ovate, glandular ciliate, apex obtuse. Corolla greenish yellow to white or occasionally purple-red, funnel-form, 4–12 mm; tube shallowly gibbous at base, inside villous, outside glandular; lobes almost regular, ovate, 1–2 mm, apex obtuse. Anthers exserted. Style exserted, villous at base; stigmas

capitate, hemispherical. Fruit purple, red, or white,  $\pm$  translucent, globose, 4–8 mm in diam.; seeds brownish, ovoid or subglobose, sometimes compressed, 1–2 mm, smooth. Fl. Apr–Jul, fr. Aug–Dec.  $2n = 18, 22$ .

Scrub, evergreen broad-leaved forests, sandy slopes along watersides, moist places in sparse forests; 300–3000 m. S Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan [Bhutan, India, Nepal].

- 1a. Leaves with midvein raised adaxially, glabrous or sparsely hairy; berry purple or white ..... 12c. var. *pileata*  
 1b. Leaves with midvein slightly impressed or flat adaxially, often stiffly hairy; berry purple or red.  
 2a. Leaves (0.5–)1–4(–8) cm, adaxially densely stiffly hairy on midvein, apex usually acuminate or mucronate; corolla 7.5–12 mm .... 12a. var. *ligustrina*  
 2b. Leaves 0.4–1(–1.5) cm, apex usually rounded or obtuse, adaxially glabrous or sparsely stiffly hairy on midvein; corolla 4–7 mm ..... 12b. var. *yunnanensis*

#### 12a. *Lonicera ligustrina* var. *ligustrina*

女贞叶忍冬(原变种) nǚ zhēn yè rěn dōng (yuán biàn zhōng)

*Caprifolium ligustrinum* (Wallich) Kuntze; *Lonicera buxifolia* H. Léveillé; *L. missionis* H. Léveillé; *L. virgultorum* W. W. Smith; *Xylosteon ligustrinum* (Wallich) D. Don.

Leaves (0.5–)1–4(–8) cm, adaxially densely stiffly hairy on midvein, midvein slightly impressed or flat adaxially, apex usually acuminate or mucronate. Corolla 7.5–12 mm. Berry purple or red.

Scrub, evergreen broad-leaved forests; (600–)1000–2000(–3000) m. NW Guangxi, Guizhou, SW Hubei, NW Hunan, Sichuan, Yunnan [Bhutan, E India, Nepal].

12b. *Lonicera ligustrina* var. *yunnanensis* Franchet, J. Bot. (Morot) 10: 317. 1896.

亮叶忍冬 liang yè rěn dōng

*Lonicera ligustrina* subsp. *yunnanensis* (Franchet) P. S. Hsu & H. J. Wang; *L. nitida* E. H. Wilson; *L. pileata* Oliver f. *yunnanensis* (Franchet) Rehder.

Leaves 0.4–1(–1.5) cm, adaxially glabrous or sparsely stiffly hairy on midvein, midvein slightly impressed or flat adaxially, apex usually rounded or obtuse. Corolla 4–7 mm. Berry purple or red.

• Forests; (1600–)2100–3000 m. S Gansu, SW Shaanxi, Sichuan, Yunnan.

12c. *Lonicera ligustrina* var. *pileata* (Oliver) Franchet, J. Bot. (Morot) 10: 317. 1896.

蕊帽忍冬 ruǐ mào rěn dōng

*Lonicera pileata* Oliver, Hooker's Icon. Pl. 16: t. 1585.

1887; *Caprifolium pileatum* (Oliver) Kuntze; *L. pileata* var. *linearis* Rehder; *L. tricalysoides* C. Y. Wu ex P. S. Hsu & H. J. Wang.

Leaves with midvein raised adaxially, glabrous or sparsely hairy. Berry purple or white.

• Sandy slopes along watersides, moist places in sparse forests, scrub on mountain slopes; (300–)600–1700(–2200) m. Guangdong, Guangxi, Guizhou, W Hubei, Hunan, S Shaanxi, Sichuan, Yunnan.

13. *Lonicera ferdinandi* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 31. 1883.

葱皮忍冬 cōng pī rěn dōng

*Caprifolium ferdinandi* (Franchet) Kuntze; *Lonicera ferdinandi* f. *beissneriana* Zabel; *L. ferdinandi* f. *franchetii* Zabel; *L. ferdinandi* var. *induta* Rehder; *L. ferdinandi* f. *leycesterioides* (Graebner) Zabel; *L. ferdinandi* var. *leycesterioides* (Graebner) Rehder; *L. ferdinandi* f. *vesicaria* (Komarov) Zabel; *L. leycesterioides* Graebner; *L. vesicaria* Komarov.

Shrubs, deciduous, 1–4.5 m tall. Winter buds with a pair of boat-shaped outer scales; scales densely white tomentose inside. Young branches usually hirsute, often with stiff hairs and minute glands; bark verrucose, splitting; vigorous shoots with well-developed interpetiolar discoid stipules. Leaves ovate to lanceolate, 3–10  $\times$  2–7 cm, abaxially usually hirsute, more densely so at base of midvein, sometimes with minute glands, adaxially sparsely hirsute or subglabrous, base rounded to subcordate, margin ciliate, entire or occasionally shallowly lobed, apex acute to acuminate. Inflorescence terminal with 1–3 whorls, cymes 2-flowered (occasionally 3-flowered); peduncle 1–2 mm, hirsute, glandular; bracts leaflike, lanceolate to ovate, to 1.5 cm; bracteoles fused into an urceolate cupule, completely surrounding 2 neighboring free ovaries, accrescent to 7–13 mm in diam. in fruit, outside densely villous when young, inside adpressed villous. Calyx pubescent; lobes triangular, ciliate. Corolla bilabiate, white, later yellowish, 1.3–1.7 cm, outside usually densely hirsute and glandular hairy, inside villous; tube shallowly gibbous toward base, slightly longer than or subequaling lobes; upper lip shallowly 4-lobed; lower lip recurved. Stamens and style exerted from corolla tube. Style pubescent toward base. Cupule loosely enclosing paired berries, sometimes splitting. Berries red, ovoid, to 1 cm, 2–7-seeded; seeds light brown, ellipsoid, compressed, 4–7 mm, densely rusty pitted. Fl. Apr–Jul, fr. Aug–Oct.  $2n = 36$ .

Forests, scrub, rocky slopes; (200–)1000–2700 m. Gansu, S Hebei, Heilongjiang, Henan, Liaoning, Nei Mongol, Ningxia, E Qinghai, W Shaanxi, Shanxi, Sichuan, Yunnan [N Korea].

14. *Lonicera hypoleuca* Decaisne in Jacquemont, Voy. Inde 4(Bot): 81. 1841.

白背忍冬 bái bèi rěn dōng

Shrubs, deciduous, to 2 m tall. Winter buds with several pairs of acute scales. Young branches, petioles, and peduncles densely spreading white hispid, rarely glabrescent. Petiole 1–3 mm, slightly clasping at base; leaf blade ovate to oblong, 1–3  $\times$  0.9–1.8 cm, abaxially glaucous and densely soft hairy, adaxially pubescent, base subtruncate to slightly cordate, apex obtuse to

rounded. Inflorescence terminal, with 3–8 whorls, sometimes branching; cymes 2-flowered (occasionally 3-flowered); peduncle to 10 mm, those in lower part of inflorescence longer; bracts leaflike, to 5 mm; bracteoles fused, shallowly cupular, usually equaling ovaries, surrounding 2 neighboring free ovaries, accrescent to 5–6 mm in diam. in fruit, outside densely glandular hairy, inside glabrous. Sepals triangular, to 1 mm, ciliate. Corolla bilabiate, creamy yellow, outside puberulent; tube ca. 7 mm, shallowly gibbous at base on ventral side, inside puberulent; upper lip shallowly 4-lobed; lower lip recurved, subequaling corolla tube. Stamens and style exerted from corolla tube; filaments and style white pubescent below middle; anthers linear, ca. 3 mm. Cupule accrescent to 1/2 length of berries; berries red, ellipsoid, ca. 5 mm, hairy. Fl. Jun–Jul, fr. Sep.

Scrub on mountain slopes; 2900–3100 m. Xizang [India, Kashmir, Nepal, Pakistan].

**15. *Lonicera fragrantissima* Lindley & Paxton in Paxton, Fl. Gard. 3: 75. 1852.**

郁香忍冬 *yu xiang ren dong*

Shrubs, deciduous, to 2 m tall. Winter buds with a pair of acute, cartilaginous outer scales covering membranous inner scales. Young branches usually with reflexed bristles. Petiole 2–5 mm, hirsute; leaf blade sometimes paler abaxially, variable in shape, obovate or ovate to lanceolate, 3–8.5 × 1–4.5 cm, glabrous to pubescent or hirsute, base subcordate to cuneate, margin ciliate or subglabrous, sometimes slightly revolute, apex rounded to acuminate. Inflorescences axillary with paired flowers at base of new shoots; flowers fragrant, opening early in spring; peduncle 1–15 mm, glabrous to hirsute; bracts leaflike to lanceolate, 7–10 mm; bracteoles absent. Paired ovaries fused to middle or above, 1–3 mm. Calyx cupular, truncate or minutely lobed, sometimes ciliate, not constricted at base. Corolla bilabiate, white to pink, 1–1.5 cm, outside glabrous to hirsute; tube 4–5 mm, inside densely puberulent, shallowly gibbous toward base; upper lip ca. 7 mm, lobed to middle; lower lip recurved, ca. 8 mm. Stamens and style exerted from corolla tube; filaments unequal in length. Style glabrous. Berries red, oblong, ca. 1 cm, partly united; seeds brown, slightly compressed, oblong, ca. 3.5 mm, with shallow pits. Fl. Jan–Apr, fr. Apr–Jun.

• Forests, scrub; 100–2700 m. Anhui, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang.

1a. Leaves ovate, 1–4.5 cm wide ..... 15a. var. *fragrantissima*

1b. Leaves lanceolate, 1–2 cm wide ..... 15b. var. *lancifolia*

**15a. *Lonicera fragrantissima* var. *fragrantissima***

郁香忍冬(原变种) *yu xiang ren dong* (*yuan bian zhong*)

*Caprifolium fragrantissimum* (Lindley & Paxton) Kuntze; *Lonicera fragrantissima* subsp. *standishii* (Carrière) P. S. Hsu & H. J. Wang; *L. mamillaris* Rehder; *L. phyllocarpa* Maximowicz; *L. proterantha* Rehder; *L. pseudoproterantha* Pampanini; *L. pseudoproterantha* var. *intermedia* Pampanini; *L. pseudoproterantha* var. *longifolia* Pampanini; *L. standishii* Carrière; *L. standishii* var. *monbeigii* W. W. Smith.

Shrubs, deciduous. Leaves ovate to lanceolate, 3–8.5 × 1–4.5 cm, acute to acuminate.

• Scrub on mountain slopes; 100–2700 m. Anhui, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang.

**15b. *Lonicera fragrantissima* var. *lancifolia* (Rehder) Q. E. Yang, Landrein, Borosova & J. Osborne, *comb. et stat. nov.***

苦糖果 *ku tang guo*

Basionym: *Lonicera standishii* f. *lancifolia* Rehder, Rep. (Annual) Missouri Bot. Gard. 14: 82. 1903.

Shrubs, deciduous. Leaves ovate to lanceolate, 3–8.5 × 1–2 cm, acute to acuminate.

• Forests, scrub; 100–2700 m. Anhui, Hubei, Hunan, Sichuan.

**16. *Lonicera mucronata* Rehder, Rep. (Annual) Missouri Bot. Gard. 14: 83. 1903.**

短尖忍冬 *duan jian ren dong*

Shrubs, evergreen, to 2 m tall. Winter buds with a pair of acute, cartilaginous outer scales covering membranous inner scales. Young branches, petioles, and peduncles densely stiffly hairy. Leaves broadly obovate, to broadly elliptic or suborbicular, 1–2 × 1–1.5 cm, venation reticulate, glabrous or sparsely adpressed stiffly hairy on both surfaces, abaxially sometimes glaucous, margin slightly revolute, ciliate, apex obtuse and mucronate. Inflorescences axillary with paired flowers at base of new shoots; flowers fragrant, opening early in spring; peduncle to 6 mm, glabrous to hirsute; bracts ovate-oblong, slightly exceeding ovaries, margin ciliate; bracteoles absent. Paired ovaries fused to middle or above, 6–8 mm in diam. Corolla bilabiate, white to pink, 1–1.5 cm, outside glabrous to hirsute; tube 4–5 mm, inside densely puberulent, shallowly gibbous toward base; upper lip ca. 7 mm, lobed to middle; lower lip recurved, ca. 8 mm. Stamens and style exerted from corolla tube; filaments unequal in length. Style glabrous. Berries red, 5–10-seeded; seeds brownish, oblong-ellipsoid, ca. 2.5 mm, with minute shallow pits. Fl. Mar–Apr, fr. Apr–May.

• Scrub in mountain valleys; 800–1500 m. W Hubei, NE Sichuan.

**17. *Lonicera praeiflorens* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 169. 1892.**

早花忍冬 *zao hua ren dong*

Shrubs, deciduous, to 2 m tall. Winter buds with a pair of acute, cartilaginous outer scales covering membranous inner scales. Young branches usually with long spreading hairs. Petiole 3–5 mm, densely villous; leaf blade broadly ovate, 1–7.5 × 0.9–4.5 cm, both surfaces densely adpressed pubescent, base broadly cuneate to rounded, margin ciliate, apex acute to apiculate. Inflorescences axillary paired flowers and at base of new shoots, flowers opening early in season; peduncle very short, usually concealed by bud scales at anthesis, to 1.2 cm at fruiting stage, usually glabrous; bracts broadly lanceolate, 3–7 mm, margin often ciliate and glandular; bracteoles absent. Paired ovaries free, suborbicular, usually glabrous. Calyx cupular, sometimes shallowly lobed, ciliate. Corolla yellowish white to pink, subregular, funnelform, ca. 1 cm, outside glabrous, deeply lobed; lobes erect to recurved, oblong, 6–7 mm, apex obtuse. Stamens and style exerted; anthers dark pink; style glabrous. Berries

red, globose, 6–8 mm in diam.; seeds brownish, oblong, ca. 4.5 mm, smooth. Fl. Apr, fr. May–Jun.  $2n = 18$ .

Forests, scrub; 200–600 m. Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia].

**18. *Lonicera setifera*** Franchet, J. Bot. (Morot) 10: 314. 1896.

齿叶忍冬 *chi ye ren dong*

*Lonicera fragilis* H. Léveillé; *L. scabrida* Franchet; *L. setifera* var. *trullifera* Rehder; *L. subdentata* Rehder.

Shrubs, deciduous, to 3 m tall. Terminal winter bud underdeveloped, substituted by 2 lateral buds. Winter buds with a pair of outer scales covering inner scales. Young branches and petioles usually densely bristly, interspersed with glandular hairs. Petiole 3–8 mm; leaf blade oblong to oblong-lanceolate, 3–12 × 1.5–6 cm, both surfaces stiffly strigose, base cuneate to rounded, margin usually undulate to shallowly lobed, and ciliate, apex acute to acuminate. Inflorescences axillary paired flowers and at base of new shoots; flowers opening early in season; peduncle very short, usually concealed by bud scales at anthesis, not accrescent in fruit; bracts broadly ovate, to 1 cm; bracteoles absent. Paired ovaries free. Calyx cupular, irregularly lobed; lobes rounded. Peduncle, bracts, ovaries, calyx, and corolla densely glandular hairy. Corolla white to purplish or pink, tubular-hypocrateriform, 1–1.4 cm, with spreading subregular lobes, densely hairy at mouth and inside tube; tube shallowly gibbous at base, concealed by bracts; lobes 3–6 mm. Stamens and style included, less than half as long as corolla tube. Style glabrous. Berries red, ellipsoid, 1–1.2 cm, glandular hairy; seeds brownish, oblong, ca. 5 mm, smooth. Fl. Mar–Apr, fr. May–Jun.

Forests, scrub; 2300–3800 m. Sichuan, Xizang, Yunnan [India].

**19–23. *Lonicera hispida* species complex**

Shrubs, deciduous, to 3 m tall, occasionally dwarf. Winter buds with a pair of narrow keeled outer scales, covering inner scales and sometimes longitudinally sulcate. Young branches often pruinose, minutely scabrid to stiffly hairy and glandular hairy, very rarely glabrous. Petiole 1.5–6 mm; leaf blade usually ovate to oblong, sometimes elliptic, 0.6–9 × 0.4–3.5 cm, subglabrous, with short stiff hairs or adpressed villous, base cuneate to slightly cordate, margin hirsute-ciliate, apex acute to obtuse and mucronulate. Inflorescences axillary paired flowers, and at base of new shoots; peduncle stout, sometimes slightly compressed, 0.5–2 cm; bracts broadly ovate, 1–4 cm; bracteoles absent. Paired ovaries free, glabrous to hirsute, often glandular hairy. Calyx cupular, 1–4 mm, to 5 mm at fruiting, truncate or lobed; lobes broad and hirsute-ciliate. Corolla yellow-green or dark purple, funnelform, subregular, 13–35 mm; tube shallowly to deeply gibbous toward base, glabrous to puberulent outside and inside at upper part; lobes erect, ovate, 5–10 mm. Stamens and style usually subequaling or longer than corolla, occasionally shorter. Style stiffly hairy on lower half. Berries red, black-brown, or blue-black and pruinose, ovoid, 1–1.5 cm, 3–8-seeded; seeds deep brown, irregularly triangular-oblong, 4–5 mm, smooth. Fl. May–Jul, fr. Jul–Sep.  $2n = 18^*$ .

Forests, scrub, alpine grasslands, rocky places, slopes, high mountains; 1700–4800 m. Gansu, Hebei, Henan, Ningxia, Qinghai, Shaanxi,

Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India (Sikkim), Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan; SW Asia (Iran)].

*Lonicera sublabiata* P. S. Hsu & H. J. Wang (Acta Phytotax. Sin. 17(4): 78. 1979), based on a type specimen collected in Lixian, Sichuan, by Z. He (12715) and kept in the Shanghai Museum of Natural History (SHM), could not be located; it has a short hispid style, a bilabiate corolla (though the 5 lobes are all located on the same side so it must be the result of a deliberate split of the corolla), and it seems to flower with the emerging leaves. Nevertheless, it does not seem to differ significantly from *L. hispida* species complex.

- 1a. Ovary glandular hairy, setose, or both, sometimes glabrous; nectary usually deeply gibbous; shrubs to 3 m.
- 2a. Ovary densely long setose; calyx broadly cupular, 4–5 mm in fruit, erect to reflexed ..... 20. *L. stephanocarpa*
- 2b. Ovary often glandular hairy and sometimes sparsely setose or glabrous; calyx inconspicuous or lobed and less than 4 mm in fruit .... 19. *L. hispida*
- 1b. Ovary glabrous; nectary usually shallowly gibbous; shrubs to 1 m.
- 3a. Shrubs to 1 m; bracts to more than 1/2 length of corolla; berries blue-black ..... 21. *L. cyanocarpa*
- 3b. Dwarf prostrate shrubs to 30 cm; bracts up to 1/2 length of corolla.
- 4a. Leaf blade oblong-lanceolate, margin minutely denticulate with rigid hairs; corolla narrowly tubular, 1.5–3.2 cm; berries red, pruinose ..... 22. *L. semenovii*
- 4b. Leaf blade oblong, margin not denticulate; corolla broadly funnelform, 2–2.5 cm; berries unknown ..... 23. *L. oreodoxa*

**19. *Lonicera hispida*** Pallas ex Schultes, Syst. Veg. 5: 258. 1819.

刚毛忍冬 *gang mao ren dong*

*Caprifolium hispidum* (Pallas ex Roemer & Schultes) Kuntze; *Lonicera anisocalyx* Rehder; *L. chaetocarpa* (Batalin ex Rehder) Rehder; *L. finitima* W. W. Smith; *L. hispida* var. *anisocalyx* (Rehder) P. K. Chou; *L. hispida* var. *chaetocarpa* Batalin ex Rehder; *L. hispida* var. *glabrata* Batalin; *L. hispida* var. *hirsutior* Regel; *L. hispida* var. *setosa* J. D. Hooker & Thomson; *L. montigena* Rehder.

For description see under species complex. Distinguishing characters for this species are as follows: Calyx inconspicuous to narrow and lobed. Ovary glandular hairy and sometimes sparsely setose or glabrous. Fl. May–Jun, fr. Jul–Sep.  $2n = 18^*$ .

Forests, scrub, alpine grasslands; 1700–4200(–4800) m. Gansu, W Hebei, S Ningxia, E Qinghai, S Shaanxi, Shanxi, W Sichuan, N Xinjiang, Xizang, NW Yunnan [Afghanistan, India (Sikkim), Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal; SW Asia (Iran)].

**20. *Lonicera stephanocarpa*** Franchet, J. Bot. (Morot) 10: 316. 1896.

冠果忍冬 *guan guo ren dong*

For description see under species complex. Distinguishing characters for this species are as follows: Calyx broadly cupular, 4–5 mm in fruit, erect to reflexed. Ovary densely long setose. Fl. Jul–Aug, fr. Sep–Oct.

• Forests, scrub; 2000–3200 m. SE Gansu, S Ningxia, S Shaanxi, E Sichuan.

**21. *Lonicera cyanocarpa*** Franchet, J. Bot. (Morot) 10: 314. 1896.

微毛忍冬 *wei mao ren dong*

*Lonicera cyanocarpa* var. *porphyrantha* C. Marquand & Airy Shaw; *L. mitis* Rehder; *L. mitis* var. *hobsonii* Rehder; *L. nubigena* Rehder; *L. viridiflava* Handel-Mazzetti.

For description see under species complex. Distinguishing characters for this species are as follows: Shrubs to 1 m. Bracts to more than 1/2 length of corolla. Flowers yellow or dark purple. Berries blue-black. Fl. Jun–Jul, fr. Aug.

Scrub, rocky grasslands; 3500–4300 m. Sichuan, Xizang, Yunnan [India (Sikkim), Nepal].

**22. *Lonicera semenovii*** Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 608. 1878.

藏西忍冬 *zang xi ren dong*

*Caprifolium semenovii* (Regel) Kuntze; *C. thomsonii* Kuntze; *Lonicera glauca* J. D. Hooker & Thomson.

For description see under species complex. Distinguishing characters for this species are as follows: Leaf blade oblong-lanceolate, margin minutely denticulate with rigid hairs. Corolla narrowly tubular, 1.5–3.2 cm. Berries red, pruinose. Fl. Jun–Jul, fr. Aug.

Rocky crevices of high mountains, rocky places; 4000–4300 m. W Xinjiang, W Xizang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan; SW Asia (Iran)].

**23. *Lonicera oreodoxa*** Harry Smith ex Rehder, J. Arnold Arb. 23: 381. 1942.

垫状忍冬 *dian zhuang ren dong*

For description see under species complex. Distinguishing characters for this species are as follows: Leaf blade oblong, margin not denticulate. Corolla broadly funnelform, 2–2.5 cm. Berries unknown.

• High mountains; 4700–4800 m. N Sichuan.

**24. *Lonicera elisae*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 32. 1883.

北京忍冬 *bei jing ren dong*

*Caprifolium elisae* (Franchet) Kuntze; *C. praecox* Kuntze; *Lonicera infundibulum* Franchet; *L. infundibulum* var. *rockii* Rehder; *L. pekinensis* Rehder; *L. praecox* (Kuntze) Rehder (1911), not K. Koch (1872).

Shrubs, deciduous, to 3 m tall. Winter buds with several pairs of scales, inner 1 accrescent and orbicular-ovate. Young branches glabrous, or setose, hirsute, and glandular hairy. Petiole 3–7 mm; leaf blade ovate to lanceolate, 2.5–7 × 1–4.5 cm, both surfaces adpressed stiffly hairy, more so abaxially, base rounded to cuneate, apex acute to acuminate. Inflorescences axillary paired flowers and at base of new shoots; flowers opening early in season; peduncle ca. 0.5 cm at anthesis; bracts broadly ovate to lanceolate, 6–10 mm, glabrous, pilose or glandular with few setose hairs; bracteoles none (original description with drawing of *Lonicera elisae* shows a pair of bracteoles; these not evident on type specimen). Neighboring 2 ovaries free, glandular hairy and hirsute, hirsute or glabrous. Calyx lobed to truncate, 2–3 mm, stiffly hairy and glandular ciliate or glabrous. Corolla white or pinkish, narrowly funnelform, 1.5–2 cm, outside stiffly hairy or glabrous, shallowly gibbous toward base; lobes subregular, ca. 1/3 as long as tube. Stamens slightly exserted and style long exserted, glabrous to hairy. Peduncle to 2.5 cm in fruit; berries orange to red, ellipsoid, ca. 1 cm, sparsely glandular hairy and hirsute or glabrous; seeds yellowish brown, slightly compressed, oblong or ovoid, 3.5–4 mm, smooth. Fl. Apr–May, fr. May–Jun.

• Forests, scrub; 500–1600(–2300) m. SW Anhui, SE Gansu, Hebei, Henan, W Hubei, S Shaanxi, S Shanxi, Sichuan, NW Zhejiang.

**25. *Lonicera subhispida*** Nakai, J. Coll. Sci. Imp. Univ. Tokyo 42(2): 92. 1921.

单花忍冬 *dan hua ren dong*

*Lonicera monantha* Nakai.

Shrubs, deciduous, 1–2 m tall. Winter buds with several pairs of scales, inner ones accrescent and orbicular-ovate. Branches glandular and slightly setose or subglabrous. Petiole 3–7 mm; leaf blade oblong to ovate, 4–7 × 2.2–5 cm, both surfaces adpressed hispid and sparsely setose, base rounded to cuneate, margin bristly ciliate, apex mucronate or acute. Inflorescence reduced to a single flower or sometimes with a second flower partially developed, axillary at base of new shoots; flowers opening early in season; peduncle 0.5–1.2 mm at anthesis, accrescent to 25 mm in fruit, sparsely spreading glandular hairy; bract usually 1, sometimes with an opposite reduced bract, ovate-lanceolate, 7–14 mm, stiffly hairy and glandular hairy; bracteoles absent. Ovary with sparse glands. Calyx 0.3–0.5 mm, margin truncate to toothed. Corolla yellow, funnel-form, 1.5–2 cm; tube gibbous toward base; lobes regular, to 1/2 as long as tube, outside hairy and sparsely glandular. Stamens and style glabrous, subequaling corolla. Berry red, fusiform or ellipsoid, 8–14 mm, glabrous; seeds 3.5–4 mm. Fl. May, fr. Jun.

Forests; ca. 800 m. Jilin, ?Liaoning [Korea, Russia].

**26. *Lonicera humilis*** Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 370. 1842.

矮小忍冬 *ai xiao ren dong*

*Caprifolium altmannii* (Regel & Schmalhausen) Kuntze; *C. humile* (Karelin & Kirilov) Kuntze; *Lonicera altmannii* Regel & Schmalhausen; *L. cinerea* Pojarkova.

Shrubs, deciduous, to 2 m tall, sometimes dwarf and cushionlike. Winter buds with several pairs of scales, lowest pair nearly surrounding whole bud. Branches with persistent petiole bases, densely puberulent, later glabrous to densely setose-hairy and with mixed glandular hairs. Petiole 1.5–5 mm; leaf blade ovate or elliptic to oblong, 0.6–4.5 × 0.4–2.5 cm, both surfaces densely adpressed setose to glabrous, sometimes scattered verrucose and with mixed glandular hairs, base broadly cuneate to rounded, margin often ciliate, apex obtuse or acute to acuminate. Inflorescences axillary paired flowers and at base of new shoots; flowers opening early in season; peduncles 2–15 mm, usually puberulent and glandular hairy; bracts usually lanceolate, sometimes ovate, 5–12 mm, pubescent, outside glandular hairy and adpressed hairy, inside glandular hairy, margin ciliate; bracteoles absent. Neighboring 2 ovaries free, glabrous or glandular hairy. Calyx ca. 1 mm, subtruncate to shallowly lobed, sometimes sparsely long ciliate. Corolla bilabiate, yellow, 1.5–2 cm; tube shallowly to deeply gibbous toward base, outside sparsely spreading hairy, inside puberulent; lower lip slightly recurved; upper lip 4-lobed to middle. Stamens and style subequaling corolla, exerted; style sparsely stiff hairy at base. Berries red, sometimes pruinose, ob-lanceolate-ovoid, 5–8 mm; seeds yellowish brown, oblong or ellipsoid, 2.5–3 mm, smooth. Fl. Apr–Jun, fr. Jul–Aug.

Subalpine or alpine rocky slopes and crevices of steep cliffs, scrub of forest understories, grassy slopes; 1000–2500 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan].

## 27–28. *Lonicera alpigena* species complex

Shrubs, deciduous, to 4 m tall. Winter buds with 2–5 pairs of outer scales; inner scales accrescent, enlarged and sometimes reflexed. Branches glabrous to densely hairy with mixed glandular hairs. Petiole 3–20 mm; leaf blade obovate or ovate-elliptic to ovate-lanceolate, 1.5–17 × 0.8–6 cm, with dense or sparse stiff hairs and sparse glands or glabrous, base cuneate to subcordate, margin ciliate, apex apiculate to long acuminate. Inflorescences axillary, paired flowers; peduncle 0.5–9 cm, usually thickened toward apex; bracts linear-subulate, to 10 mm, or sometimes minute or leaflike and ovate-lanceolate, to 15 mm; bracteoles separate or sometimes fused into a cupule, ovate to oblong, to 1 mm, ciliate. Neighboring 2 ovaries free to fused, glabrous or densely glandular hairy. Calyx lobes ovate to orbicular, to 1 mm, sometimes forming a collarlike emergence at base, apex irregularly lobed, sometimes glandular ciliate. Corolla bilabiate, purple-red, very rarely white or turning from white to yellow, 1–1.5 cm, outside sparsely pubescent and glandular hairy or glabrous; tube 4–7 mm, inside puberulent, deeply gibbous above slender base; upper lip erect, 4-lobed to 1/4; lower lip recurved. Stamens subequaling corolla; filaments and style hirsute on lower part or glabrous. Berries red or black, globose, ca. 1 cm in diam.; seeds ellipsoid, 5–6 mm, shallowly pitted to smooth. Fl. Apr–Jun, fr. Jun–Oct.

Needle-leaved and broad-leaved mixed forests, scrub, grassy slopes; 900–4000 m. Anhui, S Gansu, W Henan, Hubei, Jiangxi, S Ningxia, E Qinghai, S Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, NW Yunnan, Zhejiang [Afghanistan, Bhutan, India, Kashmir, Myanmar, Russia; Europe].

*Lonicera alpigena* Linnaeus occurs in Europe; further studies are necessary to better understand the relationships within this species complex in Europe and Asia.

The type specimen of *Lonicera jilongensis* P. S. Hsu & H. J. Wang (Acta Phytotax. Sin. 17(4): 76. 1979) has suffered extensive insect damage, but it seems to belong here.

- 1a. Ovaries free (exceptionally fused  
1/2–2/3) ..... 27. *L. webbiana*  
1b. Ovaries completely fused ..... 28. *L. fargesii*

**27. *Lonicera webbiana*** Wallich ex Candolle, Prodr. 4: 336. 1830.

华西忍冬 hua xi ren dong

*Caprifolium hemsleyanum* Kuntze; *C. karelinii* Kuntze; *Lonicera adenophora* Franchet; *L. alpigena* Linnaeus var. *phaeantha* Rehder; *L. hemsleyana* (Kuntze) Rehder; *L. heteroloba* Batalin; *L. heterophylla* Decaisne; *L. heterophylla* var. *karelinii* (Bunge ex Kirilov) Rehder; *L. jilongensis* P. S. Hsu & H. J. Wang; *L. karelinii* Bunge ex Kirilov; *L. mupinensis* Rehder; *L. perulata* Rehder; *L. tatsienensis* Franchet; *L. webbiana* var. *lanpinensis* Y. C. Tang; *L. webbiana* var. *mupinensis* (Rehder) P. S. Hsu & H. J. Wang; *Xylosteon karelinii* Kuntze.

For description see under species complex. Distinguishing characters for this species are as follows: Ovaries free. Fl. May–Jun, fr. Aug–Sep.

Needle-leaved and broad-leaved mixed forests, scrub, grassy slopes; 1800–4000 m. S Gansu, W Hubei, Jiangxi, S Ningxia, E Qinghai, S Shaanxi, Shanxi, Sichuan, Xizang, NW Yunnan [Afghanistan, Bhutan, Kashmir].

**28. *Lonicera fargesii*** Franchet, J. Bot. (Morot) 10: 312. 1896.

粘毛忍冬 nian mao ren dong

For description see under species complex. Distinguishing characters for this species are as follows: Ovaries fused. Fl. May–Jun, fr. Sep–Oct.

• Forests, scrub; 1600–2900 m. Chongqing, S Gansu, W Henan, S Shaanxi, Shanxi, Sichuan.

- 1a. Bracts leaflike, 8–15 mm ..... 28a. var. *fargesii*  
1b. Bracts subulate to linear ..... 28b. var. *setchuenensis*

**28a. *Lonicera fargesii* var. *fargesii***

粘毛忍冬(原变种) nian mao ren dong (yuan bian zhong)

*Lonicera vegeta* Rehder.

Bracts leaflike, 8–15 mm. Fl. May–Jun, fr. Sep–Oct.

• Forests, scrub; 1600–2900 m. S Gansu, W Henan, S Shaanxi, Shanxi, Sichuan.

**28b. *Lonicera fargesii* var. *setchuenensis*** (Franchet) Q. E. Yang, Landrein, Borosova & J. Osborne, *comb. nov.*

四川粘毛忍冬 si chuan nian mao ren dong

Basionym: *Lonicera orientalis* Lamarck var. *setchuenensis* Franchet, J. Bot. (Morot) 10: 311. 1896; *L. setchuenensis* (Franchet) Rehder.

Bracts subulate to linear. Fl. and fr. unknown.

● Chongqing.

**29. *Lonicera oblata*** K. S. Hao ex P. S. Hsu & H. J. Wang, *Acta Phytotax. Sin.* 17(4): 77. 1979.

丁香叶忍冬 *ding xiang ye ren dong*

Shrubs, deciduous, to 2 m tall. Winter buds with 2 pairs of ovate and apically long acute outer scales; inner scales accrescent, enlarged and reflexed. Branches subquadrangular; branches, petioles, and peduncles densely or sparsely glandular hairy. Petiole 1.5–2.5 cm; leaf blade broadly triangular-ovate to broadly rhombic-ovate, 2.5–5.3 × 2.5–5.3 cm, base broadly cuneate to truncate, apex cuspidate and mucronate or obtuse. Inflorescences axillary paired flowers; peduncle 7–10 mm; bracts subulate, to 1/2 as long as ovaries, glandular hairy; bracteoles fused into a cupule, 1/3–2/5 as long as ovaries, glandular ciliate. Neighboring 2 ovaries free, glabrous. Calyx cupular, inconspicuously dentate. Corolla bilabiate, yellowish, ca. 1.3 cm, outside sparsely puberulent and glandular hairy; tube ca. 0.7 cm, shallowly gibbous toward base, inside villous; lobes of upper lip ovate, lobed to ca. 1/3; lower lip reflexed. Stamens slightly exceeding corolla; filaments subequal, villous on lower part. Style slightly shorter than corolla, densely villous. Berries red, globose, ca. 6 mm in diam.; seeds brownish, suborbicular or ovoid-orbicular, slightly compressed, smooth, 3–4 mm. Fl. May, fr. Jul.

● Stony slopes; ca. 1200 m. Hebei (Neiqiu).

**30. *Lonicera modesta*** Rehder in Sargent, *Trees & Shrubs* 2: 49. 1907.

下江忍冬 *xia jiang ren dong*

*Lonicera graebneri* Rehder; *L. modesta* var. *lushanensis* Rehder.

Shrubs, deciduous, to 2 m tall. Winter buds with ca. 5 pairs of outer acute, keeled scales; inner scales sometimes accrescent and enlarged. Branches, petioles, and peduncles densely pubescent or glabrous. Petiole 2–5 mm; leaf blade elliptic to oblong, broadly ovate, obovate, or rhombic, 2–8 × 1.5–6 cm, abaxially pubescent, glabrous or sparsely pubescent only on veins, adaxially glabrous or pubescent often only on midvein and lateral veins, base cuneate to rounded, margin ciliate, apex obtuse, mucronate, or slightly emarginate. Inflorescences axillary, paired flowers; peduncle 1–7 mm; bracts subulate, 2–3 mm, ciliate; bracteoles fused into a cupule, ca. 1/3 as long as ovaries, ciliate, with sparse glands. Neighboring 2 ovaries half to completely fused. Calyx lobes linear-lanceolate, 2–2.5 mm, ciliate, sometimes with sparse glands. Corolla bilabiate, white, base reddish, later yellow, 1–1.2 cm, outside sparsely pubescent or subglabrous; tube ca. 5 mm, shallowly gibbous at base, inside densely hairy; upper lip 4-lobed, lobes 2–3 mm; lower lip recurved. Stamens and style exerted from corolla tube; filaments glabrous or hairy at base. Style hairy throughout. Berries turning from orange-red to red, 7–8 mm in diam.; seeds 1–4, yellowish brown, slightly compressed, ovoid or oblong, 4–6 mm, minutely granular-raised and coarse. Fl. May–Jun, fr. Jul–Oct.

● Mixed forests, scrub; 500–1700 m. Anhui, ?Fujian, SE Gansu, W Henan, Hubei, Hunan, Jiangxi, S Shaanxi, Zhejiang.

### 31–33. *Lonicera nigra* species complex

Shrubs, deciduous, to 4 m tall. Winter buds with several pairs of outer acute, keeled scales; inner scales sometimes accrescent and enlarged. Branches with white or sometimes brown pith. Young branches and peduncles often puberulent and glandular hairy. Petiole 2–10 mm; leaf blade oblong to elliptic-lanceolate, 1.5–10 × 1–3 cm, glabrous throughout but abaxially often white hairy on midvein, base cuneate to rounded, apex acute to acuminate. Inflorescences axillary, paired flowers; peduncle 0.5–3 cm; bracts lanceolate-linear, ca. 2 mm; bracteoles free, fused into 2 pairs or into an entire or lobed cupule, 1/3 to almost as long as ovaries, glandular ciliate. Neighboring 2 ovaries free, fused in lower half or completely fused. Calyx lobes triangular or linear-lanceolate, 1–2 mm, sometimes with a collar emergence at base, glandular ciliate. Corolla bilabiate, purplish, purple-red, or white becoming yellow, 9–13 mm; tube ca. 5 mm, shallowly gibbous at base, outside puberulent or glabrous, inside puberulent; upper lip crenulate; lower lip reflexed. Stamens and style exerted from corolla tube; filaments glabrous or hairy at base. Style hairy below middle part or throughout. Berries black, often pruinose, globose, 5–7 mm in diam.; seeds oblong or ovoid, 3–7 mm, granular-raised and coarse. Fl. Apr–Jul, fr. Aug–Oct.  $2n = 18$ .

Forests, scrub, coniferous forests, forest margins, grasslands; 1500–4000 m. W Anhui, Gansu, NE Guizhou, W Henan, W Hubei, Jilin, Ningxia, Qinghai, Shaanxi, S Shanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Korea, Nepal; Europe].

*Lonicera govaniana* Wallich ex Candolle (*Prodr.* 4: 337. 1830) and *L. orientalis* Lamarck (*Encycl.* 1: 731. 1785) belong to *L. caucasica* Pal-las (*Fl. Ross.* 1(1): 57. 1784). Further studies are necessary to determine if *L. caucasica*, predominantly from Asia Minor and S Asia, differs from *L. nigra* in Europe and China.

- 1a. Leaf blade usually obovate, 1–2.5 × 0.7–1.8 cm, abaxially often pruinose, apex retuse to obtuse; ovaries completely fused or sometimes free in upper part; corolla white with reddish base, later yellow ..... 33. *L. retusa*
- 1b. Leaf blade oblong to elliptic-lanceolate, 1.5–10 × 1–3 cm, glabrous throughout but abaxially often white hairy on midvein; ovaries free or fused only at base.
  - 2a. Corolla purplish or purple-red ..... 31. *L. nigra*
  - 2b. Corolla white, later yellow ..... 32. *L. nervosa*

**31. *Lonicera nigra*** Linnaeus, *Sp. Pl.* 1: 173. 1753.

黑果忍冬 *hei guo ren dong*

*Caprifolium decipiens* (J. D. Hooker & Thomson) Kuntze; *C. nigrum* (Linnaeus) Kuntze; *Lonicera acrophila* H. Léveillé; *L. barbinervis* Komarov; *L. decipiens* J. D. Hooker & Thomson; *L. lanceolata* Wallich; *L. nigra* var. *barbinervis* (Komarov) Nakai; *L. wardii* W. W. Smith.

For description see under species complex. Distinguishing characters for this species are as follows: Leaf blade oblong to

elliptic-lanceolate,  $1.5-10 \times 1-3$  cm, glabrous throughout but abaxially often white hairy on midvein. Corolla purplish or purple-red. Ovaries free or fused in lower half. Fl. Apr–Jul, fr. Aug–Oct.  $2n = 18$ .

Forests, scrub, coniferous forests, forest margins; 1500–3900 m. W Anhui, NE Guizhou, W Hubei, Jilin, Sichuan, Xizang, Yunnan [Bhutan, India, Korea, Nepal; Europe].

**32. *Lonicera nervosa*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 38. 1877.

红脉忍冬 hong mai ren dong

*Caprifolium nervosum* (Maximowicz) Kuntze; *Lonicera lanceolata* Wallich subsp. *nervosa* (Maximowicz) Y. C. Teng.

For description see under species complex. Distinguishing characters for this species are as follows: Leaf blade elliptic to ovate-oblong,  $2.5-6 \times 1-3$  cm. Corolla white, later yellow. Ovaries free. Fl. Jun–Jul, fr. Aug–Sep.

• Scrub of forest understories, grasslands; 2100–4000 m. Gansu, W Henan, Ningxia, Qinghai, Shaanxi, S Shanxi, Sichuan.

**33. *Lonicera retusa*** Franchet, J. Bot. (Morot) 10: 313. 1896.

凹叶忍冬 ao ye ren dong

*Lonicera kachkarovii* (Batalin) Rehder; *L. limprichtii* Pax & K. Hoffmann; *L. orientalis* Lamarck var. *kachkarovii* Batalin.

For description see under species complex. Distinguishing characters for this species are as follows: Leaf blade obovate, obovate-spatulate, or elliptic to broadly ovate,  $1-2.5 \times 0.7-1.8$  cm, abaxially often pruinose, puberulent and glandular dotted, base cuneate to broadly cuneate, apex retuse, truncate or sometimes obtuse. Corolla white with reddish base, later yellow. Ovaries completely fused or sometimes free in upper part. Fl. May–Jun, fr. Sep–Oct.

• Scrub; 2000–3300 m. S Gansu, S Shaanxi, SW Shanxi, W Sichuan.

### 34–36. *Lonicera maximowiczii* species complex

Shrubs, deciduous, to 2 m tall. Winter buds with several pairs of outer acute, keeled scales; inner scales sometimes accrescent and enlarged. Branches sparsely puberulent to glabrescent. Petiole 2–8 mm; leaf blade ovate or broadly ovate to oblong-lanceolate,  $4-12 \times 1.5-3.5$  cm, abaxially sparsely strigose, minutely tomentose, or glabrous, adaxially sparsely strigose or glabrous, base cuneate to rounded, margin often ciliate, apex acute to acuminate. Inflorescences axillary, paired flowers; peduncle 1–2.5 cm, glabrous or sparsely hairy; bracts subulate, 1–3 mm; bracteoles fused into a cupule, 1/3 to as long as ovaries. Neighboring 2 ovaries more than half to completely fused, very rarely completely free. Calyx lobes triangular to linear, 1–1.5 mm. Corolla bilabiate, dark purple to purple-red or white becoming yellow, ca. 1 cm, outside glabrous; tube slightly gibbous toward base, ca. 4 mm, inside densely hairy; upper lip 4 lobed, lobes 1–2 mm; lower lip recurved. Stamens and style exerted from corolla tube; filaments hairy at base. Style hairy throughout. Berries red, ovoid-orbicular; seeds yellowish brown, oblong, 4–5 mm, granular and coarse. Fl. May–Jul, fr. Aug–Sep.

Forests, forest margins, scrub; 400–2400 m. S Gansu, Hebei, Heilongjiang, ?Henan, Jilin, Liaoning, ?Nei Mongol, Ningxia, Shaanxi, Shandong, N Sichuan [Japan, Korea, Russia].

1a. Corolla white, later yellow ..... 36. *L. kansuensis*

1b. Corolla dark purple or purple-red.

2a. Corolla purple-red; leaves sparsely strigose or glabrous abaxially ..... 34. *L. maximowiczii*

2b. Corolla dark purple; leaves minutely tomentose abaxially ..... 35. *L. tatarinowii*

**34. *Lonicera maximowiczii*** (Ruprecht) Regel, Gartenflora 6: 107. 1857.

紫花忍冬 zi hua ren dong

*Xylosteon maximowiczii* Ruprecht, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 136. 1857; *Caprifolium maximowiczii* (Ruprecht) Kuntze; *Lonicera maximowiczii* var. *sachalinensis* F. Schmidt.

For description see under species complex. Distinguishing characters for this species are as follows: Leaves sparsely strigose or glabrous abaxially. Corolla purple-red. Fl. Jun–Jul, fr. Aug–Sep.  $2n = 18, 36$ .

Forests, forest margins; 800–1800 m. ?Hebei, Heilongjiang, Jilin, Liaoning, ?Nei Mongol, Shandong [Japan, Korea, Russia].

**35. *Lonicera tatarinowii*** Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 138. 1859.

华北忍冬 hua bei ren dong

*Caprifolium tatarinowii* (Maximowicz) Kuntze; *Lonicera leptantha* Rehder; *L. tatarinowii* var. *leptantha* (Rehder) Nakai.

For description see under species complex. Distinguishing characters for this species are as follows: Leaves minutely tomentose abaxially. Corolla dark purple. Fl. May–Jun, fr. Aug–Sep.

• Mixed forests, scrub; 400–1800 m. NW Hebei, ?Henan, Liaoning, ?Nei Mongol, E Shandong.

**36. *Lonicera kansuensis*** (Batalin ex Rehder) Pojarkova in Schischkin, Fl. URSS 23: 540. 1958.

甘肃忍冬 gan su ren dong

*Lonicera orientalis* Lamarck var. *kansuensis* Batalin ex Rehder, Rep. (Annual) Missouri Bot. Gard. 14: 119. 1903.

For description see under species complex. Distinguishing characters for this species are as follows: Leaves abaxially adpressed puberulent, more densely hairy on both sides of midvein. Corolla white, becoming yellow. Fl. Jun, fr. Sep.

• Sparse forests; 1800–2400 m. S Gansu, Ningxia, Shaanxi, N Sichuan.

**37. *Lonicera tatarica*** Linnaeus, Sp. Pl. 1: 173. 1753.

新疆忍冬 xin jiang ren dong

Shrubs, deciduous, to 3 m tall,  $\pm$  pruinose. Winter buds small, with ca. 4 pairs of ovate scales. Branches with pith be-

coming brown and later hollow. Petiole 2–5 mm; leaf blade ovate or ovate-oblong, sometimes oblong, 2–5 × 1–2 cm, both surfaces glabrous or sparsely pubescent, sometimes prominently pubescent, base rounded or slightly cordate, margin ciliate, apex acute or obtuse. Inflorescences axillary paired flowers; peduncle 1–2 cm; bracts linear to obovate-lanceolate, 2–7 mm; bracteoles free in 2 pairs, orbicular-ovate, to 1 mm, sometimes as long as ovaries and ciliate. Neighboring 2 ovaries free. Calyx lobes triangular-lanceolate, to 1 mm. Corolla bilabiate, pale pink to carmine-red, sometimes white or pink fading to yellow, ca. 1.5 cm; tube 5–6 mm, shallowly gibbous at base; upper lip 4 lobed, 2 lateral lobes lobed to base and spreading, middle lobes shallowly lobed; lower lip recurved. Stamens and style exerted from corolla tube. Style pubescent throughout. Berries red or yellow, globose, 5–6 mm in diam.; seeds 2–2.3 mm, smooth with concave dots. Fl. May–Jun, fr. Jun–Sep.

Forest margins, scrub; 700–1600 m. ?Hebei, Heilongjiang, Liaoning, N Xinjiang [Japan, Korea, Kyrgyzstan, ?Mongolia, Russia].

- 1a. Corolla white, or pink, not fading to yellow ..... 37a. var. *tatarica*  
 1b. Corolla white or pink fading to yellow ..... 37b. var. *morrowii*

### 37a. *Lonicera tatarica* var. *tatarica*

新疆忍冬(原变种) xin jiang ren dong (yuan bian zhong)

*Caprifolium micranthum* (Trautvetter) Kuntze; *Lonicera micrantha* (Trautvetter) Trautvetter ex Regel; *L. tatarica* var. *micrantha* Trautvetter; *L. tatarica* var. *puberula* Regel & Winkler.

Corolla white, or pink, not fading to yellow. Fl. May–Jun, fr. Jul–Aug.  $2n = 18$ .

Forest margins, scrub; 700–1600 m. ?Hebei, Heilongjiang, Liaoning, N Xinjiang [Kyrgyzstan, ?Mongolia, Russia].

### 37b. *Lonicera tatarica* var. *morrowii* (A. Gray) Q. E. Yang, Landrein, Borosova & J. Osborne, **comb. et stat. nov.**

淡黄新疆忍冬 dan huang xin jiang ren dong

Basionym: *Lonicera morrowii* A. Gray in Perry, Narr. Exped. China Japan 2: 313. 1856; *Xylosteon morrowii* (A. Gray) Moldenke.

Corolla white, or pink fading to yellow. Fl. May, fr. Jun–Sep.

Forest margins, scrub. Heilongjiang, Liaoning [Japan, Korea; introduced and invasive in North America].

"*Lonicera insularis* Nakai var. *mandshurica*" and "var. *lutescens*" (Skvortsov, China J. 13: 389. 1935) both belong to *L. tatarica* var. *morrowii* but were not validly published because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

### 38. *Lonicera ruprechtiana* Regel, Index Sem. Hort. Petrop., Suppl. 19. 1869.

长白忍冬 chang bai ren dong

*Caprifolium ruprechtianum* (Regel) Kuntze; *Lonicera brevisepala* P. S. Hsu & H. J. Wang; *L. chrysantha* Turczaninow ex Ledebour var. *subtomentosa* (Ruprecht) Maximowicz; *L. ru-*

*prechtiana* var. *lanceolata* Skvortsov; *L. ruprechtiana* var. *xanthocarpa* Zabel; *Xylosteon gibbiflorum* Ruprecht & Maximowicz var. *subtomentosum* Ruprecht.

Shrubs, deciduous, to 3 m tall. Winter buds with several pairs of ovate and acute scales; inner scales often accrescent. Branches with pith becoming brown and later hollow. Branches and petioles tomentose-pubescent to sparsely pubescent, minutely yellow-brown glandular hairy, or subglabrous; petiole 3–8 mm; leaf blade ovate-oblong to oblong-lanceolate, 2–8 × 0.7–2.5 cm, abaxially densely strigose to villous or sparsely pubescent, adaxially sparsely pubescent or subglabrous, base rounded to cuneate, margin sometimes dentate, apex acute to acuminate. Inflorescences axillary paired flowers; peduncle 10–16 mm, sparsely pubescent to tomentose and minutely glandular hairy; bracts linear, 1–8 mm, pubescent and glandular ciliate; bracteoles free in 2 pairs, orbicular-ovate to ovate-lanceolate, to 1 mm. Neighboring 2 ovaries free. Calyx lobes triangular-lanceolate, ca. 1 mm. Corolla bilabiate, white, later yellow, 12–16 mm, outside glabrous; tube short, 4–5 mm, inside densely pubescent, deeply gibbous toward base; upper lip 4-lobed; 2 lateral lobes of upper lip usually lobed 1/2–3/4 and slightly spreading, middle lobes shallowly lobed; lower lip recurved. Stamens and style exerted from corolla tube; style pubescent throughout; stigmas capitate, large. Berries yellow, orange-red, or red, globose, 5–7 mm in diam.; seeds brown, ellipsoid, ca. 3 mm, with minute concave dots. Fl. May–Jun, fr. Jul–Aug.  $2n = 18$ .

Broad-leaved forests, forest margins; 300–1100 m. Heilongjiang, Jilin, Liaoning [N Korea, Russia].

*Lonicera ruprechtiana* var. *calvescens* Rehder (Mitt. Deutsch. Dendrol. Ges. 1912: 194. 1913) was described from a cultivated specimen at the Arnold Arboretum, grown from seed collected near Vladivostok.

### 39. *Lonicera chrysantha* Turczaninow ex Ledebour, Fl. Ross. 2(1): 388. 1844.

金花忍冬 jin hua ren dong

Shrubs, deciduous, to 4 m tall. Winter buds ovoid-lanceolate, with several pairs of scales; outer scales triangular, sparsely puberulent; inner scales accrescent, lanceolate, densely pubescent and white long ciliate outside. Branches with pith becoming brown and later hollow. Branches and petioles spreading pubescent with interspersed minute glands. Petiole 4–10 mm; leaf blade ovate to rhombic or oblong to lanceolate, 3–10 × 1–5 cm, abaxially densely strigose to villous or sparsely pubescent, adaxially sparsely pubescent or subglabrous, base cuneate to rounded, margin ciliate, apex rounded or acute to acuminate or caudate. Inflorescences fragrant, axillary paired flowers; peduncle 1.5–3 cm; bracts linear or narrowly linear-lanceolate, 2.5–8 mm, often exceeding ovaries; bracteoles of each flower fused or separate, ovate to suborbicular, ca. 1 mm, long ciliate. Neighboring 2 ovaries free, ± glandular, glabrous or densely hairy. Calyx lobes ovate, with rounded apex, ciliate and glandular, sometimes with a collarlike emergence at base. Corolla bilabiate, white at first, later yellow, sometimes tinged orange-red, 1–1.5 cm, outside sparsely to densely hairy; tube 2–5 mm, pubescent inside, deeply or sometimes inconspicuously gibbous toward base; upper lip shallowly 4-lobed; lower lip re-

curved. Stamens and style exerted from corolla tube; filaments densely hairy below middle; connectives sometimes pubescent; style hairy throughout. Berries red, orbicular, ca. 5 mm in diam.; seeds brown-red, ellipsoid, ca. 3 mm, with minute concave dots and sometimes with red glands. Fl. May–Jun, fr. Jul–Sep.  $2n = 18$ .

Forests, scrub at forest margins; 200–3000(–3800) m. Anhui, Gansu, Guizhou, Hebei, S Heilongjiang, W Henan, Hubei, Jiangsu, Jiangxi, E Jilin, S Liaoning, S Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Japan, N Korea, Mongolia, Russia; Europe].

*Lonicera chrysantha* is from the *L. xylosteum* species complex and is the only species in the complex occurring in China. *Lonicera xylosteum* Linnaeus occurs in Europe and Russia; further studies are necessary to better understand the relationships within this complex.

- 1a. Ovary glandular hairy; leaves abaxially  
sparsely strigose ..... 39a. var. *chrysantha*  
1b. Ovary pilose and glandular hairy;  
leaves abaxially tomentose-pubescent  
..... 39b. var. *koehneana*

**39a. *Lonicera chrysantha* var. *chrysantha***

金花忍冬(原变种) jin hua ren dong (yuan bian zhong)

*Caprifolium chrysanthum* (Turczaninow ex Ledebour) Kuntze; *Lonicera chrysantha* f. *crassipes* (Nakai) S. L. Tung; *L. chrysantha* var. *crassipes* Nakai; *L. chrysantha* var. *linearifolia* S. W. Liu & T. N. Ho; *L. chrysantha* var. *longipes* Maximowicz; *L. chrysantha* f. *villosa* Rehder; *Xylosteon chrysanthum* (Turczaninow ex Ledebour) Ruprecht.

Leaves abaxially sparsely strigose. Ovary glandular hairy.

Forests, scrub at forest margins; 200–2000(–3000) m. S Gansu, Hebei, S Heilongjiang, W Henan, Hubei, Jiangsu, Jiangxi, E Jilin, S Liaoning, S Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan [Japan, N Korea, Russia].

**39b. *Lonicera chrysantha* var. *koehneana* (Rehder) Q. E. Yang, Landrein, Borosova & J. Osborne, **comb. in stat. nov.****

须蕊忍冬 xu rui ren dong

Basionym: *Lonicera koehneana* Rehder in Sargent, *Trees & Shrubs* 1: 41. 1902; *L. chrysantha* subsp. *koehneana* (Rehder) P. S. Hsu & H. J. Wang; *L. gynopogon* H. Léveillé; *L. koehneana* var. *chrysanthoides* Rehder; *L. koehneana* var. *intecta* Rehder; *L. koehneana* var. *pallescens* Rehder; *L. koehneana* var. *pogonanthera* Handel-Mazzetti; *L. vestita* W. W. Smith.

Leaves abaxially tomentose-pubescent. Ovary pilose and glandular hairy.

• Forests, scrub at forest margins; 700–3000(–3800) m. Anhui, Gansu, Guizhou, W Henan, W Hubei, Jiangsu, Shaanxi, Shandong, SW Shanxi, Sichuan, Xizang, Yunnan, Zhejiang.

**40. *Lonicera maackii* (Ruprecht) Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 136. 1859.**

金银忍冬 jin yin ren dong

Shrubs, deciduous, to 6 m tall; trunk to 10 cm in diam. Winter buds ovoid, with several pairs of scales; outer scales tri-

angular, sparsely puberulent; inner scales accrescent, lanceolate, outside pubescent. Branches with pith becoming brown and later hollow. Branches and petioles spreading pubescent with interspersed minute glands. Petiole 2–9 mm; leaf blade green or purplish when young, usually ovate-lanceolate, 2.5–8 × 1.5–4 cm, abaxially sparsely strigose, adaxially sparsely pubescent or subglabrous, base broadly cuneate to rounded, margin ciliate, apex acute to long acuminate. Inflorescence fragrant, axillary paired flowers; peduncle 1–3 mm, shorter than petioles; bracts linear, sometimes leaflike, 3–7 mm; bracteoles of each flower ± fused, green or purplish, ca. 1 mm, apex truncate and ciliate. Neighboring 2 ovaries free, glabrous or sparsely minutely glandular hairy. Calyx campanulate, 2–3 mm, scarious between lobes; lobes broadly triangular, unequal, apex acute. Corolla bilabiate, purplish, or white at first, later yellow, ca. 2 cm, outside shortly adpressed hairy or glabrous; tube 4–5 mm, shallowly gibbous toward base, inside puberulent or glabrous; upper lip 4-lobed; lower lip recurved. Stamens and style exerted from corolla tube; filaments and style with minute hairs below middle. Berries dark red, orbicular, 5–6 mm in diam.; seeds with minute shallow concave dots. Fl. May–Jun, fr. Aug–Oct.  $2n = 18$ .

Forests, scrub; 100–1800(–3000) m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, ?Nei Mongol, Shaanxi, Shandong, S Shanxi, NE Sichuan, Xizang, Yunnan, N Zhejiang [Japan, Korea, Russia; introduced and invasive in North America].

*Lonicera quinquelocularis* Hardwicke has been cited in China (*A. Henry* 3853); it is possibly not distinct from *L. maackii* except for the translucent berries with dark colored seeds.

- 1a. Corolla white at first, later yellow;  
bracteoles and young leaves green ..... 40a. var. *maackii*  
1b. Corolla, bracteoles, and young leaves  
purplish ..... 40b. var. *erubescens*

**40a. *Lonicera maackii* var. *maackii***

金银忍冬(原变种) jin yin ren dong (yuan bian zhong)

*Xylosteon maackii* Ruprecht, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 369. 1857; *Caprifolium maackii* (Ruprecht) Kuntze; *Lonicera maackii* f. *podocarpa* Franchet ex Rehder.

Corolla white at first, later yellow. Bracteoles and young leaves green.

Forests, scrub; 100–1800(–3000) m. Anhui, SE Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, S Shanxi, NE Sichuan, Xizang, Yunnan, N Zhejiang [Japan, Korea, Russia].

**40b. *Lonicera maackii* var. *erubescens* (Rehder) Q. E. Yang, Landrein, Borosova & J. Osborne, **stat. nov.****

红花金银忍冬 hong hua jin yin ren dong

Basionym: *Lonicera maackii* f. *erubescens* Rehder, Mitt. Deutsch. Dendrol. Ges. 22: 263. 1913.

Corolla, bracteoles, and young leaves purplish.

• Forests, scrub; 100–300 m. Anhui, Gansu, Henan, Jiangsu, ?Liaoning.

**41. *Lonicera trichosantha*** Bureau & Franchet, J. Bot. (Morot) 5: 48. 1891.

毛花忍冬 mao hua ren dong

Shrubs, deciduous, 3–5 m tall, occasionally prostrate. Winter buds with 5 or 6 pairs of scales; outer scales triangular, sparsely puberulent; inner scales sometimes accrescent, lanceolate, inside pubescent. Branches with pith becoming brown and later hollow. Branches horizontally spreading; together with petioles and peduncles densely or sparsely pubescent and minutely glandular hairy to subglabrous. Petiole 1–7 mm; leaf blade greatly varied in shape, obovate, ovate, oblong-elliptic, or ovate-lanceolate, 1–10 × 0.5–3.5 cm, both surfaces pubescent, abaxially densely pubescent or only on midvein, base rounded or broadly cuneate, rarely truncate or shallowly cordate, margin ciliate, apex obtuse and mucronate or acute to acuminate. Inflorescence axillary paired erect flowers; peduncle 1–10 mm; bracts linear-lanceolate, 3–5 mm, early withering; bracteoles suborbicular-ovate, ca. 2 mm, 1/3–1/2 as long as ovaries, ± fused at base and cupular, apex slightly truncate to lobed. Neighboring 2 ovaries free, glabrous. Calyx campanulate, 1.5–2(–4) mm, scarious, lacinate or split to base into 1 to several lobes; bracts, bracteoles, and calyx glabrous to sparsely pubescent and glandular. Corolla bilabiate, yellow, 1.2–1.5 cm, outside strigose and glandular hairy; tube ca. 4 mm, often shallowly gibbous toward base, inside densely puberulent; upper corolla lip shallowly 4-lobed; lower lip recurved, oblong, 8–11 mm. Stamens and style exerted from corolla tube; filaments inserted at throat of corolla, puberulent at base; style slightly curved, pubescent throughout; stigmas discoid, large. Berries turning from orange-yellow to yellow-red and red, globose, 6–8 mm in diam.; seeds ca. 1.5 mm, smooth. Fl. May–Jul, fr. Aug–Sep.

• Forests, forest margins, scrub; 2400–4600 m. S Gansu, ?Qinghai, S Shaanxi, W Sichuan, E and S Xizang, NW Yunnan.

- 1a. Leaves usually obovate, ovate, oblong, or elliptic, apex obtuse and mucronate, or shortly acuminate ..... 41a. var. *trichosantha*
- 1b. Leaves usually ovate-lanceolate to lanceolate, apex acuminate ..... 41b. var. *deflexicalyx*

**41a. *Lonicera trichosantha* var. *trichosantha***

毛花忍冬(原变种) mao hua ren dong (yuan bian zhong)

*Lonicera ovalis* Batalin; *L. prostrata* Rehder; *L. trichosantha* f. *acutiuscula* Rehder; *L. trichosantha* f. *glabrata* Rehder.

Leaves usually obovate, ovate, oblong, or elliptic, apex obtuse and mucronate, or shortly acuminate.

• Forests, forest margins, scrub; 2700–4100 m. S Gansu, S Shaanxi, W Sichuan, E and S Xizang, NW Yunnan.

**41b. *Lonicera trichosantha* var. *deflexicalyx*** (Batalin) P. S. Hsu & H. J. Wang, Acta Phytotax. Sin. 17(4): 79. 1979.

长叶毛花忍冬 chang ye mao hua ren dong

*Lonicera deflexicalyx* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 173. 1892; *L. deflexicalyx* var. *xerocalyx* (Diels)

Rehder; *L. trichosantha* var. *xerocalyx* (Diels) P. S. Hsu & H. J. Wang; *L. xerocalyx* Diels.

Leaves usually ovate-lanceolate to lanceolate, apex acuminate.

• Forests, forest margins, scrub; 2400–4600 m. S Gansu, ?Shaanxi, W Sichuan, NW Yunnan.

**42. *Lonicera calcarata*** Hemsley, Hooker's Icon. Pl. 27: t. 2632. 1900.

长距忍冬 chang ju ren dong

Climbers, glabrous throughout. Branches becoming hollow. Winter buds with several pairs of broad scales. Accessory buds often present. Petiole 1–2 cm; leaf blade ovate or elliptic to oblong, 8–13 × 2.5–8 cm, leathery, base rounded to broadly cuneate, apex acuminate. Inflorescence axillary paired flowers; peduncle erect, 1.7–3 cm; bracts leaflike, ovate to orbicular-ovate, 1.5–2.5 cm; bracteoles fused in 2 pairs, apex rounded or retuse. Neighboring 2 ovaries fused to more than half. Calyx minute. Corolla bilabiate, white at first, later yellow to orange-red, ca. 3 cm; tube ca. 10 mm, funnelform, spurred toward base, spur ca. 12 mm, curved forward and often hidden within bracts; upper lip erect, 4-lobed, lobes unequal in shape to 8 mm; lower lip recurved. Stamens and style exerted from corolla tube; filaments and style pubescent in lower half; stigmas globose and lobed. Ovaries 5-locular. Berries yellow to red, ca. 1.5 cm in diam., subtended by persistent bracts; seeds numerous, compressed, with 2 grooves on concave side, margin thickened. Fl. May, fr. Jun–Jul.

• Forests, forest margins, scrub along streamsides; 1200–2500 m. Guangxi, SW Guizhou, SW Sichuan, Xizang, Yunnan.

**43. *Lonicera crassifolia*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 172. 1892.

匍匐忍冬 pu fu ren dong

*Lonicera rhododendroides* Graebner.

Shrubs, evergreen, with long prostrate branches sometimes rooting, axillary shoots short and erect with persistent petioles. Branches solid, with crisped golden hairs; winter buds with several pairs of lanceolate and ciliate scales. Petiole 3–8 mm, grooved adaxially, ciliate; leaf blade broadly elliptic, 1–4.5 × 0.7–3 cm, leathery, both surfaces glabrous but adaxially hirsute on midvein, margin ciliate and revolute, both ends rounded to acute, apex sometimes cuspidate or retuse. Inflorescence axillary paired flowers at apices of short branches; peduncle 2–10 mm, glabrous to hirsute; bracts lanceolate, to 1 mm; bracteoles free, ovate, ca. 1/2 as long as bracts. Ovaries free, oblong, glaucous. Calyx lobes narrowly lanceolate to ovate-triangular, to 1 mm, margin ciliate, apex obtuse. Corolla bilabiate, ca. 1.4 cm, white, becoming yellow with reddish tube ca. 0.9 cm, outside glabrous, inside hirsute; tube shallowly gibbous toward base; upper lip 4-lobed, lobes ovate, ca. 1 mm; lower lip recurved. Stamens and style exerted from corolla tube; filaments and style sparsely stiffly hairy in lower part; stigmas globose. Berries black, glaucous, globose, 5–6 mm in diam.; seeds few, brownish, ellipsoid, compressed, 3–4 mm, shallowly reticulate. Fl. Jun–Jul, fr. Oct–Nov.

• Streamsides, rocky cliffs, crevices of moist forest margins; 900–1700(–2300) m. Guizhou, SW Hubei, NW Hunan, Sichuan, Yunnan.

**44. *Lonicera japonica*** Thunberg in Murray, Syst. Veg., ed. 14, 216. 1784.

忍冬 ren dong

Climbers, semievergreen. Branches becoming hollow. Branches, petioles, and peduncles with dense, yellow-brown spreading stiff hairs, interspersed with long glandular hairs. Petiole 3–8 mm; leaf blade ovate or oblong to lanceolate, 3–8 × 1.5–4 cm, abaxially sparsely to densely hairy, adaxially hairy along veins, base rounded to subcordate, margin ciliate, occasionally sinuate, apex acute to acuminate. Flowers fragrant, paired and axillary toward apices of branchlets; peduncle 2–40 mm, shorter toward apex of branchlets; bracts leaflike, ovate to elliptic, 1–3 cm; bracteoles ca. 1 mm, pubescent, apex rounded or truncate and ciliate. Neighboring 2 ovaries free; ovary ca. 2 mm, glabrous. Calyx lobes triangular, ca. 1 mm, densely hairy abaxially and along margin, apex acute. Corolla bilabiate, white, becoming yellow, or purple outside and white inside, 3–5 cm, spreading hairy with interspersed long glandular hairs outside; tube 1.5–3 cm, not gibbous at base; upper lip irregularly 4-lobed, lobes 2–8 mm; lower lip recurved. Stamens and style glabrous, subequaling to exceeding corolla. Berries black when mature, glossy, globose, 6–7 mm in diam.; seeds brown, ovoid or ellipsoid, ca. 3 mm, shallowly pitted. Fl. Apr–Jun, fr. Oct–Nov.  $2n = 18^*$ .

Scrub, sparse forests, mountain slopes, stony places, roadsides; (800–)1500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea; widely cultivated in SE Asia; introduced and invasive in North America].

1a. Corolla white, later yellow-white ..... 44a. var. *japonica*  
1b. Corolla purple outside, white inside ..... 44b. var. *chinensis*

**44a. *Lonicera japonica* var. *japonica***

忍冬(原变种) ren dong (yuan bian zhong)

*Caprifolium japonicum* (Thunberg) Dumortier; *Lonicera brachypoda* Candolle var. *repens* Siebold; *L. fauriei* H. Léveillé & Vaniot; *L. japonica* f. *macrantha* Matsuda; *L. japonica* var. *repens* (Siebold) Rehder; *L. japonica* var. *sempervillosa* Hayata; *L. shintenensis* Hayata.

Corolla white, later yellow-white.

Scrub or sparse forests on mountain slopes, stony places, roadsides; ca. 1500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**44b. *Lonicera japonica* var. *chinensis*** (Watson) Baker in Saunders, Refug. Bot. 4: t. 224. 1871.

红白忍冬 hong bai ren dong

*Lonicera chinensis* Watson, Dendrol. Brit. 2: t. 117. 1825;  
*L. japonica* f. *chinensis* (Watson) H. Hara.

Corolla purple outside, white inside.

• Mountain slopes; ca. 800 m. Anhui, ?Guizhou, ?Zhejiang.

**45. *Lonicera acuminata*** Wallich in Roxburgh, Fl. Ind. 2: 176. 1824.

淡红忍冬 dan hong ren dong

*Caprifolium fuchsoides* (Hemsley) Kuntze; *C. henryi* (Hemsley) Kuntze; *Lonicera acuminata* var. *depilata* P. S. Hsu & H. J. Wang; *L. affinis* Hooker & Arnott var. *angustifolia* Hayata; *L. alseuosmoides* Graebner; *L. apodantha* Ohwi; *L. buddleioides* P. S. Hsu & S. C. Cheng; *L. fuchsoides* Hemsley; *L. giraldui* Rehder; *L. henryi* Hemsley; *L. henryi* var. *angustifolia* (Hayata) Ohwi; *L. henryi* var. *fulvovillosa* Ohwi; *L. henryi* var. *setuligera* W. W. Smith; *L. henryi* var. *subcoriacea* Rehder; *L. henryi* var. *transarisanensis* (Hayata) Yamamoto; *L. henryi* var. *trichosepala* Rehder; *L. pampaninii* H. Léveillé; *L. transarisanensis* Hayata; *L. trichosepala* (Rehder) P. S. Hsu.

Climbers, semievergreen. Branches usually becoming hollow. Branches, petioles, and peduncles with dense curved or spreading brown-yellow stiff hairs, sometimes interspersed with long glandular hairs, sometimes glabrescent or becoming glabrous. Leaves occasionally 3-whorled; petiole 2–15 mm; leaf blade ovate or oblong to linear-lanceolate, 2.5–13 × 1.3–4.5 cm, both surfaces brown-yellow hirsute at least on midvein or glabrescent, base rounded to cordate, margin often ciliate, apex acuminate to caudate. Flowers paired, axillary at apices of branchlets, sometimes paniculate; peduncle 0–23 mm, shorter toward apex of branchlets; bracts subulate, occasionally leaflike, 2–4 mm, pubescent and ciliate; bracteoles ovate, ca. 1 mm, glabrous to densely ciliate. Neighboring ovaries free, ca. 2 mm, glabrous, occasionally sparsely hairy, sometimes pruinose. Calyx lobes ovate to narrowly triangular, to 1.5 mm, margin ciliate, sometimes glabrous or glandular. Corolla bilabiate, white tinged red, becoming yellow tinged orange or purple, 1.5–2.4 cm, outside glabrous to densely pubescent; tube funnelform, 9–12 mm, diam. at throat 2–5 mm, inside hirsute, broadly and shallowly gibbous toward base; upper lip irregularly 4-lobed and erect, lobes orbicular-ovate, 1–2 mm; lower lip recurved. Stamens longer or subequaling corolla; filaments hirsute at base. Style exerted, hirsute at least in lower half or glabrous. Berries blue-black and pruinose, ovoid, 6–7 mm in diam.; seeds ellipsoid to oblong, slightly compressed, 4–4.5 mm, shallowly pitted. Fl. May–Jul, fr. Oct–Nov.

Forests, scrub; 100–3200 m. S Anhui, Fujian, SE Gansu, Guangdong, Guangxi, W Guizhou, ?Henan, Hubei, NW Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Myanmar, Nepal, Philippines].

This is a highly variable species. Further studies are needed for a satisfactory taxonomic treatment.

**46. *Lonicera ferruginea*** Rehder in Sargent, Trees & Shrubs 1: 43. 1902.

锈毛忍冬 xiu mao ren dong

*Lonicera fulva* Merrill; *L. giraldui* Rehder f. *nubium* Handel-Mazzetti; *L. nubium* (Handel-Mazzetti) Handel-Mazzetti.

Climbers. Branches becoming hollow. Branches, petioles, and peduncles covered with ± dense yellow-brown stiff curved

hairs, and with minute glandular hairs on young parts. Petiole 4–10 mm; leaf blade ovate to lanceolate, 5–14 × 2–5 cm, abaxially densely yellow-brown strigose with raised veins, adaxially glabrescent and densely hairy on midvein, veins slightly impressed adaxially, base rounded to subcordate, margin ciliate with ciliae to 1 mm, apex acute to caudate. Flowers paired in short or contracted racemes, racemes paniculate toward apex of branchlets with subulate involucre bracts; inflorescence peduncle to 7 cm; involucre bract filiform, 4–12 mm; peduncle of paired flowers 0–5 mm; bracts narrowly linear, 2–4 mm; bracteoles ovate, ca. 1 mm; bracts and bracteoles densely strigose. Neighboring 2 ovaries free, ca. 2 mm, densely strigose at least in upper half or glabrous. Calyx lobes lanceolate, to 2 mm. Corolla bilabiate, white at first, later yellow, 1.8–2.8 cm; tube 1.2–2.2 cm, outside strigose, inside hirsute, not gibbous at base; upper lip 4-lobed, lobes 2–3 mm; lower lip linear-oblong. Stamens longer or subequaling corolla; filaments sparsely hirsute on lower part. Style glabrous or hirsute in lower half. Berries black, ovoid-orbicular, ca. 8 mm in diam.; seeds ovoid and slightly compressed, ca. 3.5 mm, shallowly pitted. Fl. May–Jul, fr. Aug–Oct.

Sparse and dense forests, scrub; 600–2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan [India, N Thailand].

#### 47–51. *Lonicera macrantha* species complex

Climbers, semievergreen to deciduous. Branches solid, often becoming hollow. Branches, petioles, and peduncles with ± dense spreading, yellow-brown long stiff hairs and minute glandular hairs, grayish pubescent, yellow-brown velutinous, or sometimes glabrous. Petiole 3–15 mm; leaf blade ovate or oblong to lanceolate, 2–14 × 1–5 cm, abaxially hirsute mixed with short glandular hairs, pubescent, shortly white velutinous, glaucous with large sessile orange glands, or occasionally subglabrous, veins reticulate and raised, adaxially hirsute-hairy on veins and midvein, veins conspicuously impressed, sometimes wrinkled, base rounded to subcordate, occasionally broadly cuneate, margin ciliate and revolute, apex acute to acuminate, sometimes obtuse and mucronate. Flowers fragrant, paired and in racemes toward apex of branchlets, often paniculate with leaflike to subulate involucre bracts; peduncle 1–15 mm, sometimes to 40 mm in lower part of inflorescence; peduncle, bracts, bracteoles, and calyx lobes stiffly hairy and glandular hairy; bracts lanceolate to linear, 2–7 mm, occasionally leaflike to 14 mm; bracteoles orbicular-ovate, ca. 1 mm. Neighboring 2 ovaries free, ca. 2 mm, glabrous or sometimes sparsely to densely hirsute or with sessile glands. Calyx lobes lanceolate, 1–2 mm, ciliate. Corolla bilabiate, white, later yellow, (1.5–)3–7 cm, outside with spreading hairs and minute glandular hairs, glabrous, or strigose; tube (1–)2–5 cm, inside densely puberulent, not gibbous at base; upper lip 4-lobed, lobes ca. 5 mm; lower lip recurved. Stamens and style slightly exceeding corolla, glabrous or sometimes pubescent at base. Berries white or black, sometimes pruinose, 1 of paired ovaries sometimes aborting, globose or ellipsoid, 7–12 mm; seeds few, ovoid, compressed, 5–7 mm, shallowly pitted and furrowed. Fl. Mar–Jul, fr. Jul–Dec.

Forests of mountain valleys or slopes, scrub, riversides, stream-

sides, roadsides; 200–2900 m. S Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, ?Kashmir, Myanmar, Nepal, N Vietnam].

These species have long been used medicinally in China.

- 1a. Ovaries densely hirsute ..... 49. *L. confusa*
- 1b. Ovaries glabrous to sparsely hirsute.
  - 2a. Stems with spreading, yellow-brown long stiff hairs and minute glandular hairs.
    - 3a. Leaves abaxially hirsute mixed with minute glandular hairs .... 47. *L. macrantha*
    - 3b. Leaves abaxially white velutinous obscuring leaf surface, mixed with stiff hairs ..... 48. *L. similis*
  - 2b. Stems yellow-brown velutinous to tomentose or grayish pubescent, occasionally glabrous.
    - 4a. Stems yellow-brown velutinous to tomentose.
      - 5a. Leaves abaxially white-yellow velutinous with conspicuously raised veins ..... 51. *L. reticulata*
      - 5b. Leaves abaxially hirsute mixed with minute glandular hairs ..... 47. *L. macrantha*
    - 4b. Stems grayish pubescent or occasionally glabrous.
      - 6a. Leaves abaxially glabrous to pubescent, without large sessile orange glands ..... 49. *L. confusa*
      - 6b. Leaves abaxially glaucous, with large sessile orange glands ..... 50. *L. hypoglauc*

**47. *Lonicera macrantha*** (D. Don) Sprengel, Syst. Veg. 4(2): 82. 1827.

大花忍冬 da hua ren dong

*Caprifolium macranthum* D. Don, Prodr. Fl. Nepal. 140. 1825; *Lonicera esquirolii* H. Léveillé; *L. fulvotomentosa* P. S. Hsu & S. C. Cheng; *L. guillonii* H. Léveillé & Vaniot; *L. hirtiflora* Champion ex Benth; *L. inodora* W. W. Smith; *L. macrantha* var. *calvescens* Chun & F. C. How; *L. macranthoides* Handel-Mazzetti; *L. strigosiflora* C. Y. Wu ex X. W. Li.

For description see under species complex. Distinguishing characters for this species are as follows: Stems with spreading, yellow-brown long stiff hairs and minute glandular hairs or yellow-brown tomentose. Leaves abaxially hirsute mixed with minute glandular hairs. Ovaries glabrous to sparsely hirsute. Berries white to black. Fl. Apr–May, fr. Jul–Aug.

Forests of mountain valleys or slopes, scrub; 300–1800 m. S Anhui, Fujian, Guangdong, Guangxi, Guizhou, ?Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Nepal].

**48. *Lonicera similis*** Hemsley, J. Linn. Soc., Bot. 23: 366. 1888.

细毡毛忍冬 xi zhan mao ren dong

*Caprifolium simile* (Hemsley) Kuntze; *Lonicera buchana-*

*anii* Lace; *L. delavayi* Franchet; *L. macrantha* (D. Don) Sprengel var. *biflora* Collett & Hemsley; *L. macrantha* var. *heterotricha* P. S. Hsu & H. J. Wang; *L. macranthoides* Handel-Mazzetti var. *heterotricha* (P. S. Hsu & H. J. Wang) B. K. Zhou; *L. omeiensis* (P. S. Hsu & H. J. Wang) B. K. Zhou; *L. similis* var. *delavayi* (Franchet) Rehder; *L. similis* var. *omeiensis* P. S. Hsu & H. J. Wang.

For description see under species complex. Distinguishing characters for this species are as follows: Stems with spreading, yellow-brown long stiff hairs and minute glandular hairs. Leaves abaxially white velutinous obscuring leaf surface, mixed with stiff hairs. Bracts sometimes leaflike, linear-lanceolate, 5–14 mm. Corolla sometimes less than 3 cm. Ovaries glabrous to sparsely hirsute. Berries black. Fl. May–Jun(–Jul), fr. Sep–Oct.

Streamsides in mountain valleys, scrub and forests on sunny mountain slopes; 400–1600(–2200) m. ?Anhui, S Fujian, S Gansu, Guangxi, Guizhou, W Hubei, W Hunan, ?Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang [Myanmar].

**49. *Lonicera confusa*** Candolle, Prodr. 4: 333. 1830.

水忍冬 shui ren dong

*Lonicera dasystyla* Rehder; *L. multiflora* Champion ex Benthams; *L. telfairii* Hooker & Arnott.

For description see under species complex. Distinguishing characters for this species are as follows: Stems grayish pubescent or glabrous. Leaves abaxially glabrous to pubescent without large sessile orange glands. Ovaries densely to sparsely hirsute or glabrous. Berries black. Fl. Mar–May, fr. Aug–Oct.

Mountain slopes, mixed forests, scrub, roadsides of plains, riversides; 300–800 m. Guangdong, Guangxi, Hainan, Yunnan [Nepal, N Vietnam].

**50. *Lonicera hypoglauca*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 270. 1866.

菰腺忍冬 gu xian ren dong

*Caprifolium hypoglaucum* (Miquel) Kuntze; *C. mollissimum* (Blume ex Maximowicz) Kuntze; *Lonicera affinis* Hooker & Arnott var. *hypoglauca* (Miquel) Rehder; *L. affinis* var. *mollissima* Blume ex Maximowicz; *L. affinis* var. *pubescens* Maximowicz; *L. hypoglauca* subsp. *nudiflora* P. S. Hsu & H. J. Wang; *L. rubropunctata* Hayata.

For description see under species complex. Distinguishing characters for this species are as follows: Stems grayish pubescent. Leaves abaxially glaucous with large sessile orange glands. Ovaries glabrous to sparsely hirsute. Berries black. Fl. Apr–May(–Jun), fr. Oct–Nov.

Scrub, sparse forests; 200–700(–1800) m. S Anhui, Fujian, Guangdong, Guangxi, Guizhou, SW Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, ?Kashmir, ?Nepal].

**51. *Lonicera reticulata*** Champion, Hooker's J. Bot. Kew Gard. Misc. 4: 167. 1852.

皱叶忍冬 zhou ye ren dong

*Caprifolium reticulatum* (Champion) Kuntze; *Lonicera rhytidophylla* Handel-Mazzetti.

For description see under species complex. Distinguishing characters for this species are as follows: Stems yellow-brown velutinous. Leaves abaxially white-yellow velutinous with conspicuously raised veins. Berries black. Fl. Jun–Jul, fr. Oct–Nov.

• Scrub, forests; 400–1100 m. Fujian, Guangdong, NE Guangxi, ?Guizhou, S Hunan, SW Jiangxi.

**52. *Lonicera longiflora*** (Lindley) Candolle, Prodr. 4: 331. 1830.

长花忍冬 chang hua ren dong

*Caprifolium longiflorum* Lindley, Edwards's Bot. Reg. 15: t. 1232. 1829; *Lonicera longituba* H. T. Chang ex P. S. Hsu & H. J. Wang.

Climbers, subglabrous throughout but young branches and petioles sometimes slightly yellow-brown hairy. Branches solid or becoming hollow. Petiole 5–10 mm, interpetiolar line raised; leaf blade ovate or elliptic to lanceolate, 4–8.5 × 1.5–5 cm, leathery, venation pinnate or occasionally triplinerved, veins raised abaxially, base rounded to cuneate, apex acute to acuminate. Flowers paired, often clustered at apices of branchlets into lax racemes; peduncle 3–14 mm; bracts linear-lanceolate, 1–5 mm; bracteoles orbicular-ovate, ca. 1 mm, glabrous. Neighboring 2 ovaries free, oblong, ca. 3 mm, glabrous. Calyx lobes broadly triangular or lanceolate, to 1.5 mm, sometimes ciliate. Corolla bilabiate, white, later yellow, 5–9 cm, outside glabrous or with few scattered, spreading, long, glandular hairs or with stiff hairs; tube 3–6 cm, 2–3 mm in diam., inside pubescent, base not gibbous; upper lip 4-lobed to 2 mm; lower lip recurved to coiled. Stamens and style long exserted from corolla tube. Style hairy at base. Berries white to black. Fl. Mar–Sep, fr. Oct.

• Sparse forests, sunny places along roadsides on mountains; 1200–1700 m. Guangdong, Guangxi, Hainan, Yunnan.

**53. *Lonicera hildebrandiana*** Collett & Hemsley, J. Linn. Soc., Bot. 28: 64. 1891.

大果忍冬 da guo ren dong

*Lonicera braceana* Hemsley.

Climbers, evergreen to semievergreen, glabrous throughout. Branches solid, glabrous, sometimes with bristles. Winter buds with several pairs of broad, shortly acuminate scales. Petiole 1–2.5 cm; leaf blade elliptic to oblong, 7–15 × 4–7.5 cm, leathery, base broadly cuneate to rounded, sometimes slightly decurrent, apex acute to acuminate. Flowers fragrant, paired, axillary, toward apices of branchlets, sometimes shortly paniculate; peduncle 4–15 mm; bracts triangular, ca. 1.5 mm; bracteoles ovate-triangular, 0.5–1 mm. Neighboring 2 ovaries free. Calyx cupular; lobes triangular, 0.5–2 mm. Corolla bilabiate, white, becoming yellow and tinged with pink, 7.5–12 cm; tube 4.5–7 cm, ca. 4 mm in diam., not gibbous at base; upper lip 4-lobed, 2 lateral ones split to middle, middle ones only slightly lobed. Stamens and style exserted from corolla tube; filaments pubescent; anthers linear, 7–8 mm. Style and stamens shorter to equaling corolla, pubescent. Berries green, globose to pyriform, large, ca. 2.5 cm; seeds few, ca. 8 mm. Fl. Mar–Jul, fr. May–Aug.

Forests, scrub in moist places of forest margins; 1000–2300 m. Guangxi, Yunnan [Myanmar, Thailand].

A specimen of *Lonicera leiantha* Kurz was noted by Rehder (Rep. (Annual) Missouri Bot. Gard. 14: 163. 1903) as occurring in China: Yunnan, Poneshee, *D. J. Anderson s.n.* This specimen is not from the type location (Myanmar: Ava). It has no flowers and appears to be of *L. hildebrandiana*.

**54. *Lonicera bournei*** Hemsley, J. Linn. Soc., Bot. 23: 360. 1888.

西南忍冬 *xi nan ren dong*

*Caprifolium bournei* (Hemsley) Kuntze; *Lonicera obscura* Collett & Hemsley.

Climbers. Branches hollow. Branches, petioles, and peduncles densely yellow pubescent and sometimes glandular. Petiole 2–8 mm; leaf blade ovate to elliptic, 2–7.5 × 1.5–4 cm, leathery, both surfaces sometimes pubescent on midvein, veins raised abaxially, base rounded to cordate, apex acute to acuminate. Flowers fragrant, paired and axillary toward apices of branchlets, forming racemes; involucre bracts large, peduncle 1–10 mm; bracts, bracteoles, and calyx lobes pubescent; bracts lanceolate, 0.5–3 mm; bracteoles minute, orbicular-ovate. Neighboring 2 ovaries free, elliptic, ca. 2 mm, glabrous. Calyx cupular; lobes triangular, ca. 0.5 mm, apex acute. Corolla bilabiate, white, later yellow, 3–4.5 cm, outside glabrous to pubescent; tube narrowly funnelform, slightly curved, 2.5–4 cm, 1–2 mm in diam., not gibbous at base; upper lip 4-lobed, 2 lateral lobes split to middle, middle ones only slightly lobed. Stamens and style slightly exserted from corolla tube. Style sparsely puberulent. Berries red, globose, ca. 5 mm in diam. Fl. Feb–Apr, fr. May.

Forests; 800–2000 m. Guangxi, Yunnan [Myanmar].

**55. *Lonicera subaequalis*** Rehder, Rep. (Annual) Missouri Bot. Gard. 14: 172. 1903.

川黔忍冬 *chuan qian ren dong*

*Lonicera carnosifolia* C. Y. Wu ex P. S. Hsu & H. J. Wang.

Climbers. Branches solid or becoming hollow. Branchlets and leaves glabrous. Petiole 2–10 mm; leaf blade elliptic to oblong or obovate, 4.5–11 × 3–6 cm, abaxially glaucous, base attenuate and decurrent to petiole, opposite leaves sometimes slightly fused and perfoliate, margin cartilaginous, apex obtuse. Inflorescence sessile at apices of branchlets with an involucre bract of 1 pair of perfoliate leaves 4–6 cm across, apex acute; flowers sessile and verticillate, 6 per whorl; whorls 1 or 2 clustered into a capitulum; internode below involucre bract 3–6 cm; bracts minute; bracteoles suborbicular, ca. 1 mm, glandular hairy. Ovaries glabrous, sometimes glandular hairy at apex. Calyx lobes broadly ovate, ca. 1 mm, glandular and sometimes sparsely ciliate. Corolla yellow, sometimes red inside, funnel-form, 2–4 cm, outside with sparse long stiff hairs and glands, sometimes glabrous, inside puberulent; tube shallowly gibbous at base; lobes subregular, slightly unequal, ovate, 4–8 mm, apex rounded. Stamens inserted slightly below base of corolla lobes. Style exserted, glabrous to puberulent toward base. Berries red,

subglobose, ca. 7 mm in diam.; seeds whitish, ellipsoid, ca. 2 mm, pitted. Fl. May–Jun, fr. Jul–Oct.

• Shaded places in forests on mountain slopes; 1500–2500 m. Guizhou, Sichuan.

**56. *Lonicera yunnanensis*** Franchet, J. Bot. (Morot) 10: 310. 1896.

云南忍冬 *yun nan ren dong*

*Lonicera ciliatissima* C. Y. Wu ex P. S. Hsu & H. J. Wang; *L. mairei* H. Léveillé; *L. yunnanensis* var. *linearifolia* C. Y. Wu ex X. W. Li; *L. yunnanensis* var. *tenuis* Rehder.

Climbers. Branchlets glabrous, occasionally with long spreading stiff hairs. Branches solid or becoming hollow. Leaves elliptic to lanceolate or obovate, 2–10 × 1–5 cm, abaxially glaucous and glabrous or adpressed puberulent, occasionally strigose and glandular hairy, adaxially glabrous, base obtuse to rounded and decurrent to short petiole and sometimes slightly united with opposite leaf blade, margin cartilaginous, occasionally ciliate, apex obtuse and mucronulate. Inflorescence fragrant, shortly pedunculate at apices of branchlets with 1 or 2 involucre bracts of perfoliate leaves 2.5–9 cm across, apex acute to acuminate; flowers sessile and verticillate, 6 per whorl; whorls 1–3 clustered into a capitulum; internode below involucre bract 1–6 cm; bracts lanceolate, to 2 mm; bracteoles suborbicular, ca. 1 mm, glabrous. Ovaries glabrous or occasionally with long stiff hairs and minute glandular hairs. Calyx lobes triangular, minute, glabrous. Corolla bilabiate, white or yellow, 1.5–2.5 cm, outside glabrous to sparsely pubescent with minute glandular hairs; tube shallowly gibbous toward base, 10–20 mm, inside puberulent; upper lip shallowly 4-lobed; lower lip narrowly oblong. Stamens and style exserted. Berries red, black when mature. Fl. Apr–Jul, fr. Sep–Oct.

• Forests on mountain slopes, scrub; 1700–3000 m. SW Sichuan, NW Yunnan.

**57. *Lonicera tragophylla*** Hemsley, J. Linn. Soc., Bot. 23: 367. 1888.

盘叶忍冬 *pan ye ren dong*

*Caprifolium tragophyllum* (Hemsley) Kuntze; *Lonicera harmsii* Graebner.

Climbers, deciduous. Branches solid or becoming hollow. Branchlets glabrous. Leaves sessile or petiole to 3 mm; leaf blade elliptic to lanceolate or ovate, 4–12 × 2–3 cm, abaxially glaucous, shortly white hispid, sometimes with dense, stiff, yellow hairs on lower part of midvein, very rarely glabrous, adaxially glabrescent, midvein and margin sometimes purple-red-dish at base, base attenuate and decurrent to petiole, margin cartilaginous, apex obtuse or ± acute. Inflorescence at apices of branchlets, shortly pedunculate; peduncle 3–11 mm; involucre bract of 1 pair of perfoliate leaves 4–10 cm across, apex acute; flowers sessile and verticillate, 6 per whorl; whorls 2–4 clustered into a capitulum; internode below involucre bract 3–7 cm; bracts narrowly ovate, ca. 1 mm; bracteoles minute, glabrous. Ovaries pyriform, glabrous. Calyx lobes minute, triangu-

lar or ovate. Corolla bilabiate, yellow to orange-yellow, reddish outside in upper part, 5–9 cm, outside glabrous; tube not gibbous at base, 4–7 cm, inside sparsely puberulent; upper lip shallowly 4-lobed; lower lip narrowly oblong. Stamen and style exserted, glabrous. Style with swollen nectary at base. Berries turning from yellow to red-yellow when mature, eventually

deep red, subglobose, ca. 1 cm in diam.; seeds whitish, ellipsoid, ca. 2 mm, pitted. Fl. May–Jul, fr. Jul–Oct.

● Forests, scrub, rocky crevices at riversides; (700–)1000–2000(–3000) m. Anhui, S Gansu, N Guizhou, SW Hebei, NW Henan, Hubei, S Ningxia, Shaanxi, S Shanxi, Sichuan, Zhejiang.

# LINNAEACEAE

北极花科 bei ji hua ke

Yang Qiner (杨亲二)<sup>1</sup>; Sven Landrein<sup>2</sup>

Shrubs, erect or creeping. Leaves opposite, sometimes whorled, simple, estipulate, with an interpetiolar line. Inflorescence terminal or axillary; flowers in 3-flowered cymes, paired or single; bracts leaflike or reduced and located at base of ovary and forming an "epicalyx." Flowers bisexual,  $\pm$  zygomorphic. Perianth 4- or 5-merous. Corolla imbricate in bud; nectary consisting of  $\pm$  compact glandular hairs, inside corolla tube (nectaria trichomalialia). Stamens 4, alternating with corolla lobes; filaments adnate from 1/3–1/2 with corolla tube. Ovary inferior, 3- or 4-loculed, placentation axile; 1 or 2 locules with a single fertile ovule and 2 locules with numerous sterile ovules; style long, stigmas capitate. Fruit an achene crowned with persistent sepals (deciduous in *Linnaea*). Seeds 1 or 2; embryo small, straight; endosperm copious.

Seven genera and 19 species (including one cultivated hybrid): Afghanistan, China, India, Japan, Korea, Kyrgyzstan, Nepal, Pakistan, Russia, Uzbekistan, and in Europe and North America; six genera (two endemic) and 15 species (eight endemic, one cultivated hybrid) in China.

Hu Jia-qi. 1988. Caprifoliaceae (Linnaeaceae, excluding *Heptacodium* and *Symphoricarpos*). In: Hsu Ping-sheng, ed., Fl. Reipubl. Popularis Sin. 72: 112–131.

- 1a. Petioles of opposite leaf pairs dilated and connate at base, enclosing axillary buds; corolla hypocrateriform, with a cylindrical tube and 4 or 5 spreading lobes; flowers in 3-flowered cymes or paired; stigmas green and mucilaginous ... 1. *Zabelia*
- 1b. Petioles of opposite leaf pairs not dilated, axillary buds exposed; corolla funnelform or bilabiate with 5 spreading lobes; flowers paired or single; stigmas white and not mucilaginous.
  - 2a. Two bracts accrescent and becoming winglike in fruit; ovary 4-locular with 2 fertile locules ..... 5. *Dipelta*
  - 2b. Bracts not winglike in fruit; ovary 3- or 4-locular with 1 or 2 fertile locules.
    - 3a. Evergreen, creeping subshrubs; two bracts shieldlike and covered with sticky glandular hairs; inflorescence reduced to 2 single flowers at apices of branchlets (those can look like paired flowers but have more bracts and internodes separating them) ..... 6. *Linnaea*
    - 3b. Erect shrubs; bracts and inflorescence not as above.
      - 4a. Bracts and bracteoles covered with bristles, accrescent and becoming spongy, woody and fused to ovaries in fruit ..... 4. *Kolkwitzia*
      - 4b. Bracts and bracteoles without bristles, small and non-acrescent in fruit.
        - 5a. Flowers terminal and paired (flowers opening simultaneously), sometimes 1–3(–8) due to supernumerary flowers axillary to bracteoles (more often so on repeat-bloom long shoots), spring flowering ..... 3. *Diabelia*
        - 5b. Flowers axillary, paniculate, single or paired (flowers opening consecutively), summer or autumn flowering ..... 2. *Abelia*

## 1. ZABELIA (Rehder) Makino, Makinoa 9: 175. 1948.

六道木属 liu dao mu shu

*Abelia* sect. *Zabelia* Rehder in Sargent, Pl. Wilson. 1: 124. 1911.

Shrubs, deciduous. Old branches often with 6 deep longitudinal grooves. Young branches often with retrorse stiff hairs. Leaves opposite, margin entire or dentate (or sometimes lobed on vigorous shoots), shortly petiolate, estipulate. Petioles of opposite leaf pairs dilated and connate at base, enclosing winter buds. Inflorescence a terminal congested thyrse of sessile cymes; cymes 1–3-flowered. Calyx of 4 or 5 sepals, persistent, spreading, narrowly oblong to elliptic. Corolla white, pale rose, or sometimes reddish, hypocrateriform and  $\pm$  zygomorphic, 4- or 5-lobed; corolla tube usually without distinct swelling at base, glandular inside. Stamens included, didynamous, inserted at base or middle of corolla tube; anthers yellow, introrse. Ovary usually 3-locular, 2 locules with 2 series of sterile ovules and 1 locule with a single fertile ovule; style filiform; stigmas green, capitate, mucilaginous. Fruit a leathery achene, oblong, crowned with persistent calyx lobes; seed subterete, testa membranous; endosperm fleshy.

Six species: Afghanistan, China, NW India, Japan, Korea, Kyrgyzstan, Nepal, Russia (Far East); three species (one endemic) in China.

This group was first published by Rehder (in Sargent, Pl. Wilson. 1: 118. 1911) as *Abelia* sect. *Zabelia*. It was described in honor of Zabel who was the first to delimit the genus *Abelia* into sections (Mitt. Deutsch. Dendrol. Ges. 2: 33. 1893). The phylogeny of this group was further studied by Makino and supported by the studies of Ikuse and Kurosawa (Notes on Sect. *Zabelia* Rehder of the genus *Abelia*, J. Jap. Bot. 29(4): 11. 1954), and later by Fukuoka (Phylogeny of the Tribe Linnaeaceae, Acta Phytotax. Geobot. 23: 82. 1968). The genus *Zabelia* was segregated from *Abelia* based on pollen, wood anatomy, inflorescence structure, and karyology (Makino, Makinoa 9: 175. 1948; cf. Hisauchi & Hara, J. Jap. Bot. 29: 143. 1954).

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<sup>2</sup> Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, United Kingdom.

- 1a. Calyx and corolla lobes 5; inflorescence a congested terminal thyrse of sessile cymes (cymes 1–3-flowered); bracts and bracteoles leaflike; sepals long ciliate in fruit ..... 1. *Z. triflora*
- 1b. Calyx and corolla lobes 4; inflorescence terminal of paired flowers (occasionally more due to supernumerary flowers axillary to bracteoles); bracts and bracteoles reduced; sepals not long ciliate in fruit (occasionally sparsely ciliate) ..... 2–3. *Z. biflora* species complex

**1. *Zabelia triflora*** (R. Brown ex Wallich) Makino, Makinoa 9: 175. 1948.

醉鱼草状六道木 *zui yu cao zhuang liu dao mu*

*Abelia triflora* R. Brown ex Wallich, Pl. Asiat. Rar. 1: 14. 1829; *A. angustifolia* Bureau ex Franchet; *A. buddleioides* W. W. Smith; *A. buddleioides* var. *divergens* W. W. Smith; *A. buddleioides* var. *intercedens* Handel-Mazzetti; *A. buddleioides* var. *stenantha* Handel-Mazzetti; *Zabelia buddleioides* (W. W. Smith) Hisauchi & H. Hara; *Z. buddleioides* var. *divergens* (W. W. Smith) Golubkova; *Z. buddleioides* var. *stenantha* (Handel-Mazzetti) Hisauchi & H. Hara; *Z. stenantha* (Handel-Mazzetti) Golubkova.

Shrubs, deciduous, 1–2 m tall. Young branches with retrorse stiff hairs, becoming glabrous. Petiole very short, to 2 mm, hispid. Leaf blade ovate to lanceolate, 15–70 × 5–20 mm, both surfaces glabrous but long hispid on margin and veins abaxially, base cuneate, margin entire to occasionally serrate or lobed, apex acute. Inflorescence a congested terminal thyrse of cymes (cymes 1–3-flowered); pedicels short or nearly absent. Bracts leaflike, lanceolate to obovate; bracteoles linear to subulate, ca. 4 mm, hispid. Calyx of 5 linear sepals, 4–10 × ca. 1 mm, ciliate with stiff hairs. Corolla white, sometimes tinged red, hypocrateriform, 10–20 mm, nearly twice as long as sepals; lobes 5, spreading, suborbicular; tube densely villous inside, with sparsely adpressed hairs outside. Stamens 4, didynamous, included; filaments short, hispid; anthers oblong. Ovary narrowly ovoid, hirsute; styles filiform, exceeding stamens; stigmas capitate. Achene terete, striate, crowned with 5 slightly enlarged and long ciliate persistent sepals. Fl. May, fr. Jun–Aug.

Forests, scrub, grasslands; 1800–3500 m. SW Sichuan, SE Xizang, NW Yunnan [Afghanistan, NW India, Nepal, Pakistan].

The Chinese specimens were previously named as *Abelia buddleioides* by W. W. Smith (Notes Roy. Bot. Gard. Edinburgh 9: 75. 1915–1916). The type specimen *Forrest 12636* from Yunnan is similar to the type of *A. triflora* var. *parvifolia* (Clarke) Hisauchi & H. Hara from Pakistan. Nevertheless, the group shows much variation in the size and shape of the leaves and sepals.

### 2–3. *Zabelia biflora* species complex

Shrubs deciduous, 2–3 m tall. Petiole 4–7 mm, sparsely hispid. Leaf blade narrowly ovate or obovate to lanceolate, 30–80 × 5–30 mm, abaxially glabrous but with stiff hairs on veins, adaxially sparsely pubescent when young, base cuneate to obtuse, margin entire or with 1–6 pairs of teeth, apex acute to long acuminate. Inflorescence terminal, of paired flowers (occasionally more due to supernumerary flowers axillary to bracteoles); flowers sessile but long pedunculate, peduncles often appearing ± fused; peduncles 0–12 mm; flowers with 3 bracts at base of each ovary; bracts 1–6 mm. Sepals 4, ovate-lanceolate or obovate. Corolla white sometimes tinged red abaxially, 4-lobed; lobes orbicular, 1/3 or 1/5 as long as tube; tube pubescent inside. Stamens 4, didynamous, included. Ovary to 8

mm, with sparse, stiff hairs; styles long, equaling corolla, slender; stigmas capitate, not exerted from corolla tube. Achene 1–1.5 cm, crowned with 4 persistent and slightly enlarged sepals. Fl. Apr–Jun, fr. Aug–Sep.

Scrub, forests, grasslands; 800–3700 m. Anhui, Fujian, SE Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangxi, Liaoning, Nei Mongol, S Ningxia, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Korea, Russia (Far East)].

The *Zabelia biflora* species complex was revised by Nakai (J. Jap. Bot. 13(8): 1–12. 1937) who distinguished 11 species. We currently recognize two species in China.

Most of the differences between taxa were based on the length of the peduncles, bracts, and bracteoles, which are highly variable. Classification of *Zabelia biflora* is complex and needs to be investigated.

- 1a. Distributed in NE China (Anhui, Hebei, Henan, Liaoning, Nei Mongol, Shanxi) ..... 2. *Z. biflora*
- 1b. Distributed in SW China (Anhui, Fujian, SE Gansu, Guizhou, Henan, Hubei, Jiangxi, S Ningxia, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang) ..... 3. *Z. dielsii*

**2. *Zabelia biflora*** (Turczaninow) Makino, Makinoa 9: 175. 1948.

六道木 *liu dao mu*

*Abelia biflora* Turczaninow, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 10: 152. 1837; *A. adenotricha* Hance; *A. biflora* var. *coreana* (Nakai) C. F. Fang; *A. biflora* f. *minor* (Nakai) C. F. Fang; *A. biflora* var. *minor* Nakai; *A. coreana* Nakai.

For description see under species complex. Fl. Apr–Jun, fr. Aug–Sep.

Scrub, forests; 1000–2000 m. Anhui, Hebei, Henan, Liaoning, Nei Mongol, Shanxi [Korea, Russia (Far East)].

**3. *Zabelia dielsii*** (Graebner) Makino, Makinoa 9: 175. 1948.

南方六道木 *nan fang liu dao mu*

*Linnaea dielsii* Graebner, Bot. Jahrb. Syst. 29: 140. 1900; *Abelia anhweiensis* Nakai; *A. brachystemon* (Diels) Rehder; *A. davidii* Hance; *A. dielsii* (Graebner) Rehder; *A. hersii* Nakai; *A. onkocarpa* (Graebner) Rehder; *A. umbellata* (Graebner & Buchwald) Rehder; *A. zanderi* (Graebner) Rehder; *L. brachystemon* Diels; *L. onkocarpa* Graebner; *L. umbellata* Graebner & Buchwald; *L. zanderi* Graebner; *Zabelia brachystemon* (Diels) Golubkova.

For description see under species complex. Fl. Apr–Jun, fr. Aug–Sep.

• Scrub, forests, grasslands; 800–3700 m. Anhui, Fujian, SE Gansu, Guizhou, Henan, Hubei, Jiangxi, S Ningxia, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang.

## 2. *ABELIA* R. Brown in Abel, Narr. J. China, App. B, 376. 1818.

糯米条属 *nuo mi tiao shu*

Shrubs, deciduous or semi-evergreen. Winter buds exposed, ovoid-orbicular, small, with several pairs of scales. Leaves opposite, rarely 3- or 4-whorled, shortly petiolate with an interpetiolar line, estipulate. Leaf margin entire to dentate or crenate-serrate. Flowers axillary, paniculate, single or paired (flowers opening consecutively); paired flowers with 6 bracts (*Abelia chinensis*), single flowers with 4 bracts (*A. uniflora* and *A. forrestii*) at base of ovaries; bracts small and not accrescent. Sepals 2–5, spreading, narrowly oblong, elliptic, persistent. Corolla 5-lobed, funnelform or bilabiate, white, yellow, pink, or red. Corolla tube gibbous ventrally at base containing a nectary of dense glandular hairs (nectaria trichomalia). Stamens didynamous, adnate to corolla tube, included or exserted; anthers introrse. Ovary narrowly oblong, 3-locular, 2 locules with 2 series of sterile ovules, 1 locule with a single fertile ovule; style filiform; stigmas capitate, white and papillose. Fruit an oblong, leathery achene, crowned with persistent sepals. Seed subterete, testa membranous; endosperm fleshy.

Five species (including one cultivated hybrid): China, Japan; five species (three endemic, one cultivated hybrid) in China.

- 1a. Flowers paired, opening consecutively; paired ovaries with 6 bracts at base; sepals 5; corolla funnelform, 10–12 mm; stamens and style conspicuously exserted from corolla tube ..... 1. *A. chinensis*  
 1b. Flowers solitary; ovary with 4 bracts at base; sepals 2–5; corolla bilabiate (funnelform to slightly bilabiate in *A. ×grandiflora*), 20–50 mm; stamens and style not conspicuously exserted from corolla tube.  
 2a. Corolla ca. 20 mm; plants cultivated ..... 5. *A. ×grandiflora*  
 2b. Corolla 25–50 mm; plants wild.  
 3a. Sepals usually 2; corolla lower lip with reticulate orange markings ..... 3–4. *A. uniflora* species complex  
 3b. Sepals usually 5; corolla lower lip without any markings ..... 2. *A. forrestii*

**1. *Abelia chinensis*** R. Brown in Abel, Narr. J. China, App. B, 376. 1818.

糯米条 *nuo mi tiao*

*Abelia aschersoniana* (Graebner) Rehder; *A. cavaleriei* H. Lévillé; *A. chinensis* var. *ionandra* (Hayata) Masamune; *A. hanceana* M. Martens ex Hance; *A. ionandra* Hayata; *A. liponensis* M. T. An & G. Q. Gou; *A. rupestris* Lindley; *Linnaea aschersoniana* Graebner; *L. chinensis* (R. Brown) A. Braun & Vatke; *L. rupestris* (Lindley) A. Braun & Vatke.

Shrubs, deciduous to semi-evergreen, to 2 m tall, highly branched. Young branches slender and pubescent. Leaves opposite, sometimes in whorls of 3; leaf blade ovate, 2–5 × 1–3.5 cm, abaxially sparsely pubescent, densely white villous at base of midvein and lateral veins, base rounded or cordate, margin remotely crenate-serrate, apex acute to long acuminate. Inflorescence a large terminal panicle of paired flowers (flowers opening consecutively). Flowers fragrant, with 6 oblong or lanceolate bracts at base of paired ovaries. Calyx of 5 sepals, elliptic, 5–6 mm, turning red at fruiting stage. Corolla 5-lobed, white to pink, funnelform, 10–12 mm, ca. 2 × as long as sepals, outside pubescent and gibbous at base of tube. Stamens and style long exserted; filaments slender, equal in length, inserted at base of corolla tube. Ovary cylindric, slightly compressed, pubescent, longitudinally striate; stigmas capitate. Achene crowned with persistent and slightly enlarged sepals. Fl. Aug–Sep, fr. Oct–Nov.  $2n = 32$ .

Mountains; 200–1500 m. Fujian, Guangdong, Guangxi, Guizhou, ?Henan, Hubei, Hunan, ?Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

This species is commonly cultivated in China.

**2. *Abelia forrestii*** (Diels) W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 76. 1916.

细瘦糯米条 *xi shou nuo mi tiao*

*Linnaea forrestii* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 178. 1912; *Abelia gracilentia* W. W. Smith; *A. gracilentia* var. *microphylla* W. W. Smith; *A. microphylla* (W. W. Smith) Golubkova.

Shrubs, deciduous, to 2 m tall. Branches densely pubescent. Leaf blade narrowly elliptic to lanceolate, 3–7 × 1–2 cm, base obtuse, margin entire, apex acute. Flowers single and axillary, sometimes slightly paniculate; peduncles 3–4 mm; ovary with 4 linear bracts at base. Calyx reddish in fruit; sepals 5, oblanceolate, 6–8 × 1–2 mm, 3-veined, sparsely pubescent. Corolla white to rose, bilabiate, outside pubescent or glandular hairy, inside sparsely villous; tube to 45 mm, expanded in upper part, gibbous at base; lobes 5, orbicular, 4–5 mm; lip without any markings. Stamens 4; filaments ca. as long as corolla; anthers elliptic, to 2 mm. Style sparsely pubescent; stigmas capitate, slightly exserted. Achene to 7 mm, crowned with 5 persistent and enlarged sepals. Fl. May–Sep, fr. Oct.

• Sunny places, on mountain slopes, scrub; 1900–3300 m. SW Sichuan, NW Yunnan.

This is a rare species.

### 3–4. *Abelia uniflora* species complex

Shrubs deciduous, to 4 m tall. Branches pubescent, occasionally glabrous. Leaves highly variable in shape and size, ovate, orbicular, or lanceolate, 1–8 × 0.5–3.5 cm, abaxially densely white pubescent at base of midvein and lateral veins, adaxially sparsely pubescent, base cuneate, margin subentire or remotely serrate, apex obtuse to acuminate. Flowers single and axillary, sometimes slightly paniculate. Calyx of 2 oblong to elliptic sepals, 10–15 mm, ca. 1/3 as long as corolla tube. Corolla white to purplish pink, bilabiate, 25–50 mm, gibbous at base of tube, 5-lobed, outside pubescent, inside villous on lip; upper lip 2-lobed; lower lip 3-lobed, bearded and with reticu-

late orange markings. Stamens 4, didynamous; filaments partially adnate to corolla tube. Ovary pubescent, with 4 ovate to lanceolate bracts at base; style ca. as long as corolla tube; stigmas capitate. Achene 6–15 mm, pubescent, crowned with 2 persistent and slightly enlarged sepals. Fl. Apr–Jun, fr. Aug–Oct.

• Thickets, forests; 200–2000 m. Fujian, Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

This species shows variation in leaf and sepal shape, ovary length, and corolla size. In the past, many species have been recognized as separate. A specimen collected in Guizhou (Simmons *et al.* 288) has been identified to show introgression from *Abelia chinensis*. This phenomenon, as well as possible polyploidy, renders the infraspecific classification of *A. uniflora* very unreliable.

- 1a. Leaves shortly acuminate; sepals with rounded apex ..... 3. *A. uniflora*  
 1b. Leaves long acuminate with asymmetrical apex; sepals with acute apex ..... 4. *A. macrotera*

3. *Abelia uniflora* R. Brown in Wallich, Pl. Asiat. Rar. 1. 15. 1830.

蓮梗花 tong geng hua

*Abelia engleriana* (Graebner) Rehder; *A. longituba* Rehder; *A. mairei* H. Léveillé; *A. myrtilloides* Rehder; *A. parvifolia* Hemsley; *A. schischkinii* Golubkova; *A. schumannii* (Graebner) Rehder; *A. tereticalyx* (Graebner & Buchwald) Rehder; *A. verticillata* H. Léveillé; *Linnaea engleriana* Graebner; *L. koehneana* Graebner; *L. parvifolia* (Hemsley) Graebner; *L. schumannii* Graebner; *L. tereticalyx* Graebner & Buchwald; *Strobilanthes hypericifolia* H. Léveillé.

For description see under species complex. Distinguishing characters for this species are as follows: Leaves shortly acuminate. Sepals with rounded apex. Fl. Apr–Jun, fr. Aug–Oct.

• Thickets, forests; 200–2000 m. Fujian, Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

The holotype of *Abelia uniflora* is held in Cambridge University Herbarium (CGE) and the name was validly published by R. Brown within the description of *Zabelia triflora*.

4. *Abelia macrotera* (Graebner & Buchwald) Rehder in Sargent, Pl. Wilson. 1: 126. 1911.

二翅糯米条 er chi nuo mi tiao

*Linnaea macrotera* Graebner & Buchwald, Bot. Jahrb. Syst. 29: 131. 1900; *Abelia deutzifolia* (H. Léveillé) H. Léveillé; *A. graebneriana* Rehder; *A. graebneriana* var. *deutzifolia* (H. Léveillé) Lauener; *Strobilanthes deutzifolia* H. Léveillé.

For description see under species complex. Distinguishing characters for this species are as follows: Leaves long acuminate with asymmetrical apex. Sepals with acute apex. Fl. Apr–Jun, fr. Aug–Oct.

• Thickets, forests; 200–2000 m. Guangxi, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

5. *Abelia* × *grandiflora* (Rovelli ex André) Rehder, Cycl. Amer. Hort. 1: 1. 1900.

大花糯米条 da hua nuo mi tiao

*Abelia rupestris* Lindley f. *grandiflora* Rovelli ex André, Rev. Hort. 58: 488. 1886.

Shrubs, semi-evergreen, 1–1.5 m tall. Branches pubescent. Leaves sometimes whorled on vigorous shoots (3- or 4-whorled). Leaves adaxially glossy green, sometimes coppery tinged, ovate, to 4.5 cm, glabrous or with tuft of hairs on veins abaxially, base cuneate, margin remotely serrate with unequal teeth, apex acute. Flowers single and axillary, paniculate; peduncle 2–4 mm; flower with 4 bracts at base of ovary. Calyx with sepals varying from 2–5, reddish, often partly united, lanceolate, apex acute. Corolla white, sometimes tinged with pink, funnelform to slightly bilabiate, gibbous at base, ca. 20 mm, slightly fragrant, hirsute bearded with long hairs on lower lip. Stamens nearly as long as corolla tube; filaments partially adnate to corolla, generally inserted but sometimes slightly protruding, glabrous. Ovary 2–8 mm, slender, minutely pilose; style slightly exserted, 17–18 mm, glabrous; stigmas capitate. Achene 8–10 mm, slender, sparsely pilose or glabrous, with persistent sepals at apex. Fl. Jun–Oct, fr. Sep–Nov.

Cultivated in China [cultivated in Africa, the Americas, and Europe].

*Abelia* × *grandiflora* is a cultivated hybrid between *A. uniflora* and *A. chinensis*. It is commonly cultivated in the Americas, Africa, and Europe but less so in China.

### 3. DIABELIA Landrein, Phytotaxa 3: 35. 2010.

双六道木属 shuang liu dao mu shu

*Linnaea* [unranked] *Serratae* Graebner, Bot. Jahrb. Syst. 29: 127. 1900.

Shrubs, deciduous. Winter buds exposed, with several pairs of scales. Branches without grooves. Leaves opposite, shortly petiolate with an interpetiolar line, estipulate. Leaf margin entire to serrate, often undulate. Flowers terminal and paired at ends of short shoots (flowers opening simultaneously); flowers sometimes 1–3(–8) due to supernumerary flowers axillary to bracteoles (more often so on repeat-bloom long shoots); paired flowers with 6 bracts at base of ovaries, bracts small and not accrescent. Sepals 2–5, spreading, narrowly oblong, elliptic, persistent and ± accrescent in fruit. Corolla 5-lobed, bilabiate, white, yellow, pink, or red. Corolla tube gibbous ventrally at base and containing a nectary of dense glandular hairs sometimes clavate and free (nectaria tri-chomalial). Stamens didynamous, adnate to corolla tube, included or exserted; anthers introrse. Ovary narrowly oblong, 3-locular, 2 locules with 2 series of sterile ovules, 1 locule with a single fertile ovule; style filiform; stigmas capitate, white and papillose. Fruit an oblong, leathery achene, crowned with persistent sepals. Seed subterete, testa membranous; endosperm fleshy.

Three species: China, Japan; two species in China.

- 1a. Sepals usually 2; nectary not clavate and free at apex ..... 1. *D. serrata*  
 1b. Sepals usually 5; nectary clavate and free at apex ..... 2. *D. spathulata*

**1. *Diabelia serrata*** (Siebold & Zuccarini) Landrein, Phytotaxa 3: 37. 2010.

黄花双六道木 huang hua shuang liu dao mu

*Abelia serrata* Siebold & Zuccarini, Fl. Jap. 1: 76. 1835.

Shrubs, deciduous, to 3 m tall. Branches pubescent. Leaf blade ovate, ca.  $5 \times 2.5$  cm, both surfaces sparsely pubescent, more densely so on veins, base cuneate, margin entire or remotely serrate, ciliate, apex acute to acuminate. Flowers paired, terminal; ovaries with 6 bracts at base; peduncle 2–3 mm; bracts lanceolate, 2–3 mm. Calyx of usually 2 oblong sepals, ca.  $10 \times 6$  mm, apex sometimes lobed. Corolla bilabiate, yellow or yellow-green, with orange markings on lower lip; tube ca. 18 mm, inside villous. Stamens 4, didynamous, partially adnate to corolla tube, slightly exserted. Ovary 8–10 mm, pubescent; style filiform, slightly exceeding stamens; stigmas capitate. Achene crowned with usually 2 slightly accrescent sepals. Fl. May, fr. Sep.

Forests; ca. 900 m. Zhejiang (Yongjia) [Japan].

**2. *Diabelia spathulata*** (Siebold & Zuccarini) Landrein, Phytotaxa 3: 37. 2010.

温州双六道木 wen zhou shuang liu dao mu

*Abelia spathulata* Siebold & Zuccarini, Fl. Jap. 1. 77. 1835.

Shrubs, deciduous, to 3 m tall. Branchlets glabrous. Petiole to 4 mm; leaf blade ovate, ca.  $6 \times 3$  cm, both surfaces sparsely pubescent, base rounded, margin entire to remotely serrate and undulate, apex acuminate to caudate. Flowers paired; ovaries with 6 bracts at base; peduncle 4–9 mm; bracts lanceolate, 2–3 mm. Calyx reddish; sepals usually 5, oblong-lanceolate. Corolla to 25 mm, bilabiate; upper lip 2-lobed; lower lip 3-lobed, pink or white tinged with yellow, villous inside and with orange markings on lower lip; tube constricted in middle. Nectary clavate and free at apex. Stamens 4, didynamous; filaments partially adnate to corolla tube. Style filiform, equaling corolla tube; stigmas capitate. Achene glabrous or sparsely pubescent, crowned with usually 5 persistent and slightly enlarged sepals. Fl. May, fr. Jun–Oct.

Forests; 700–900 m. Zhejiang (Wenzhou) [Japan].

#### 4. **KOLKWITZIA** Graebner, Bot. Jahrb. Syst. 29: 593. 1901.

蜡实属 wei shi shu

Shrubs, deciduous. Winter buds with several pairs of pubescent scales. Leaves opposite, shortly petiolate with an interpetiolar line, estipulate. Flowers paniculate, single or paired (flowers opening consecutively) in same inflorescence; paired flowers with 6 bracts, single flowers with 4 bracts at base of ovaries; ovaries each crowned with a long narrow beak; bracts densely hairy, adnate to ovaries, accrescent and becoming spongy, woody, and covered with stiff bristles in fruit. Calyx of 5 narrow, sparsely pubescent sepals. Corolla bilabiate, 5-lobed; lobes spreading. Stamens 4, didynamous, partially adnate to corolla tube. Ovary 3- or 4-locular, 2 locules with 2 series of sterile ovules, 1 or 2 locules with a single fertile ovule. Achenes single or in pairs embedded in accrescent bristly bracts, each crowned with persistent sepals.

• One species: China.

**1. *Kolkwitzia amabilis*** Graebner, Bot. Jahrb. Syst. 29: 593. 1901.

蜡实 wei shi

*Kolkwitzia amabilis* var. *calicina* Pampanini; *K. amabilis* var. *tomentosa* Pampanini.

Shrubs, erect, to 3 m tall. Branchlets hirsute, becoming glabrous. Petiole 1–2 mm; leaf blade elliptic to ovate,  $3\text{--}8 \times 1.5\text{--}2.5$  cm, both surfaces sparsely pubescent, densely spreading pubescent and ciliate on veins and margin, base rounded or broadly cuneate, margin entire, rarely shallowly dentate, apex acute to acuminate. Inflorescence paniculate; flowers single or paired (flowers opening consecutively) in same inflorescence;

peduncle 10–15 mm; bracts lanceolate, tightly adnate to base of ovary. Sepals 5, lanceolate, to 5 mm, pubescent. Corolla whitish, tinged pink, 15–25 mm, outside pubescent, base very narrow, abruptly enlarged above middle; lower lip 3-lobed, bearded, with orange reticulate markings; upper lip 2-lobed. Ovary bottle-shaped with a long neck; style pubescent; stigmas capitate, inserted. Achenes embedded in spongy, woody, and bristly bracts, apex elongated, crowned with persistent, non-acrescent sepals. Fl. May–Jun, fr. Aug–Sep.  $2n = 32^*$ .

• Mountain slopes, roadsides, scrub; 300–1300 m. Anhui, Gansu, ?Hebei, Henan, Hubei, Shaanxi, Shanxi.

This species is rare in the wild but widely cultivated.

#### 5. **DIPelta** Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 50. 1877.

双盾木属 shuang dun mu shu

Shrubs, erect, deciduous. Winter buds with several pairs of scales. Leaves opposite, estipulate, shortly petiolate, slightly pubescent on veins and margin, margin entire or dentate at apex. Inflorescences of single flowers, paniculate; ovaries with 4 bracts at base; bracts unequal in size, larger 2 tightly adnate to ovary. Sepals 5, linear to lanceolate,  $\pm$  fused at base. Corolla bilabiate, distinctly nar-

rowed and gibbous at base; upper lip 2-lobed; lower lip 3-lobed. Stamens 4, didynamous, partially adnate to corolla tube, included. Ovary 4-locular, 2 locules with 2 series of sterile ovules, 2 locules each with a single fertile ovule; style slightly shorter than corolla. Fruit an achene with 2 accrescent, membranous, winglike bracts at base, crowned with persistent calyx.

- Three species: China.

- 1a. Sepals fused into a tube for at least 2/3 of their length; style villous ..... 3. *D. elegans*  
 1b. Sepals fused for less than 1/2 their length; style glabrous to sparsely hairy.  
 2a. Narrow part of corolla tube exerted from sepals; accrescent bracts often peltate, obscuring sepals at anthesis, calyx divided to base ..... 1. *D. floribunda*  
 2b. Narrow part of corolla tube not exerted from sepals; accrescent bracts reniform, not obscuring sepals at anthesis, calyx divided 1/2–2/3 ..... 2. *D. yunnanensis*

**1. *Dipelta floribunda*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 51. 1877.

双盾木 *shuang dun mu*

*Dipelta floribunda* var. *parviflora* Rehder.

Shrubs or small trees, to 6 m tall, deciduous. Branches glandular hairy, becoming glabrous. Petiole 6–14 mm; leaf blade ovate to lanceolate, 4–10 × 1.5–6 cm, midvein white pubescent, base cuneate or obtuse, margin entire, occasionally remotely 2- or 3-dentate at apex, apex acute or long acuminate. Peduncles to 10 mm; ovaries with 4 bracts tightly adnate to base; 2 outer bracts larger, peltate, obscuring sepals at anthesis, accrescent to 20 mm wide when mature, dry membranous, with conspicuous veins; 2 inner bracts smaller, unequal, one ovate, other smaller and narrowly elliptic. Calyx 5-lobed, glandular hairy; lobes linear, 5–7 mm. Corolla white to pink, bilabiate, narrowly cylindrical at base, flaring and campanulate in upper part, 25–40 mm; lower lip with reticulate orange-yellow markings. Ovary pubescent; style filiform, glabrous to sparsely hairy. Achene crowned with persistent calyx, enclosed within 2 accrescent, membranous, winglike, peltate bracts. Fl. Apr–Jul, fr. Aug–Sep.

- Mixed forests, scrub; 600–2200 m. Gansu, Guangxi, Hubei, Hunan, Shaanxi, Sichuan.

*Dipelta wenxianensis* Y. F. Wang & Lian (Acta Bot. Boreal.-Occid. Sin. 14(6): 91, f. 92. 1994; as seen in the illustration but type specimen not located) and a specimen collected in Gansu (Wenxian: Bikou, *D. E. Boufford* 37425) with peltate bracts, pilose style, calyx divided to base, and short corolla tube both show intermediate characters between *D. floribunda* and *D. yunnanensis*. It is not excluded that other intermediate specimens exist.

**2. *Dipelta yunnanensis*** Franchet, Rev. Hort. 63: 246. 1891.

云南双盾木 *yun nan shuang dun mu*

*Dipelta ventricosa* Hemsley; *D. yunnanensis* var. *brachycalyx* Handel-Mazzetti.

Shrubs, deciduous, to 4 m tall. Branches pubescent. Petiole to 5 mm; leaf blade elliptic to lanceolate, 5–10 × 2–4 cm, abaxially white villous on midvein, ciliate along margin, adaxially sparsely pubescent, base cuneate to rounded, margin entire or rarely remotely dentate, apex acuminate to long acuminate. Ovaries with 4 bracts; 2 outer bracts larger, reniform, accrescent in fruit and not obscuring calyx at anthesis; 2 inner bracts smaller, unequal, one ovate, other smaller and narrowly elliptic. Calyx 5-lobed, pubescent; lobes divided 1/2–2/3, spreading in fruit. Corolla white to dark pink, bilabiate, 20–40 mm, very short and narrowly tubular at base; lower lip pubescent with yellow-orange reticulate markings. Ovary pubescent; style inserted, glabrous. Achene ovoid with a short neck, pubescent. Achene crowned with persistent calyx, enclosed within 2 accrescent, membranous, winglike, and reniform bracts. Fl. May–Jul, fr. Jul–Nov.

- Mixed forests, scrub; 800–2400 m. Gansu, Guizhou, Hubei, Shaanxi, Sichuan, Yunnan.

**3. *Dipelta elegans*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: 174. 1895.

优美双盾木 *you mei shuang dun mu*

Shrubs, deciduous, to 2 m tall. Leaf blade elliptic, 5–10 × 2–5 cm, glandular hairy, pubescent on veins and margin, base acute to rounded, margin entire or remotely dentate in upper 1/2, apex long acute to long acuminate. Ovaries with 4 bracts; 2 outer bracts larger, peltate, accrescent in fruit and not obscuring calyx at anthesis. Calyx tubular-campanulate, 5-lobed, sparsely hairy; lobes obtuse, ca. 1/3 as long as tube. Corolla bilabiate, densely pubescent, narrowly cylindric at base, flaring and campanulate in upper part; lower lip villous. Ovary pubescent; style pilose to sparsely pubescent; stigmas capitate. Achene with 2 very large persistent peltate bracts to 40 mm wide. Fl. May–Jun, fr. Sep.

- Broad-leaved forests; ca. 2000 m. Gansu, ?Shaanxi, Sichuan.

## 6. LINNAEA Linnaeus, Sp. Pl. 2: 631. 1753.

北极花属 *bei ji hua shu*

*Linneusia* Rafinesque; *Obolaria* Kuntze (1891), not Linnaeus (1753).

Subshrubs, creeping, evergreen. Branches ascending, slender. Leaves opposite, petiolate, estipulate. Inflorescences of 2 paired and nodding flowers at apices of short lateral branches; peduncles long, slender; ovary with 2 pairs of bracts at base; 2 outer bracts larger and shieldlike, covered with stipitate glandular hairs; 2 inner bracts minute; peduncles, ovaries, and sepals glandular hairy.

Sepals 5, deciduous. Corolla funnelform, 5-lobed, slightly bilabiate. Stamens 4, didynamous, inserted in corolla tube; anthers included. Ovary 3-locular, 2 locules with 2 series of sterile ovules, 1 locule with a single fertile ovule; style filiform; stigmas capitate. Fruit a 1-seeded achene.

One species: widely distributed in alpine and cold regions of the N Hemisphere.

**1. *Linnaea borealis*** Linnaeus, Sp. Pl. 2: 631. 1753.

北极花 bei ji hua

*Linnaea borealis* f. *arctica* Witrock.

Subshrubs, creeping, evergreen, 5–10 cm tall. Stem long, slender, sparsely shortly pubescent. Petiole 3–4 mm; leaf blade orbicular to obovate, abaxially glabrous, adaxially sparsely pubescent, margin with 1–3 pairs of rounded teeth. Flowers fra-

grant, nodding; main peduncles 60–70 mm; inflorescence bracts linear, shortly pubescent; inflorescence peduncles less than 10 mm. Sepals shortly pubescent, narrowly acute, deciduous in fruit. Corolla white to pink, to 10 mm; tube glabrous outside, pubescent inside. Stigmas capitate. Achenes nodding, yellow, orbicular. Fl. and fr. Jul–Aug.  $2n = 32$ .

Needle-leaved forests, on trunks, mossy rocks; 700–2300 m. Hebei, Heilongjiang, Jilin, ?Liaoning, Nei Mongol, Xinjiang [widely distributed in other parts of N temperate regions].

## MORINACEAE

刺参科 ci shen ke

Hong Deyuan (洪德元)<sup>1</sup>; Fred R. Barrie<sup>2</sup>

Herbs, perennial, caudexes usually covered with remnants of old leaf bases. Leaves opposite or verticillate; petioles often amplexicaul at base, forming a sheath. Flowers hermaphroditic, zygomorphic, in verticillasters or subcapitate to capitate heads. Involucel (epicalyx) of 4 fused bracteoles, with several to numerous spiny teeth or setae, 12-veined. Calyx fissured along ventral side, or 2-lipped. Corolla tubular; limb 5-lobed, scarcely to markedly 2-lipped. Stamens 4, all fertile, or 2 fertile plus 2 staminodes; anthers introrse, 2-celled, opening longitudinally. Ovary of 3 carpels, inferior, 1-locular, 6-veined, adnate to calyx tube; style 1, slender; stigma simple; ovules solitary, pendulous. Fruit an achene, enclosed in involucel and surmounted with persistent calyx.

Two genera and ca. 13 species: SE Europe to the Himalaya and SW China; two genera and ten species (four endemic) in China.

Hsing Chi-hua. 1986. *Morina*. In: Lu An-ming & Chen Shu-kun, eds., Fl. Reipubl. Popularis Sin. 73(1): 48–56.

- 1a. Fertile stamens 4; calyx limb oblique; fertile stems always coming from below rosettes; plants not thistlelike ..... 1. *Acanthocalyx*  
1b. Fertile stamens 2; calyx limb 2-lipped; fertile stems not from below rosettes; plants thistlelike ..... 2. *Morina*

### 1. ACANTHOCALYX (Candolle) Tieghem, Ann. Sci. Nat., Bot., sér. 9, 10: 199. 1909.

刺续断属 ci xu duan shu

*Morina* sect. *Acanthocalyx* Candolle, Prodr. 4: 645. 1830.

Taproots fleshy, branching. Caudexes short, woody, often covered with remnants of old leaf bases. Flowering stems emerging below rosettes, usually with 2 bilateral lines of hairs on internodes. Cauline leaves opposite; petioles joined, forming a sheath. Inflorescences subcapitate, often with 1 or more whorls of flowers below primary head; involucral bracts free, connate or sheathing at base; flowers sessile; involucels campanulate, very fragile and papery at anthesis, enlarging and becoming ± leathery in fruit, persistent, with several to numerous teeth. Calyx tubular, oblique at mouth, with a ventral fissure, often with 2 lateral and 3 posterior subspine teeth. Corolla tubular, somewhat swollen below limb, with 2 posterior and 3 anterior spreading lobes. Stamens 4, ± equal, inserted just below swollen part of corolla tube. Style equal to or exceeding corolla tube in length; stigma disk-shaped; ovary 1-loculed; ovule pendulous. Achenes smooth or rugose, apex somewhat cup-shaped.

Two species: Himalaya and the Hengduan Mountains; two species in China.

- 1a. Corolla pink or purple; leaf blade elliptic, lanceolate, or linear-lanceolate; calyx 7–15 mm ..... 1. *A. nepalensis*  
1b. Corolla white or yellowish white; leaf blade linear or linear-lanceolate; calyx 4–7 mm ..... 2. *A. alba*

**1. *Acanthocalyx nepalensis*** (D. Don) M. J. Cannon, Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 12. 1984.

刺续断 ci xu duan

Fertile stems 1–3, 10–50 cm tall, sparsely pubescent above. Rosulate leaves lanceolate or linear-lanceolate, less frequently linear, 10–25 × 0.5–2.6 cm, both surfaces glabrous, base attenuate, sheathing, margins usually setose or spinose, apex acute to acuminate. Cauline leaves 2–4-paired, elliptic to linear-lanceolate, reduced above; lowermost pair often reduced, subovate or spatulate, spineless; uppermost pair densely spiny at base, overlapping but not sheathing. Inflorescence capitate, sometimes with 1 or 2 separate clusters of flowers below primary head; involucral bracts ovate, spinose, concave or folded; involucels sessile, tubular-campanulate, 8–10 mm, outside sparsely villous, apex truncate, villous, with 15 or more irregular spines. Calyx tubular, green below, purple above, or entirely purple, 7–15 mm; tube ca. 1/2 as long as total length of calyx; fissure large, edges villous and dentate-spiny; spines usually 5, irregularly arranged. Corolla pink or purple, slightly zygomorphic,

straight or slightly curved; tube 10–25 × 1.5–3 mm, villous; lobes 5, obcordate, 3–4 mm. Stamens 4, included; filaments sparsely villous, inserted at corolla throat. Style longer than stamens. Achenes columnar, 4–6 mm, glabrous or puberulent. Fl. Jun–Aug, fr. Jul–Sep.

Grassy slopes, alpine meadows; 2800–4200 m. W Sichuan, S and SE Xizang, N Yunnan [Bhutan, N India, Nepal].

- 1a. Ovary and achene usually glabrous ..... 1a. subsp. *nepalensis*  
1b. Ovary and achene usually puberulent ..... 1b. subsp. *delavayi*

#### **1a. *Acanthocalyx nepalensis* subsp. *nepalensis***

刺续断(原亚种) ci xu duan (yuan ya zhong)

*Morina nepalensis* D. Don, Prodr. Fl. Nepal. 161. 1825;  
*M. betonicoides* Benthams; *M. nana* Wallich ex Benthams.

Ovary and achene usually glabrous.

Grassy slopes; 2800–4200 m. S Xizang [Bhutan, N India, Nepal].

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**1b. *Acanthocalyx nepalensis* subsp. *delavayi*** (Franchet) D. Y. Hong, Novon 20: 418. 2010.

大花刺参 da hua ci shen

*Morina delavayi* Franchet, Bull. Soc. Bot. France 32: 8. 1885; *Acanthocalyx delavayi* (Franchet) M. J. Cannon; *Barleria crotalaria* H. Léveillé; *M. bulleyana* Forrest & Diels; *M. nepalensis* subsp. *delavayi* (Franchet) D. Y. Hong & L. M. Ma; *M. nepalensis* var. *delavayi* (Franchet) C. H. Hsing.

Ovary and achene usually puberulent.

Alpine meadows; 3000–4200 m. W Sichuan, SE Xizang, N Yunnan [India (Sikkim)].

**2. *Acanthocalyx alba*** (Handel-Mazzetti) M. J. Cannon, Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 14. 1984.

白花刺续断 bai hua ci xu duan

*Morina alba* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 68. 1925; *M. leucoblephara* Handel-Mazzetti; *M. nepalensis* D. Don var. *alba* (Handel-Mazzetti) Y. C. Tang ex C. H. Hsing.

Caudex covered with remnants of old leaf bases. Fertile

stems 1–3, 10–40 cm tall. Rosulate leaves linear or linear-lanceolate, 10–20 × 0.5–1 cm, both surfaces glabrous, base attenuate, margins entire. Leaves on flowering stems 2–4-paired, similar to rosulate leaves but shorter; petioles folded, sheathing; lowermost pair often much smaller, subovate, usually spineless, with sheaths nearly as long as or longer than blades; uppermost pair of leaves densely spiny and much broader at base. Inflorescences capitellate, sometimes with 1 or 2 separate flower clusters below primary head; involucre bracts ovate, spinose, concave or folded; involucels sessile, tubular-campanulate, 4–7 mm, apex truncate, villous, with 12–16 irregular spines. Calyx green, tubular, 5–8 mm; tube 1–2.5 mm; limb usually with 2 lateral and 3 posterior teeth, margins villous. Corolla white, yellowish, or yellowish green; tube markedly curved, 12–20 mm, densely puberulent above; limb 5-lobed; lobes obcordate, ca. 3 mm. Filaments inserted at corolla throat. Style longer than stamens. Achenes columnar, 4–6 mm, glabrous to densely puberulent. Fl. Jun–Aug, fr. Jul–Sep.

Subalpine or alpine meadows, forests; 2500–4100 m. SE Gansu (Tao He basin), S Qinghai, W Sichuan, SE Xizang, NW Yunnan [N India].

## 2. MORINA Linnaeus, Sp. Pl. 1: 28. 1753.

刺参属 ci shen shu

*Asaphes* Sprengel (1827), not Candolle (1825); *Cryptothladia* (Bunge) M. J. Cannon; *Morina* sect. *Cryptothladia* Bunge.

Roots usually thickened, branched. Caudex short, woody, usually covered with remnants of leaf bases. Leaves in whorls of 3 or 4(–6), rarely 2, opposite, linear to oblong-lanceolate, entire to pinnatifid, spinose. Inflorescence of several verticillasters, each subtended by a whorl of leaflike bracts. Flowers sessile or shortly pedicellate, enveloped in an involucre; involucels campanulate, with 8–16 spiny teeth, 2 significantly longer than others. Calyx tube oblique, campanulate; limb 2-lipped, lips 2- or 3-lobed or emarginate. Corolla tube elongate; limb spreading, 2-lipped; upper lip 2-lobed, lower one 3-lobed. Fertile stamens 2, inserted at corolla throat; staminodes 2, at base of corolla tube, cordate. Nectary 1, anterior, at base of corolla tube, 3-lobed. Ovary inferior, 1-loculed, enveloped in an involucre; style usually longer than stamens; stigma disklike; ovule single, pendulous. Achenes rugose, columnar, slightly or markedly obliquely truncate.

About ten species: from the Balkans to C Asia and E Himalaya; eight species (four endemic) in China.

Cannon and Cannon (Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 1–35. 1984) treated *Cryptothladia* at the rank of genus, separating it from *Morina*. Hong (Novon 20: 418–419. 2010) has explained why this taxon would be better merged into the genus *Morina*.

Cannon and Cannon (loc. cit.: 18) stated that *Morina parviflora* Karelin & Kirilov (*Cryptothladia parviflora* (Karelin & Kirilov) M. J. Cannon) occurred on the border of Kazakhstan with China (Dzungarian Alatau). However, we have not seen any specimens that could be identified as this species.

- 1a. Involucral bracts connate, forming shallow cups; involucel teeth much shorter than tube (1/2 or less as long as tube) ..... 6. *M. polyphylla*
- 1b. Involucral bracts free; involucel teeth at least 2/3 as long as tube.
  - 2a. Leaves with petioles 4–8 cm; leaf margins spinose, rarely sinuate-dentate.
    - 3a. Involucral bracts acuminate at apex, spinose along whole margins; calyx lips 2-lobed, lobes lanceolate, 5–6 mm; middle and upper cauline leaves petiolate ..... 1. *M. chlorantha*
    - 3b. Involucral bracts acute or rounded at apex, spinose only at base; calyx emarginate; middle and upper cauline leaves sessile ..... 2. *M. bracteata*
  - 2b. Leaves sessile or subsessile; leaf margins mostly lobed, less frequently entire.
    - 4a. Leaves entire or slightly toothed; flowers in 20 or more closely packed whorls of 8–12 ..... 5. *M. ludlowii*
    - 4b. Leaves lobed; flowers in fewer, usually interrupted, whorls.
      - 5a. Corolla 2–3 cm, greatly exceeding calyx, obviously 5-lobed; staminodes inserted at middle part of corolla tube.
      - 5b. Involucral bracts broadly ovate or orbicular, ca. as long as wide (excluding pointed apex); calyx covered by involucral bracts ..... 7. *M. longifolia*

- 6b. Involucral bracts broadly ovate-lanceolate, much longer than wide; calyx exposed ..... 8. *M. coulteriana*  
 5b. Corolla less than 1 cm, almost hidden by calyx, weakly lobed with 2 or 4 major lobes;  
 staminodes inserted at base of corolla tube.  
 7a. Calyx lobes 4, ovate, apex rounded; leaves shallowly lobed ..... 3. *M. chinensis*  
 7b. Calyx lobes 4–6, narrowly ovate or ovate-lanceolate, apex usually spinose; leaves cleft  
 almost to midvein ..... 4. *M. kokonorica*

**1. *Morina chlorantha*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 208. 1912.

绿花刺参 lǜ huā cǐ shēn

*Cryptothladia chlorantha* (Diels) M. J. Cannon; *Morina chlorantha* var. *subintegra* Pax & K. Hoffmann ex H. Limpricht.

Caudexes robust, base covered with brown fibrous remnants of leaves. Stems 20–70 cm tall. Basal leaves rosulate; petiole 5–7 cm; blade lanceolate to ovate-lanceolate, 15–35 × 2–2.5 cm, base decurrent, apex acuminate, margin spinose, rarely sinuate-dentate, tooth margin spinose. Cauline leaves similar but smaller, in 2 or 3 whorls of 4, rarely opposite, gradually becoming sessile upward, glabrous. Inflorescence of 6–8 whorls, compact but separated after anthesis; each whorl with 4 involucral bracts, these narrowly ovate, 2.5–3 cm, glabrous, base densely spinose, margins spinose, apex acuminate; involucels tubular, 1.2–1.5 cm, stalked, outside pubescent, apex ca. 10-spinose. Calyx green, 8–10 mm, both sides pubescent, 2-lipped, each lip 2-lobed; lobes lanceolate, 5–6 mm, long ciliate, apex obtuse or 2-spinose at apex. Corolla green-yellow, slightly shorter than calyx, 7–9 mm, outside villous; limb 2-lipped; lobes 5. Stamens inserted at upper part of corolla tube; filaments short, villous; staminodes subsessile, inserted at base of corolla tube. Gynoecium included, slightly longer than stamens; stigma capitate, slightly compressed. Achenes purple-brown, oblong, ca. 5 mm, angular and furrowed, apex obliquely truncate. Fl. May–Aug, fr. Aug–Sep.

• Grassy slopes, forest margins; 2800–4000 m. W Sichuan, NW Yunnan (Lijiang, Zhongdian).

**2. *Morina bracteata*** C. Y. Cheng & H. B. Chen, Acta Phytotax. Sin. 29: 190. 1991.

宽苞刺参 kuan bao cǐ shēn

Roots elongate, branched. Caudexes short, covered with black-brown fibrous remnants of old leaves. Stems ca. 45 cm tall, glabrous below, villous above. Basal leaves rosulate; petiole 4–8 cm; leaf blade elliptic or obovate-elliptic, 9–12 × 2.5–3 cm, both surfaces glabrous, base attenuate to petiole, margin spinulose only at base, apex acute; cauline leaves similar, in whorls of 4, sessile or shortly petiolate. Inflorescence of 6 or 7 whorls, lower whorls often separate from each other, upper ones compact, each whorl with 4 involucral bracts; involucral bracts ovate, 2.5–3.5 cm, glabrous or white villous at base, spinulose only along lower margins, apex acute or rounded; involucels tubular-campanulate, 1–1.5 cm, white villous outside, apex with 10–12 spines; spines unequal in length, 6 or 7 longer, 2–3 mm. Calyx campanulate, ca. 9 mm, villous, 2-lobed; lobes 4.5–5 mm, apex emarginate, rounded. Corolla shorter than calyx, pale green, tubular, 5–6 mm, villous outside; limb slightly 2-lipped; lobes 5, subequal. Fertile stamens in-

serted at upper part of corolla tube; filaments short, barbate; staminodes inserted at base of corolla tube. Style slightly longer than stamens; stigma capitate. Achenes brown, obovoid-oblong, 6–6.5 × 3–3.5 mm, tuberculate-rugose, apex obliquely truncate. Fl. and fr. Aug.

• Slopes; ca. 3200 m. Sichuan (Butuo).

**3. *Morina chinensis*** Y. Y. Pai, Repert. Spec. Nov. Regni Veg. 44: 122. 1938.

刺参 cǐ shēn

*Cryptothladia chinensis* (Y. Y. Pai) M. J. Cannon; *Morina lorifolia* C. Y. Cheng & H. B. Chen.

Roots robust, usually unbranched. Caudexes short, simple or branched, covered with old, nearly complete leaf bases. Fertile stems 15–70 cm tall, glabrous and purple below, purplish and white villous above. Leaves on sterile stems 6–8, linear-lanceolate, 10–25 × 1–2 cm, glabrous, midvein marked, base decurrent and amplexicaul, apex acuminate, margin irregularly and shallowly lobed; lobes subtriangular, with 3–9 rigid spines. Cauline leaves in 2 or 3 whorls of 4–6 leaves, similar to those on sterile stems but shorter, 5–15 cm, gradually smaller upward, margins of lobes spinose. Inflorescence of 6–9 whorls of up to 20 flowers each, compact at anthesis but separated in fruit; involucral bracts 4, leaflike, narrowly ovate, 2.5–3.5 cm, margins densely spiny, apex acuminate; involucels hidden in involucral bracts, campanulate, 1–1.4 cm, sparsely villous outside, apex truncate, margin with 10 unequal spines to 6 mm. Calyx exerted ca. 3 mm above involucel, 2-lipped, 6–10 mm, each lip 2-lobed; lobes rounded, veins prominent, outside glabrous, inside lanate, base barbate. Corolla pale green, shorter than calyx, 6–7 mm; limb 2-lipped, upper lip 2-lobed, lower lip 3-lobed, sparsely villous. Stamens adnate to upper part of corolla tube; staminodes inserted at base of corolla tube; anthers included. Style slightly longer than stamens; stigma capitate. Achenes brown, oblong, 2–3 mm, rugose, apex obliquely truncate, with persistent calyx, hidden in involucels. Fl. Jul–Aug, fr. Sep.

• Alpine meadows with shrubs; 2800–4300 m. SE Gansu, Nei Mongol (Helan Shan), Qinghai, NW Sichuan, Xizang (Qamdo).

**4. *Morina kokonorica*** K. S. Hao, Repert. Spec. Nov. Regni Veg. 40: 215. 1936.

青海刺参 qīng hǎi cǐ shēn

*Cryptothladia kokonorica* (K. S. Hao) M. J. Cannon.

Roots robust, ca. 40 cm, up to 3 cm in diam., simple or remotely branched. Caudexes usually branched, covered with brown-black remnants of old leaves. Stems usually caespitose, 20–70 cm tall, simple or 2- or 3-branched, ridged and glabrous below, villous above. Leaves on sterile shoots 5 or 6, rosulate, linear-lanceolate, 7–20 × 1–1.5 cm, both surfaces glabrous, base

decurent into petiole, margin coarsely and irregularly pinnatifid, with triangular, spinose lobes, apex acuminate. Leaves on fertile stems similar, in 2 or 3 whorls of 4, narrowly lanceolate, base amplexicaul, smaller upward. Inflorescence of up to 8 whorls of 16–20 flowers, compact in bud, but separated after anthesis, each with 4 involucre bracts, these narrowly ovate, 2–3 cm, margin yellow spinose, apex acuminate; involucre campanulate, hidden in bracts, 1.2–1.5 cm, prominently veined, stalked, margin with more than 10 unequal spines up to 7 mm. Calyx cup-shaped, 8–15 mm, exserted ca. 3 mm above involucre bracts, outside glabrous, inside villous, base barbate, 2-segmented, each segment 2- or 3-lobed; lobes lanceolate, apex often spinose. Corolla pale green, 6–8 mm, included in calyx, outside glabrous; limb 2-lipped, 5-lobed. Stamens inserted at upper part of corolla tube; filaments short, villous; staminodes inserted at base of corolla tube, subsessile. Style included, slightly longer than stamens; stigma capitate. Achenes brown, columnar, 6–7 mm, smooth, angular, apex obliquely truncate. Fl. Jun–Aug, fr. Aug–Sep.

• Stony slopes, meadows, flood plains; 3000–4500 m. S Gansu, Qinghai, W Sichuan, E and S Xizang (west to Burang, north to Bainain, Sogxian).

**5. *Morina ludlowii*** (M. J. Cannon) D. Y. Hong, *Novon* 20: 418. 2010.

藏南刺参 zang nan ci shen

*Cryptothladia ludlowii* M. J. Cannon, *Bull. Brit. Mus. (Nat. Hist.)*, Bot. 12: 22. 1984.

Caudexes thickly covered with fibrous remnants of leaf bases. Stems up to 50 cm tall. Basal and lower cauline leaves in whorls of 3 or 4, narrowly elliptic, 5–9 × 1–2 cm, adaxially pubescent, connate basally, forming a loose sheath, margins entire or remotely toothed, ciliate, spinose; upper cauline leaves similar, uppermost whorl often barely connate. Inflorescence short initially, 2–3 cm, elongating rapidly, terete, or slightly grooved, densely covered with whitish, mostly retrorse hairs. Flowers in 20 or more closely packed whorls of 8–12; involucre bracts leaflike, regularly decussate, lowermost whorl similar to leaves but smaller, usually 3-lobed; lobes irregularly spinose-dentate, acute or cuspidate; central lobe larger, often reddish or deeply colored; involucre tubular-campanulate, 4–6 mm, ca. 2 mm wide at base, laminate, becoming larger and rigid in fruit, villous, often with stalked or sessile glands, 4–12-dentate, one tooth often larger. Calyx tube tubular-campanulate, 2.5–4 mm at anthesis; limb 2-fid; lobes shallowly divided; lobules rounded to apiculate, outside glabrous, inside villous and glandular. Corolla included, ± tubular, outside glabrous, 4-lobed; posterior lobe ± fimbriate; anterior lobe entire, exceeding posterior, inside hispid; lateral 2 lobes very small. Stamens inserted at middle part of corolla tube; filaments short, with a tuft of hairs below anthers; staminodes at base of corolla tube, shortly stalked. Style slightly shorter than corolla tube; stigma disk-shaped. Achenes subglobose, 3–5 mm, abaxially with a shallow furrow, apex slightly obliquely truncate, obtusely pointed, somewhat rugose. Fl. May–Aug, fr. Aug–Sep.

Thickets, stony hillsides; 3700–4300 m. S Xizang (Cona) [Bhutan, NE India].

**6. *Morina polyphylla*** Wallich ex Candolle, *Prodr.* 4: 644. 1830.

多叶刺参 duo ye ci shen

*Cryptothladia polyphylla* (Wallich ex Candolle) M. J. Cannon.

Roots ± lignified, up to 2 cm in diam. Caudexes thickly covered with brown fibrous remnants of old leaves, up to 3 cm in diam. Flowering stems to 50 cm tall, terete, or furrowed, glabrous below, white hairy above, often purple. Leaves on sterile shoots rosulate; petiole long and narrow; blade linear to linear-lanceolate, up to 40 × 1.5–4 cm, pinnatifid; segments usually 3–5-fid; lobules spinose apically, glabrous or sparsely pubescent; cauline leaves on flowering shoots in whorls of (3 or) 4–6, similar but smaller. Inflorescence 8–10 cm, compact, of many whorls; involucre bracts (3 or) 4–6 per whorl, connate basally, forming a cup-shaped structure, apex linear or linear-lanceolate, with lateral spines and tapering into a robust spine; involucre cylindric, 6–13 mm, toothed, usually pilose, rarely subglabrous, with many sessile and a few stalked glands, teeth usually 8–10, apex tapered to a terminal bristle or spine, 1 or 2 longer than others. Calyx tubular or campanulate, 7–12 mm; tube 4–5 mm, usually densely pilose and glandular inside; limb 2-lobed; lobes spreading, white or lavender, deeply divided, 4 lobules apically rounded or spinose. Corolla pink or white, ca. as long as involucre, subtubular; limb 4-lobed. Stamens inserted at middle of corolla tube; staminodes inserted at base of corolla tube. Style ca. as long as corolla tube; stigma disk-shaped. Achenes 4.8–5.5 × 2.8–3 mm, plano-convex, obliquely truncate, surmounted with persistent and enlarged calyx. Fl. May–Jul, fr. Aug–Sep.

Grassy slopes, alpine meadows, rarely forests; 2600–4700 m. S Xizang (Yadong) [Bhutan, N India (Sikkim), Nepal].

**7. *Morina longifolia*** Wallich ex Candolle, *Prodr.* 4: 644. 1830.

长叶刺参 chang ye ci shen

Caudexes often covered with fibrous remnants of old leaves. Stems up to 80 cm tall. Leaves on sterile shoots rosulate, rosulate leaves and lower cauline leaves with petioles fused, forming sheaths 2.5–4.5 cm; blade linear to linear-lanceolate, up to 40 × 4 cm, both surfaces glabrous, margin regularly lobed, each lobe with 4 or 5 spinose teeth; upper cauline leaves similar, smaller, usually 3 per whorl, sheaths up to 8 mm, or petioles barely connate. Flowering stems erect, to 90 cm, glabrous, slightly ridged to terete below, pubescent to villous above. Inflorescence of (4–) 7–9(–11) whorls, pedicellate or sessile; upper whorls confluent at anthesis, separating in fruit; involucre bracts broadly ovate to orbicular, bases markedly overlapping, adaxially sparsely hairy, abaxially villous, margin often with numerous short spiny teeth and ciliate, apex spinose; involucre tubular, 7–10 × 2.5–4 mm, glandular pubescent, spines 5–13. Flowers pedicellate. Calyx glabrous, or with short adpressed hairs on tips; lobes shallowly bifid; lobules rounded or rarely slightly apiculate; tube 4.5–6 × 2.5–4 mm at anthesis. Corolla white, becoming pink to deep red; tube 20–30 × 1–2 mm, with many glandular and a few simple hairs outside; limb 2-lipped; lobes of lower lip ± spreading, central lobe ca. 7 × 3 mm, upper lip ± spreading. Stamens inserted at throat of corolla; filaments 1–3 mm, with a tuft of hairs below anthers; stami-

nodes minute, inserted 2–3.5 mm below mouth of corolla under anterior lip. Style slightly longer than stamens; stigma disk-shaped. Achenes rugose on abaxial side, with a deep furrow and prominent longitudinal veins on adaxial side, apex slightly obliquely truncate and crenulate. Fl. Jun–Sep, fr. Sep–Oct.  $2n = 16, 34$ .

Grassy slopes, thickets; 3000–4300 m. S Xizang (Gyirong) [Bhutan, India, ?Nepal, Pakistan].

**8. *Morina coulteriana*** Royle, Ill. Bot. Himal. Mts. 1: 245. 1835.

黄花刺参 huang hua ci shen

Caudexes woody, often covered with remnants of old leaf bases. Sterile shoots dwarf; fertile shoots up to 1 m tall or more, ridged and glabrous below, sparsely villous and purple above. Leaves on sterile shoots rosulate, 20–25 × ca. 2.5 cm, glabrous, pinnatilobate, with spiny, simple or compound teeth; petioles fusing to form a deep sheath 8–15 mm; lower cauline leaves similar, in whorls of 3 or 4(or 5); upper cauline leaves also

similar but smaller. Inflorescence of 6–8 whorls of numerous flowers; lower 3–5 whorls separate, upper 3 or 4 confluent; involucre bracts 3 or 4 per whorl, broadly ovate-lanceolate, up to 8 × 2 cm, spiny, prominently net-veined, upper bracts smaller; involucels subcylindrical, villous, 4–9 × 2.5–4 mm, with 9–12 teeth. Calyx glabrous to villous, with a large tuft of hairs at base, tubular-campanulate, 3–6.5 × 2–4 mm; limb 2-lipped; lips deeply bifid, apex acute or apiculate, often spinose. Corolla yellow or greenish yellow; tube villous, 25–30 × 1–2 mm; limb 2-lipped; upper lip 2-lobed, lower one 3-lobed, median lobe of lower lip 5.5–10 × 3.5–6 mm. Stamens with filaments 2–3 mm, with a tuft of hairs below anthers; staminodes minute, cordiform. Style slightly longer than stamens; stigma disk-shaped. Achenes convex on adaxial side, rugose on abaxial side, with very deep longitudinal furrows. Fl. Jun–Aug, fr. Aug–Sep.

Grassy or shrubby slopes; 3000–3700 m. S Xinjiang, SE Xizang (Mainling) [Afghanistan, NW India, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].

## DIPSACACEAE

川续断科 chuan xu duan ke

Hong Deyuan (洪德元)<sup>1</sup>, Ma Liming (马黎明)<sup>1</sup>; Fred R. Barrie<sup>2</sup>

Herbs, mostly perennial, less frequently annual or biennial, very rarely subshrubs. Leaves opposite, or sometimes whorled, simple, entire or toothed, pinnatifid to pinnatisect. Inflorescences of compact cymes forming a terminal, involucre head, or diffuse and paniculiform (*Triplostegia*). Flowers bisexual, nearly always subtended by 1 or 2 cupular, apically toothed or subtire involucre (epicalyx); receptacle hairy or naked. Calyx usually small, cupular, or 4- or 5-segmented, or with up to 10 teeth or setae. Corolla sympetalous, 5 (or 4)-lobed,  $\pm$  irregular. Stamens 4, rarely 2 or 3, inserted at summit of corolla tube; anthers 4-sporangiate, opening by longitudinal slits. Gynoecium of 2 carpels, but 1 carpel obsolete; ovary inferior, 1-loculed; ovule solitary, apical, pendulous; style slender; stigma entire or 2-fid. Fruit an achene, enclosed by involucre and crowned by persistent calyx.

Ten genera and ca. 250 species: Africa, Asia, Europe; four genera and 17 species (four endemic) in China.

He Shi-yuan, Hsing Chi-hua & Yin Tsu-tang. 1986. Dipsacaceae. In: Lu An-ming & Chen Shu-kun, eds., Fl. Reipubl. Popularis Sin. 73(1): 44–84.

- 1a. Inflorescence paniculiform ..... 1. *Triplostegia*
- 1b. Inflorescence a compact head.
  - 2a. Plants spiny; flowers uniform; involucre usually without an evident crown ..... 4. *Dipsacus*
  - 2b. Plants without spines; flowers usually dimorphic, corolla of marginal flowers larger and 2-lipped; involucre usually with a crown.
    - 3a. Leaves usually all basal; calyx segments 8 or more, plumose or setose, shedding ..... 2. *Pterocephalus*
    - 3b. Leaves mostly cauline; calyx segments 5, setose, persistent ..... 3. *Scabiosa*

### 1. TRIPLOSTEGIA Wallich ex Candolle, Prodr. 4: 642. 1830.

双参属 shuang shen shu

Herbs, perennial, erect. Taproots fusiform. Rhizomes horizontal. Basal leaves dense, rosulate; leaf blade serrate or pinnatifid; cauline leaves decussate, otherwise similar. Inflorescence paniculiform, flowers in remote, terminal, simple or compound dichasia, all parts densely white villous and glandular hairy; bracts linear; involucre 2, urceolate, outer involucre 4-lobed, outer surface glandular pubescent, inner involucre 8-ribbed. Flowers nearly actinomorphic. Calyx reduced, 4-lobed. Corolla tubular-funnelform, 5-lobed; lobes subequal, imbricate in bud. Stamens 4, equal in length, alternate with corolla lobes; anthers introrse, versatile. Style solitary; stigma capitate. Achenes enveloped in urceolate involucre. Seeds subglobose, acute at both ends, smooth, with 2 obscure angles; endosperm copious; embryo small.

Two species: from India and Nepal northward to Gansu, southward to Malaysia, and eastward to Taiwan; two species in China.

*Triplostegia pinifolia* H. Léveillé and *T. mairei* H. Léveillé have been identified respectively as *Sedum fastigiatum* J. D. Hooker & Thomson (Crassulaceae) and *Chrysosplenium macrophyllum* Oliver (Saxifragaceae) by L. A. Lauener (Notes Roy. Bot. Gard. Edinburgh 30: 284, 290. 1970).

- 1a. Corolla 3–5 mm; involucre hooked at apex; leaf blade ovate-lanceolate, petiolate ..... 1. *T. glandulifera*
- 1b. Corolla 7–12 mm; involucre not hooked at apex; leaf blade obovate to obovate-lanceolate, sessile ..... 2. *T. grandiflora*

**1. *Triplostegia glandulifera*** Wallich ex Candolle, Prodr. 4: 642. 1830.

双参 shuang shen

*Hoeckia aschersoniana* Engler & Graebner; *Triplostegia repens* Hemsley.

Herbs, perennial, erect, 15–40 cm tall. Taproots 2-forked, brown, nearly fusiform, 30–50  $\times$  2–3 mm, slightly fleshy. Rhizomes elongate, 4-angular, nodes 4–6, internodes 0.5–2 cm, nodes rooted. Stems angular, glabrous or sparsely puberulent, glandular hairy above. Leaves opposite, petiolate; petiole 1–3 cm; leaf blade obovate-lanceolate, 2–6  $\times$  1.5–4 cm, pinnatifid,

more deeply so at base, abaxially puberulent on veins, adaxially sparsely puberulent, ultimately glabrescent, margin irregularly lobed or serrate; upper leaves smaller, lobed, sessile. Inflorescences paniculiform; bracts 2–4 mm, midvein prominent, margin sparsely ciliate; pedicels ca. 1 mm; outer involucre 4-lobed; lobes lanceolate, 1.5–2 mm, abaxially densely covered with purple glandular hairs; inner involucre urceolate, ca. 1.5 mm, 8-ribbed, apex constricted into limb; limb 8-toothed or 8-dentate. Corolla white or rose, funnelform, 3–5 mm; lobes obtuse. Stamens slightly exserted; filaments ca. 5 mm; anthers white. Style slightly longer than stamens. Achenes enveloped by involucre; involucre 3–4 mm in fruit, glandular hairy, 4-lobed; lobes long acuminate, hooked. Fl. and fr. Jul–Oct.  $2n = 18$ .

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Forests, grassy slopes, meadows, by streams; 1500–4000 m. Chongqing, SE Gansu (Xigu), Hubei (Enshi, Jianshi), Shaanxi (Yangxian), W Sichuan, Taiwan (Yushan), SE Xizang, NW Yunnan [Bhutan, India, Malaysia (peninsular), Myanmar, Nepal].

**2. *Triplostegia grandiflora*** Gagnepain, Bull. Soc. Bot. France 47: 333. 1901.

大花双参 da hua shuang shen

*Triplostegia delavayi* Franchet ex Diels.

Herbs, perennial, erect, 20–45 cm tall. Taproots often dichotomous, nearly fusiform, 30–40 × ca. 5 mm, slightly fleshy. Rhizomes short, nodes 2–4, internodes ca. 1 cm. Stems solitary, simple, slightly 4-angular, white villous, sometimes glandular hairy above. Leaves opposite, sessile, slightly amplexicaul, obovate to obovate-lanceolate, 3–8 cm, both surfaces villous, base cuneate, apex rounded, pinnatifid or pinnatilobate; terminal lobe

largest, all lobes serrate; upper leaves gradually smaller and becoming bractlike. Inflorescence branches elongate, densely white villous and glandular hairy; bracts leaflike to linear, 5–20 mm, 1-veined, white villous and glandular hairy, margin shallowly serrate or entire, apex obtuse; pedicels 2–3 mm; outer involucre 4-lobed; lobes lanceolate, 2–3 mm, densely covered with black glandular hairs, apex acute; inner involucre ovoid, 8-ribbed; limb 5-dentate, teeth acute at base, hirsute. Calyx reduced. Corolla whitish rose, funnelform, nearly actinomorphic, 1–1.2 cm, outside sparsely puberulent, 5-lobed; lobes ca. 1/3 as long as total length of corolla, apex obtuse. Stamens slightly exserted; anthers yellow, introrse. Ovary enveloped by urceolate involucre; style shorter than stamens; stigma capitate. Achenes enveloped in involucre; lobes not hooked. Fl. and fr. Jul–Oct.

Forests, forest margins, grassy slopes; 2000–3000 m. SW Sichuan, N Yunnan [Bhutan].

## 2. **PTEROCEPHALUS** Vaillant ex Adanson, Fam. Pl. 2: 152, 595. 1763.

翼首花属 yi shou hua shu

Herbs, perennial or annual, or sometimes subshrubs. Leaves basal, rosulate, entire, pinnatifid to pinnatisect. Capitula solitary, terminal; involucre of 2, rarely 3 whorls of 4–6 involucre bracts; receptacles covered with hirsute hairs or bracts; involucre 1, 4–8-ribbed, apex obscurely dentate, or corona-like, or membranous and dentate. Calyx segmented and 8–24-setose or pinnate. Corolla 4- or 5-lobed, that of central flowers nearly actinomorphic, that of marginal flowers nearly 2-lipped; upper lip with 1 lobe, entire or 2-lobed; lower lip usually 3-lobed. Stamens 4, rarely 2 or 3, inserted at upper part of corolla, exserted. Ovary inferior, enveloped by involucre. Achenes smooth or ribbed. Seeds with a large, straight embryo and scanty endosperm.

About 25 species: from the Mediterranean to C Asia and tropical Africa; two species (one endemic) in China.

- 1a. Leaves spatulate or linear-spatulate, entire or narrowly segmented; inflorescences globose in fruit; involucre bracts of outer layer narrowly ovate; persistent calyx segmented into 20 pinnate hairs; corolla 5-lobed, obovoid, 4–5 mm ..... 1. *P. hookeri*
- 1b. Leaves oblong-lanceolate or oblanceolate, pinnatifid to bipinnatisect; inflorescences compressed globose in fruit; involucre bracts of outer layer lanceolate; persistent calyx segmented into 8 brown setae; corolla 4-lobed ..... 2. *P. bretschnideri*

**1. *Pterocephalus hookeri*** (C. B. Clarke) E. Pritzel, Bot. Jahrb. Syst. 29: 601. 1901.

匙叶翼首花 chi ye yi shou hua

*Scabiosa hookeri* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 218. 1881; *Pterocephalodes hookeri* (C. B. Clarke) V. Mayer & Ehrendorfer; *Pterocephalus batangensis* Pax ex K. Hoffmann.

Herbs, perennial, 10–50 cm tall, white villous throughout. Taproots robust, columnar, 8–15 × 1.5–3.5 cm, lignified. Leaves all basal, rosulate, oblanceolate, 5–18 × 1–2.5 cm, base attenuate into winged petiole, margin entire, remotely and coarsely serrate, or pinnatifid, apex obtuse or acute; segments in 3–5 pairs, obliquely ovate or lanceolate, 1–2 cm; terminal lobe larger, lanceolate, abaxially white, midvein conspicuous, adaxially green, white puberulent. Scapes 10–40 cm, 2–4 mm in diam., white villous, more densely so near inflorescences. Capitula solitary, terminal, erect or slightly pendulous, globose, 3–4 cm in diam.; involucre bracts 2- or 3-layered, narrowly ovate to ovate-lanceolate, 12–18 × 5–7 mm, pilose, margin ciliate, apex acute; bracts linear-oblanceolate, 1–1.2 cm, base clawed, densely white villous, midvein conspicuous; involucre tubular,

4–5 × ca. 1.5 mm, outside white hirsute, attenuate toward base, sinuate-dentate, apex slightly spreading. Calyx segmented to base into 20 soft pinnate hairs. Corolla yellowish white to pale purple, tubular-funnelform, 1–1.2 cm, outside rather densely villous, shallowly 5-lobed; lobes obtuse, ca. 3.5 mm. Stamens 4; anthers dark purple, ca. 3 mm. Ovary enveloped in involucre; style ca. 1.5 cm, strongly exserted; stigma pale brown, compressed globose. Achenes pale brown, obovoid, 3–5 mm, longitudinally 8-ribbed, sparsely adpressed hairy; pinnate hairs of persistent calyx ca. 1 cm, white. Fl. and fr. Jul–Oct.

Grassy slopes, meadows, by fields; 1800–4800 m. S Qinghai, W Sichuan, Xizang, N Yunnan [Bhutan, India, Nepal].

**2. *Pterocephalus bretschnideri*** (Batalin) Pritzel ex Diels, Bot. Jahrb. Syst. 29: 601. 1901.

裂叶翼首花 lie ye yi shou hua

*Scabiosa bretschnideri* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: 184. 1895; *Pterocephalodes bretschnideri* (Batalin) V. Mayer & Ehrendorfer.

Herbs, perennial, 8–40 cm tall. Taproots columnar, 3–20 mm in diam. Leaves basal, rosulate; petiole 3–10 cm; leaf blade

oblong to oblanceolate, 5–20 cm, pinnatifid to bipinnatisect; segments linear, both surfaces glabrous or puberulent. Scapes white puberulent, more densely so near inflorescence. Capitula solitary, terminal, oblate, 2.5–3 cm in diam.; involucre bracts 2-layered, 10–14, broadly linear, outside white puberulent; receptacles disklike, densely white hairy; bracts brown, linear-lanceolate, 4–6 mm, pubescent, apex acuminate; involucels ellipsoid-obovoid, 4–5 mm, 8-ribbed, densely white hirsute, membranous at apex, dentate. Calyx segmented into 8 brown setae, setae 1–1.2 cm, hispidulous above. Corolla pale rose to

purple-red, tubular, 12–15 mm; tube 7–10 mm, densely white villous; limb with 4 obtuse lobes, slightly 2-lipped; upper lip slightly larger, ca. 2.5 mm; 3 lobes of lower lip ca. 2 mm, with several brown veins. Stamens 4, inserted at upper part of corolla; filaments ca. 5 mm, obviously exserted. Stigma capitate. Achenes ellipsoid, ca. 4 mm, apex tapering into a rostrum, 8-veined, sparsely villous; persistent calyx 8-setose. Fl. Jul–Aug, fr. Sep–Oct.

● Mountainous rocky crevices, grassy slopes in forests; 1600–3400 m. W Sichuan, SE Xizang (Nangxian), N Yunnan.

### 3. *SCABIOSA* Linnaeus, Sp. Pl. 1: 98. 1753.

蓝盆花属 lan pen hua shu

*Asterocephalus* Zinn.

Herbs, biennial or perennial, sometimes subshrubs due to lignification at base, rarely annual. Leaves opposite; cauline leaves amplexicaul; leaf blade pinnatipartite or pinnatisect, rarely entire. Capitula terminal, oblate-globose, ovoid, or ovoid-conical, long pedunculate; involucre bracts leaflike, in 1 or 2 series; receptacles conical to semiglobose, sometimes columnar; bracts linear-lanceolate, 1-veined, back often carinate; involucel (epicalyx) 1, broadly funnelform or angular-columnar, 8-ribbed in fruit, furrowed in entire length, or furrowed only above and rounded at base, often fissured into 2–8 pits apically, top becoming a membranous, campanulate or rotate crown, 16–30-veined, margin dentate. Calyx stalked, disklike, 5-segmented into radial setae. Corolla usually dimorphic, tubular, blue, purple, purple-red, yellow, or white, 4- or 5-lobed; that of marginal ray flowers usually larger, 2-lipped; upper lip usually 2-lobed, shorter; lower lip 3-lobed, elongated and raylike; that of central flowers usually tubular; lobes subequal in length. Stamens 4, exserted. Ovary enveloped in involucels; style slender; stigma peltate or capitate. Achenes enveloped in involucels, crowned with persistent setose calyx. Seeds with a large, straight embryo and scanty endosperm.

About 100 species: S and W Africa, Asia, Europe, mainly in the Mediterranean; six species (one endemic) in China.

- 1a. Annuals; capitula ca. 5 mm in diam. at anthesis; calyx setae up to 1 cm ..... 3. *S. olivieri*
- 1b. Perennials; capitula over 30 mm in diam. at anthesis; calyx setae shorter.
  - 2a. Involucels subcylindrical, not angular below, furrowed or pitted above.
    - 3a. Basal leaf blades lanceolate or elliptic, entire ..... 1. *S. alpestris*
    - 3b. Basal leaf blades pinnatifid; leaf segments 1.5–3 mm wide ..... 2. *S. austroaltaica*
  - 2b. Involucels 8-ribbed, or with 4 obvious and 4 obscure ribs.
    - 4a. Corolla yellow; involucels obviously 8-ribbed ..... 4. *S. ochroleuca*
    - 4b. Corolla blue or purple; involucels 8-ribbed, but only 4 ribs marked, while others obscure.
      - 5a. Leaves pinnatifid to pinnatisect; segments linear or lanceolate ..... 5. *S. comosa*
      - 5b. Leaves linear-lanceolate, margins serrate or lacerate ..... 6. *S. lacerifolia*

1. *Scabiosa alpestris* Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 536. 1842.

高山蓝盆花 gao shan lan pen hua

*Trochocephalus alpestris* (Karelin & Kirilov) A. Löve & D. Löve.

Herbs, perennial. Caudexes lignified, 2–5-branched, outside brown-black. Stems 20–50 cm tall, nodes 2–4, usually pubescent, occasionally glabrous. Basal leaves and first pair of lower cauline leaves petiolate; petioles 5–7 cm; leaf blade lanceolate, 5–8 × 0.5–1.1 cm, glabrous or sparsely puberulent, base attenuate into petiole, margin usually entire, ciliate, hairs white, apex acuminate. Cauline leaves in 1–3 pairs, second and third pairs pinnatisect; lateral segments linear-lanceolate; terminal lobe larger, lanceolate, 4–7 × 0.6–0.8 cm; all segments pubescent below, margins ciliate. Peduncles ca. 10 cm; capitula 3–6 cm in diam. at anthesis, globose and ca. 3 cm in diam. in fruit; involucre bracts linear-lanceolate, 1.2–1.5 cm, densely white hirsute; involucels 8–10 mm, rounded and sparsely white pilose

below, with 8 pits above, crown membranous, 5–6 mm, 16–18-veined, margin sinuous-dentate. Calyx 5-setose, setae brown, radial, 1–3 mm, longer than crown. Corolla pale purple or purple-red, outside lanate; limb ± lipped, 5-lobed; lobes unequal in size. Anthers yellow. Style purple-red; stigma capitate, exserted. Fl. May–Aug, fr. Aug–Sep.

Alpine meadows; 3000–3200 m. Xinjiang (Huocheng, Wujia, Zhaosu) [Kazakhstan, Kyrgyzstan].

2. *Scabiosa austroaltaica* Bobrov in Schischkin & Bobrov, Fl. URSS 24: 457. 1957 [*"austro-altaica"*].

阿尔泰蓝盆花 a er tai lan pen hua

*Lomelosia austroaltaica* (Bobrov) Soják; *Scabiosa xjiangensis* Y. K. Yang, G. J. Liu & J. K. Wu.

Subshrubs, 20–60 cm tall. Caudexes robust, lignified, several branched. Stems erect, nodes 1–4, densely puberulent. Leaves mostly basal; basal leaves petiolate; petiole 1–2.5 cm; leaf blade oblong, 3–10 × 0.7–3 cm, pinnatifid; segments linear-

lanceolate, incised, pubescent. Cauline leaves smaller, 2- or 3-paired, sessile, sparsely puberulent,  $\pm$  setose at axils of veins, pinnatisect; segments lanceolate, 5–20  $\times$  1.5–3 mm. Capitula 2–3 cm in diam. at anthesis, globose and 1.5–2 cm in diam. in fruit; involucre bracts narrowly ovate, 1/3–1/2 as long as marginal ray flowers, sparsely puberulent, apex acuminate; bracts linear-lanceolate, upper 1/3 carinate, lower part linear, sparsely villous; involucels 3–4 mm, above with 8 pits, base densely white hirsute, crown 2–3 mm wide. Calyx 5-setose. Corolla blue-purple, outside adpressed puberulent. Fl. Jun–Jul, fr. Aug.

Grassy slopes; ca. 1200 m. Xinjiang [E Kazakhstan].

**3. *Scabiosa olivieri*** Coulter, Mém. Dipsac. 36. 1823.

小花藍盆花 xiao hua lan pen hua

*Lomelosia olivieri* (Coulter) Greuter & Burdet; *Scabiosa olivieri* var. *longinvolucra* Y. K. Yang, N. R. Cui & Y. Hazit; *Trochocephalus olivieri* (Coulter) A. Löve & D. Löve.

Herbs, annual, 10–38 cm tall. Taproots solitary, 40–50  $\times$  3–4 mm. Stems terete, slender, branched from base and dichotomous from lower middle part, white puberulent. Leaves opposite, sessile; leaf blade oblong or linear-lanceolate, 20–50  $\times$  3–10 mm, both surfaces densely villous, margin often entire, not segmented, or with 1 or 2 pairs of leaflets, sometimes pinnatifid. Peduncles 3–10 cm, slender, sparsely villous; capitula globose, 3–5 mm in diam. at anthesis, flowers 5–15, strongly dimorphic; involucre bracts 3–5, oblong-ovate or ovate-orbicular, 2–3  $\times$  1.5–2 mm, shorter than flowers, rather densely villous, apex acuminate; involucels broadly funnelform, ca. 2 mm, base white hispidulous, upper half 8-pitted; crown spreading, 3–6 mm wide, membranous, with 20–24 ribs, outside sparsely villous along ribs. Calyx radially 5-setose, shortly stalked, brown, setae sometimes to 1 cm, 4–5  $\times$  as long as involucre crown. Corolla pale purple or white, outside puberulent. Achenes white hairy. Fl. May–Jun, fr. Jun–Jul.  $2n = 18$ .

Sandy places, deserts of plains. N Xinjiang (Manas He basin, Ürümqi) [from E Mediterranean to C Asia and India].

**4. *Scabiosa ochroleuca*** Linnaeus, Sp. Pl. 1: 101. 1753.

黃盆花 huang pen hua

Herbs, perennial. Caudexes columnar, often multi-branched, brown. Stems caespitose or solitary, erect, 25–80 cm tall, shallowly furrowed, white villous above. Basal leaves petiolate; petiole 1–5 cm; leaf blade pinnatifid, 5–10 cm, with 2–4 pairs of segments, or undivided. Cauline leaves 2–5-paired, subsessile or shortly petiolate; leaf blade 4–10 cm, abaxially densely pubescent, adaxially white villous, pinnatifid to pinnatisect or bipinnatisect, segments unequal in length; ultimate segments lanceolate or linear-lanceolate, 1.5–2 mm wide, 1-veined, apex acuminate. Peduncles 18–30 cm, white villous; capitula solitary, terminal, oblate-spheroidal, 2–2.5 cm in diam. at anthesis, becoming oblong, ca. 1.5 cm in fruit; involucre bracts linear-lanceolate, both surfaces sparsely pubescent, apex acuminate; bracts oblanceolate, sparsely puberulent, apex acute; involucels funnelform, 3–4 mm, 8-ribbed and 8-furrowed, sparsely white villous on ribs and sparsely puberulent in furrows, crown 1.5–2 mm wide, outside sparsely puberulent, edges

dentate. Calyx lobes 5, brown-yellow, ca. 4 mm, setose. Corolla yellow or white, 7–10 mm; marginal ray flowers subequal to central ones in size. Corolla tube 6–7 mm, outside densely white villous; lobes 5, unequal in size, middle one of lower lip to 3 mm, others 1.5–2  $\times$  ca. 1.5 mm. Stamens 4, inserted at middle part of corolla tube, exserted. Achenes yellowish, ellipsoid, ca. 2.5 mm, setae up to 7 mm; receptacles visible after achenes shed, fusiform, 10–15  $\times$  ca. 4 mm, densely puberulent. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 16$ .

Meadows, grasslands, grassy slopes: 1300–2200 m. NW Xinjiang [Kazakhstan, Mongolia, Russia (Siberia); C Europe].

**5. *Scabiosa comosa*** Fischer ex Roemer & Schultes, Syst. Veg. 3: 84. 1818.

藍盆花 lan pen hua

*Scabiosa austromongolica* Hurusawa; *S. comosa* var. *lachnophylla* (Kitagawa) Kitagawa; *S. fischeri* A. Candolle; *S. fischeri* f. *breviseta* Handel-Mazzetti; *S. hairalensis* Nakai; *S. henanensis* Y. K. Yang & J. K. Wu; *S. hopeiensis* Nakai; *S. japonica* Miquel var. *acutiloba* H. Hara; *S. japonica* subsp. *tschiliensis* (Grüning) Hurusawa; *S. japonica* var. *tschiliensis* (Grüning) Hurusawa; *S. lachnophylla* Kitagawa; *S. liaoningensis* Y. K. Yang & J. K. Wu; *S. mansenensis* Nakai; *S. superba* Grüning; *S. superba* f. *elatior* Grüning; *S. superba* f. *nana* Grüning; *S. togashiana* Hurusawa; *S. tschiliensis* Grüning; *S. tschiliensis* var. *brevisecta* Hurusawa; *S. tschiliensis* var. *longiseta* Hurusawa; *S. tschiliensis* var. *superba* (Grüning) S. Y. He; *Trochocephalus comosus* (Fischer ex Roemer & Schultes) A. Löve & D. Löve.

Herbs, perennial, 30–80 cm tall. Roots simple or 2- or 3-branched, 12–25  $\times$  0.3–0.5 cm. Stems erect, angular, internodes 6–12 cm, with adpressed, white puberulent hairs, more densely so at base and below inflorescences. Basal leaves rosulate, petiolate; petiole 3–10 cm; leaf blade narrowly elliptic to oblong, 6–10  $\times$  1–2 cm, both surfaces sparsely white pubescent, pinnatisect, rarely dentate-lobed; segments linear, 1–1.5 mm wide, often wilted at anthesis. Cauline leaves opposite, amplexicaul, forming a short sheath, sessile or with petiole 1–1.2 cm; leaf blade oblong, 8–15  $\times$  4–5 cm, pinnatisect or bipinnatisect; segments linear, 1–4 mm wide, both surfaces glabrous or sparsely white puberulent, apex acuminate. Peduncles 10–25 cm, tomentulose, hairs white; capitula 1 or 3, oblate-globose, 2.5–4(–7) cm in diam. at anthesis, globose and 1–1.5 cm in diam. in fruit; involucre bracts 6–14, lanceolate, 10–12(–28)  $\times$  1–3 mm, glabrous or sparsely pubescent; involucels yellowish, obconical, 2.5–5 mm (excluding crown), ca. 1.7 mm wide, 8-ribbed, but only 4 marked, ribs densely white hirsute, with 8 pits at apex, crown ca. 1.2 mm, 18–20-veined, densely white villous on veins, edges dentate. Calyx 5-divided; segments needlelike, 2.5–3 mm, sparsely hispidulous. Corolla pale blue or light purple, outside densely puberulent, those of central flowers tubular, 4–10 mm; limb 5-lobed; lobes equal in length; those of marginal ray flowers 2-lipped, to 2 cm; upper lip 2-lobed; lower lip 3-lobed, longer; middle lobe up to 1 cm. Style ca. 1 cm, exserted; stigma capitate. Achenes oblong, with 5 brown veins and persistent calyx setae. Fl. Jul–Aug, fr. Sep.  $2n = 16$ , 18.

Sandy dunes, dry mountain slopes, steppes; 300–1600(–3000) m. E Gansu, Hebei, W Henan, Heilongjiang, Jilin, Liaoning, Nei Mongol,

S Ningxia (Guyuan), N Shaanxi, Shanxi [Korea, Mongolia, Russia (Far East, Siberia)].

**6. *Scabiosa lacerifolia*** Hayata, Bot. Mag. (Tokyo) 20: 16. 1906.

台湾蓝盆花 tai wan lan pen hua

Herbs, perennial, glabrous or puberulent. Stems erect, 10–20 cm tall, sparsely branched. Leaves sessile, semiamplexicaul; leaf blade linear-lanceolate, pinnatisect or lacerate, segments irregularly dentate; basal leaves 5–12 × 5–6 cm. Cauline leaves opposite, 4–5 cm, apex acute. Peduncles 5–6 cm or even

longer; capitula terminal, oblate-globose, 3.5–4 cm in diam.; involucre bracts 3-whorled, lanceolate; outermost ones ca. 1.5 cm; inner ones shorter; bracts spatulate, ca. 5 mm; involucels 4-ribbed, with 8 pits at apex, crown membranous, 4-lobed; lobes obtuse. Calyx 5-setose, radial. Corolla blue-purple; marginal ray flowers usually larger, corolla ca. 1.8 cm, 5-lobed, 2-lipped. Stamens 4, all fertile. Style filiform. Achenes surrounded by involucels, and crowned with persistent involucels and calyx setae, obovoid, 3–3.5 mm; setae ca. 1 mm.

• Grassy slopes, rocky ridges; 2000–3600 m. Taiwan.

**4. *DIPSACUS* Linnaeus, Sp. Pl. 1: 97. 1753.**

川续断属 chuan xu duan shu

Herbs, biennial or perennial. Stems erect, angulate and sulcate, usually echinulate or hispid along ridges. Basal leaves long petiolate, entire, 3-cleft, or pinnatifid, usually dentate or lobed. Cauline leaves opposite, sessile or petiolate, usually 3–5-lobed, sometimes pinnatifid or entire, both surfaces usually hispid, but glabrous or papillate-echinulate in some species. Capitula terminal, oblong, globose, or ovoid-globose; involucre bracts erect or spreading, leaflike, 1- or 2-layered, rostrate; involucels 4–8-ribbed, adnate to ovary; flowers bisexual. Calyx actinomorphic, shallowly disciform, 4-lobed, white pubescent. Corolla tubular, 4-lobed; lobes unequal in size. Stamens 4, inserted at corolla tube, alternate with corolla lobes. Gynoecium of 2 carpels; ovary inferior, enveloped by involucre; ovule solitary, pendulous, anatropous; style filiform; stigma oblique or lateral. Achenes surmounted with persistent calyx, enveloped by leathery involucre. Seed coat membranous; embryo imbedded in endosperm.

About 20 species: N Africa, Asia, Europe; seven species (two endemic) in China.

- 1a. Stems glabrous; bract rostra 1.5–3 mm ..... 1. *D. azureus*
- 1b. Stems ± spiny; bract rostra 3–11 mm.
  - 2a. Heads oblong-spherical, 2.5–7 × 2–4.9 cm; bract rostra 5–11 mm; corolla tube 3.5–5 mm.
    - 3a. Corolla black-purple, tube ca. 3.5 mm; bract rostra ca. 5 mm ..... 4. *D. atratus*
    - 3b. Corolla white or yellowish, tube 3.5–5 mm; bract rostra 5–11 mm.
      - 4a. Segments of cauline leaves 1–3-paired; heads 2–3.5 cm in diam.; leaves glabrous abaxially ..... 2. *D. inermis*
      - 4b. Segments of cauline leaves more than 3-paired; heads usually 3.5–4.9 cm in diam.; leaves spiny abaxially ..... 3. *D. chinensis*
  - 2b. Heads spherical, 1.5–3 × 1.5–3.2 cm; bract rostra 3–5 mm; corolla tube 2–2.5 mm.
    - 5a. Corolla black-purple ..... 6. *D. atropurpureus*
    - 5b. Corolla white, yellow, or pink.
      - 6a. Corolla white or yellow; plant perennial; roots fleshy and fusiform ..... 5. *D. asper*
      - 6b. Corolla pink; plant biennial; roots ± lignified, not fleshy ..... 7. *D. japonicus*

**1. *Dipsacus azureus*** Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 53. 1841.

天蓝续断 tian lan xu duan

*Cephalaria beijiangensis* Y. K. Yang, J. K. Wu & A. Sayit; *C. dipsacoides* Karelin & Kirilov; *Dipsacus dipsacoides* (Karelin & Kirilov) V. I. Bochantsev; *D. xinjiangensis* Y. K. Yang, J. K. Wu & T. Abdulla.

Herbs, perennial, 0.6–1.5 m tall. Stems glabrous, nearly spineless. Basal leaves long petiolate, undivided; cauline leaves opposite, ca. 6-paired, glabrous, sessile or petiole up to 10 cm; leaf blade 6–26 × 3–10 cm, pinnatifid to pinnatisect; terminal segment lanceolate, margin coarsely serrate; lateral segments 4–7-paired, lanceolate to elliptic, 1.2–7 × 1–3 mm. Heads 3 or 4, subspherical; terminal one 2–2.5 × 3–4.5 cm; peduncles 30–60 cm, glabrous or pubescent above; involucre bracts 2-layered; 5 or 6 in outer layer, ovate; 7–9 in inner layer, elliptic or lanceolate; bracts obovate-lanceolate or oblanceolate, 5–14 × 4–5 mm, rostra 1.5–3 mm; involucels 4-ribbed, 3–4 mm. Calyx disciform, 0.5–1 mm; lobes irregular. Corolla purple-blue, funnel-

form, 8–15 mm, outside villous; lobes elliptic or oblong, 3–4 × 1.5–2.5 mm. Stamens exserted. Style strongly exserted; stigma clavate. Achenes 4-angular, ca. 3.5 mm, totally enveloped in involucre. Fl. and fr. Aug–Sep.

1900–2000 m. Xinjiang (Huocheng, Tekes) [Kazakhstan, Kyrgyzstan].

**2. *Dipsacus inermis*** Wallich, Fl. Ind. 1: 367. 1820.

藏续断 zang xu duan

*Cephalaria cachemirica* Decaisne; *Dipsacus inermis* var. *mitis* (D. Don) Y. Nasir; *D. mitis* D. Don; *D. strictus* D. Don; *Virga inermis* (Wallich) Holub.

Herbs, perennial, 0.5–2 m tall. Taproots clavate, up to 3.5 cm in diam. Stems branched, usually 6-ridged, ridges sparsely spiny. Basal leaves rosulate, often wilted at anthesis, long petiolate; leaf blade elliptic, 5–13 × ca. 3.5 cm, undivided, margin serrate, or 3- or 5-segmented; terminal segment much larger; cauline leaves subsessile or with petiole up to 7 cm; leaf blade

broadly lanceolate, 10–22 × 3.5–7 cm, trifid or pinnatifid; lateral segments in 2 or 3 pairs; terminal segment larger, ovate, all segments yellowish hirsute on both surfaces, margins serrate. Capitula 1 or 3, 2–3.5 cm in diam. at anthesis and in fruit; peduncles up to 40 cm; involucre bracts linear, white hirsute; bracts lanceolate or obovate-lanceolate, 14–20 mm at anthesis, rostrum 5–9 mm, setose and hirsute; involucels ovoid-columnar, 5–8 mm. Corolla white or yellowish, funnelform, 11–15 mm; tube 3.5–4 mm; lobes unequal. Stamens exserted. Style strongly exserted. Achenes narrowly ellipsoid, ca. 4.5 × 1.5 mm, 4-angular, glabrous. Fl. Jul–Aug, fr. Aug–Oct.

Forests, grassy slopes, by streams; 2100–3900 m. Xizang (Nyalam), Yunnan [Afghanistan, Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan].

**3. *Dipsacus chinensis*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 377. 1894.

大头续断 da tou xu duan

*Dipsacus lijiangensis* Ai & H. B. Chen [“*lijingensis*”].

Herbs, perennial, up to 2 m tall. Taproots robust, up to 2 cm in diam. Stems branched, 8-ridged, ridges sparsely spiny. Cauline leaves opposite, lowermost leaves with petiole up to 5 cm, uppermost leaves subsessile; leaf blade broadly lanceolate, up to 25 × 7 cm, lyrate; terminal segment much larger than lateral ones; lateral segments 3–8-paired, both surfaces setose. Heads solitary or 3, globose or oblong, 3.5–4.9 cm in diam.; peduncles up to 25 cm; involucre bracts linear, setose; bracts lanceolate or obovate-lanceolate, 14–15 mm, rostrum 5–11 mm, spiny and pilose; involucels ovoid-columnar, 5–8 mm. Corolla 9–14 mm; tube 3.5–5 mm; lobes unequal. Stamens exserted. Style exserted. Achenes cuneate, 4-angular, ca. 6 × 1.5 mm, densely pubescent, apex exposed. Fl. Jul–Aug, fr. Sep–Oct.

• Forests, grassy slopes, by streams; 2100–3900 m. W Sichuan, SE Xizang, NW Yunnan (Dêqên, Lijiang, Zhongdian).

**4. *Dipsacus atratus*** J. D. Hooker & Thomson ex C. B. Clarke, Fl. Brit. India 3: 218. 1881.

紫花续断 zi hua xu duan

*Virga atrata* (J. D. Hooker & Thomson ex C. B. Clarke) Holub.

Herbs, perennial, ca. 1 m tall. Stems branched, ridged, retrorsely spiny, up to 1 cm in diam. Basal leaves and lower cauline leaves wilted at anthesis; upper cauline leaves sessile, 10–15 × 4–5 cm, both surfaces hispid, pinnatisect; terminal segment much larger than lateral ones, elliptic, apex acuminate; lateral segments 2–4-paired; all segments large serrate on margins. Heads globose, 3–3.5 cm at anthesis; peduncles to 40 cm; involucre bracts 5 or 6, ovate-elliptic, undivided, abaxially hirsute; bracts obovate, 9–11 mm; rostrum triangular, ca. 5 mm; base ca. 2 mm wide, spiny-hirsute on 2 lateral sides; involucels ca. 3 mm, glabrous, 4-ribbed and 4-dentate, with 4 minute teeth and 4 obscure ribs between large teeth and ribs. Calyx shallowly cup-shaped, 4-lobed, ca. 1 mm, edges spiny-hirsute. Corolla black-purple, funnelform, ca. 1.1 cm, base narrowly tubular, ca. 3.5 mm. Stamens exserted. Fl. Sep.

Forests on southern slopes; ca. 3600 m. S Xizang (Cona) [Bhutan, N India, Nepal].

**5. *Dipsacus asper*** Wallich ex C. B. Clarke, Fl. Brit. India 3: 218. 1881.

川续断 chuan xu duan

*Dipsacus asperoides* C. Y. Cheng & Ai; *D. asperoides* var. *emeiensis* Z. T. Yin; *D. cyanocapitatus* C. Y. Cheng & Ai; *D. daliensis* Ai; *D. daliensis* var. *multifidus* H. B. Chen; *D. enshiensis* C. Y. Cheng & Ai; *D. kangdingensis* Ai & F. X. Feng; *D. simaoensis* Y. Y. Qian; *D. yulongensis* Ai & L. J. Yang.

Herbs, perennial, up to 2 m tall. Taproots simple or branched, fusiform, up to 1.2 cm in diam., fleshy. Stems erect, branched, 4–8-ridged, ridges sparsely covered with retrorse spines. Basal leaves rosulate; petiole up to 25 cm; leaf blade pinnatisect, rarely entire, 15–25 × 5–20 cm, adaxially white setose, or papillate-setose, abaxially densely setose along veins; segments 5–9; terminal segment largest, up to 15 × 9 cm; lateral ones usually obovate or spatulate; lower cauline leaves similarly long petiolate, leaf blade entire, but mostly pinnatifid, with 5–9 segments; terminal segment lanceolate, up to 11 × 5 cm, margin sparsely large serrate, apex acuminate; upper cauline leaves shorter petiolate, lanceolate, undivided or 3-segmented. Heads globose, 1.5–3.2 cm in diam.; peduncles up to 50 cm; involucre bracts 5–7, leaflike, lanceolate or linear, hispid; bracts obovate, 7–11 mm, hispidulous, rostrate, rostrum 3–5 mm, setose; involucels 4-ribbed, obovoid-columnar, 5–8 mm, white puberulent, apex 8-dentate. Calyx 4-ribbed, disk-shaped, ca. 1 mm, undivided or 4-lobed, outside hispidulous. Corolla yellowish or white, funnelform, 9–11 mm; tube ca. 2.5 mm; lobes unequal, outside puberulent. Stamens exserted; anthers purple. Achenes obovoid-columnar, ca. 4 mm. Fl. Jul–Sep, fr. Sep–Nov.  $2n = 18$ .

Margins of forests, thickets, among herbs, by streams, roadsides; 1500–3700 m. Chongqing, N Guangdong (Lianxian), N and W Guangxi (Longsheng, Napo, Xing'an), Guizhou, W Hubei (Xingshan), Sichuan, S Xizang (Cona, Nyalam), Yunnan [India, Myanmar].

**6. *Dipsacus atropurpureus*** C. Y. Cheng & Z. T. Yin, Acta Phytotax. Sin. 23: 302. 1985.

深紫续断 shen zi xu duan

*Dipsacus fulingensis* C. Y. Cheng & Ai.

Herbs, perennial, 1–1.8 m tall. Taproots columnar, slightly fleshy. Stems erect, 6–8-ridged, ridges sparsely covered with retrorse spines. Basal leaves rosulate; petiole up to 30 cm; leaf blade broadly lanceolate, 10–18 × 6–12 cm, pinnatifid or pinnatisect; segments 5–7; terminal segment larger, oblong or broadly ovate, 6–12 × 4–8 cm; lateral ones smaller downward, lanceolate to ovate; all segments abaxially glabrous, adaxially puberulent or glabrous. Lower and middle cauline leaves shorter petiolate; leaf blade pinnatisect; terminal segment larger; lateral segments 2- or 3-paired, ovate to lanceolate; upper cauline leaves undivided or 3-segmented, segments lanceolate, both surfaces glabrous, sometimes adaxially sparsely white puberulent, margins entire. Heads globose, 2–2.5 cm in diam.; peduncles up to 30 cm; involucre bracts 7 or 8, leaflike, lanceolate,

white puberulent; bracts oblong-obovate, 6–8 mm, rostrum 1–3 mm, glabrous, sparsely setose, or villous basally; involucels obovoid-columnar; limb 4-lobed; lobes acute at apex. Calyx disk-shaped, 4-angular, outside glabrous, inside and apex villous. Corolla black-purple; tube 6–7 mm, base narrowly tubular, 1–1.5 mm; limb with one larger lobe. Stamens strongly exserted. Achenes pale brown, 2.5–4 mm, 4-angular, cuneate. Fl. Jul–Sep, fr. Sep–Nov.

• Among herbs by streams, grassy slopes by fields. Chongqing (Fuling, Nanchuan, Qianjiang).

*Dipsacus atropurpureus* differs from *D. asper* only in having a black-purple corolla (vs. yellowish or white) and a shorter rostrum (1–2 vs. 3–5 mm). Although accepted as separate species here, the two may be conspecific. Field observations and population sampling are needed to clarify this issue.

**7. *Dipsacus japonicus*** Miquel, Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch., ser. 2, 2: 83. 1868.

日本续断 *ri ben xu duan*

*Dipsacus lushanensis* C. Y. Cheng & Ai; *D. tianmuensis* C. Y. Cheng & Z. T. Yin.

Herbs, biennial or perennial?, up to 1.5 m tall. Roots not fleshy. Stems often branched, 4–6-ridged, with retrorse spines on ridges. Basal leaves rosulate, long petiolate; leaf blade narrowly elliptic, pinnatisect or undivided. Cauline leaves opposite, long petiolate to sessile; leaf blade elliptic-ovate to elliptic, 8–25 × 3–10 cm, abaxially spiny-hispid, adaxially hispidulous, pinnatisect or pinnatifid, rarely undivided; segments 2- or 3-paired; terminal lobe much larger. Capitula terminal, globose, 1.5–3.2 cm at anthesis and in fruit; involucre bracts linear, spiny-hispid; bracts obovate, 9–11 × 4–5 mm, hispidulous, rostrum 3–5 mm, lateral sides spiny-hispid; involucels 4-ribbed, 5–6 mm, white villous, 8-dentate at apex. Calyx cup-shaped, ca. 1 mm, 4-lobed, white villous. Corolla pink, purple-red, or purplish, 5–8 mm, outside villous. Stamens slightly exserted. Achenes oblong-cuneate, 4-angular, ca. 6 mm, glabrous. Fl. Aug–Sep, fr. Sep–Nov.

Grassy slopes, roadsides; below 2600 m. Anhui (Qingyang, Shucheng), Chongqing (Chengkou, Wushan, Wuxi), E Gansu (Pingliang, Yuzhong), Hebei, Henan, Hubei (Xianfeng), Hunan (Cili), Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanxi, N Sichuan (Barkam, Songpan), W Zhejiang [Japan, Korea].

## VALERIANACEAE

败酱科 *bai jiang ke*

Hong Deyuan (洪德元)<sup>1</sup>; Fred R. Barrie<sup>2</sup>, Charles D. Bell<sup>3</sup>

Herbs, perennial or biennial, rarely annuals [or shrubs, absent from China], with a characteristic fetid odor caused by monoterpenoid and sesquiterpenoid ethereal oils; vestiture of white, multicellular hairs; taprooted or rhizomatous; roots adventitious. Leaves opposite, basal and cauline, less frequently all basal, simple to pinnatisect or imparipinnate, entire to variously toothed. Inflorescences cymose, simple or compound dichasia or monochasia, bracteate and bracteolate. Flowers perfect or rarely unisexual. Calyx 5-lobed (*Nardostachys*), reduced to inconspicuous teeth (*Patrinia*), or setaceous, plumose, and pappuslike (*Valeriana*). Corolla connate, regular to irregular, sometimes 2-lipped; tube often gibbous (nectariferous) near base; limb (3–)5-lobed; corollas of female flowers 1/3–1/2 size of those of perfect or male flowers. Stamens 1–4, inserted near base of corolla tube, weakly to strongly exerted in bisexual and male flowers, vestigial and included in female flowers; anthers versatile, 4-sporangiate, opening by longitudinal slits. Ovary inferior; carpels 3, 1 fertile, with a solitary, pendulous, apical ovule, 2 sterile; style solitary; stigma entire or 3-lobed. Fruit a cypsela (but commonly referred to as an achene), sometimes winged; sterile locules often reduced; calyx persistent. Seed 1, embryo large, straight, and without endosperm.

Twelve genera and ca. 300 species: nearly cosmopolitan; three genera and 33 species (18 endemic) in China.

Chiu Lien-ching & Wang Han-jin. 1986. Valerianaceae. In: Lu An-ming & Chen Shu-kun, eds., Fl. Reipubl. Popularis Sin. 73(1): 5–44.

- 1a. Stamens 3, rarely 4; calyx segments up to 20, inrolled at anthesis, unrolled in mature fruit, becoming plumose and pappuslike ..... 3. *Valeriana*
- 1b. Stamens 4, rarely reduced to 1–3; calyx 5-dentate, not pappuslike in fruit.
  - 2a. Bracteoles not enlarged into wings in fruit; caudices nearly always covered with fibrous remains of old leaves; leaves entire ..... 1. *Nardostachys*
  - 2b. Bracteoles enlarged into wings in fruit; caudices without fibrous remains of old leaves; leaves segmented or serrate ..... 2. *Patrinia*

### 1. NARDOSTACHYS Candolle, Prodr. 4: 624. 1830.

甘松属 *gan song shu*

Herbs, perennial. Rhizomes short, stout, branching. Caudices robust, densely covered with fibrous or lamellar old leaf sheaths, crowned with rosulate leaves. Flowering stems emerging below rosettes. Rosulate leaves narrowly spatulate or linear-oblanceolate, veins 3–5, parallel, base attenuate into petiole, margin entire, apex obtuse. Cauline leaves usually 2- or 3-paired, lanceolate, smaller apically. Cymes aggregated into a terminal capitulum; involucre bracts 2- or 3-paired; each flower subtended by a bract; bracteoles 2, small. Calyx 5-dentate, enlarged in fruit. Corolla campanulate; tube gibbous basally; limb 5-lobed. Stamens 4. Sterile locules of fruit not reduced.

Two species: the Himalaya; one species in China.

1. *Nardostachys jatamansi* (D. Don) Candolle, Prodr. 4: 624. 1830.

甘松 *gan song*

*Patrinia jatamansi* D. Don, Prodr. Fl. Nepal. 159. 1825;  
*Nardostachys chinensis* Batalin; *N. grandiflora* Candolle.

Caudices erect or oblique. Flowering stems 5–50 cm tall. Rosulate leaves narrowly spatulate or linear-oblanceolate; petiole subequal to leaf blade in length; blade 3–25 × 0.5–2.5 cm, glabrous or sparsely puberulent, veins 3, base attenuate, margin entire, apex obtuse. Cauline leaves mostly 2- or 3-paired, lowermost elliptic to obovate, base attenuate into petiole; uppermost sessile, oblanceolate to lanceolate, sometimes sparsely serrate.

Capitula 1.5–2 cm in diam.; primary peduncles sometimes elongated; involucre bracts 4–6, lanceolate; bracts narrowly ovate to ovate, subequal to flowers in length. Calyx 5-lobed; lobes semiorbicular to triangular-lanceolate, enlarged in fruit, usually ciliate. Corolla purple-red, pink, or magenta, campanulate, 4.5–9 mm, 5-lobed; lobes broadly ovate to oblong, 2–3.8 mm, outside ± villous, occasionally glabrous. Stamens subequal to corolla in length; filaments villous. Style subequal to stamens in length; stigma capitate. Achenes obovoid, 3–4 mm, partially or uniformly white hispid or glabrate; calyx lobes deltoid to ovate, 1.5–2.5 mm, prominently and reticulately veined. Fl. late Jun–Aug, fr. Aug–Sep.

Alpine thickets or meadows; 2500–5000 m. SE Gansu, S Qinghai (Maqên, Yushu), W Sichuan, Xizang, N Yunnan [Bhutan, India, Nepal].

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## 2. *PATRINIA* Jussieu, Ann. Mus. Natl. Hist. Nat. 10: 311. 1807, nom. cons.

败酱属 *bai jiang shu*

*Fedia* Adanson; *Fuisa* Rafinesque.

Herbs, perennial, less frequently biennial; taprooted or rhizomatous; roots or rhizomes strongly stinking. Stems sometimes lignified at base. Basal leaves rosulate, simple to pinnatifid or pinnatisect, often wilted or caducous at anthesis. Cauline leaves opposite, simple to pinnatifid or pinnatisect, margin serrate or dentate, rarely entire. Inflorescence of corymbiform or paniculiform compound dichasia. Flowers 3–6 mm; calyx limb 5-lobed; lobes sinuous, obtusely dentate, ovate or ovate-deltoid, persistent, rarely enlarged in fruit. Corolla yellow, pale yellow, or white, campanulate or funnelform; tube villous within, gibbous basally, nectary sac with dense glands; limb 5-lobed, lobes slightly unequal. Stamens (1–)4, in unequal pairs, inserted at base of corolla tube, usually exserted; longer filaments villous basally, shorter filaments glabrous; anthers oblong, versatile. Style sometimes curved above; stigma capitate or peltate. Achene ovoid or obovoid-oblong; bracteoles reduced or expanded and winglike, detaching as a unit with fruit, 2- or 3-veined, reticulate veins conspicuous. Seeds compressed ellipsoid.

About 20 species: C and E Asia; 11 species (five endemic) in China.

- 1a. Cauline leaves in whorls of 3 ..... 10. *P. trifoliata*
- 1b. Cauline leaves opposite, decussate.
  - 2a. Bracteoles reduced in fruit; peduncles densely hirsute on upper side only; corolla yellow ..... 6. *P. scabiosifolia*
  - 2b. Bracteoles enlarged and winged in fruit; peduncles uniformly pubescent or hairs in bilateral rows; corolla yellow, pale yellow, or white.
    - 3a. Winged bracteoles 2- or occasionally 3-veined.
      - 4a. Peduncles hispidulous, hairs less than 0.4 mm; cauline leaves usually pinnatifid, rarely entire.
        - 5a. Leaves rigid, leathery, leaf segments obtuse or acute at apex; corolla 6.5–9 mm; bracteoles in fruit 7–9 × 5–7 mm ..... 7. *P. scabra*
        - 5b. Leaves thin, papery, leaf segments acute to acuminate at apex; corolla 3–4.5 mm; bracteoles in fruit 5.5–6.2 × 4.5–5.5 mm ..... 2. *P. heterophylla*
      - 4b. Peduncles hirsute, hairs ca. 1 mm; cauline leaves usually undivided or sometimes with 1–3 pairs of lateral segments.
        - 6a. Corolla white, limb 3.5–5 mm wide; stamens 4 ..... 11. *P. villosa*
        - 6b. Corolla yellow or pale yellow, very rarely white, limb 2–4 mm wide; stamens 1–4 ..... 4. *P. monandra*
    - 3b. Winged bracteoles usually 3-veined, rarely 2-veined or multiveined.
      - 7a. Peduncles scaberulose.
        - 8a. Basal and cauline leaves pinnatisect or bipinnatisect; segments linear ..... 3. *P. intermedia*
        - 8b. Basal leaves usually shallowly lobed or entire; cauline leaves pinnatifid or pinnatisect, segments various in shape ..... 5. *P. rupestris*
      - 7b. Peduncles hirsute.
        - 9a. Plants usually more than 30 cm tall; calyx not obviously enlarged in fruit; leaves glabrous ..... 1. *P. glabrifolia*
        - 9b. Plants dwarf, less than 25 cm tall; calyx obviously enlarged in fruit; leaves usually pubescent.
          - 10a. Rhizomes robust; basal leaves oblanceolate, entire or pinnatifid ..... 8. *P. sibirica*
          - 10b. Rhizomes usually slender; basal leaves oblanceolate-oblong, all pinnatifid ..... 9. *P. speciosa*

**1. *Patrinia glabrifolia*** Yamamoto & Sasaki, Trans. Nat. Hist. Soc. Formosa 19: 106. 1929.

光叶败酱 *guang ye bai jiang*

Herbs, perennial, 25–60 cm tall. Rhizomes horizontal, coarse. Stems erect, glabrous, or bilaterally puberulent above. Lower leaves crowded, spatulate or weakly petiolate, glabrous; petiole to 5 cm; blade oblanceolate or oblong, to 25 × 6 cm, base attenuate, margin coarsely serrate, apex acuminate. Cauline leaves petiolate; petiole 1–3.5 cm; blade linear to linear-lanceolate, 4.5–9 × 0.5–1.5 cm, glabrous, base cuneate-decurrent, margin entire or coarsely serrate, apex acuminate. Inflorescence corymbiform-paniculiform; lateral branches in 4–6 pairs, with 2 lines of dense, stiff hairs; pedicels reduced. Calyx lobes inconspicuous. Corolla yellow, ca. 5 mm, regularly 5-lobed; lobes spreading. Stamens 4, exserted. Style ca. 2.5 mm; stigma capitate; fertile ovary locule slightly compressed, ellipsoid,

densely hispidulous or subglabrous below and above margin. Achenes oblong, 2.5–3 mm; bracteoles elliptic or obovate-elliptic, ca. 3 × 1.5 mm, to obovate or orbicular, 3–7 × 2.5–6 mm, 3-veined, apex rounded, sinuate or with 3 rounded lobes. Fl. Jul, fr. Aug.

• Calcareous stony slopes; 1000–2200 m. C and E Taiwan (Hualian, Nantou).

**2. *Patrinia heterophylla*** Bunge, Enum. Pl. Chin. Bor. 35. 1833.

墓回头 *mu hui tou*

*Patrinia angustifolia* Hemsley; *P. graveolens* Hance; *P. heterophylla* subsp. *angustifolia* (Hemsley) H. J. Wang.

Herbs, perennial, 15–100 cm tall. Rhizomes horizontal, longer than 20 cm. Stems erect, densely scaberulose or subglabrous. Basal leaves rosulate, petiolate; blade narrowly elliptic,

3–8 cm, pinnatifid to pinnatisect; segments 1–5 pairs, ovate to linear-lanceolate; terminal segment usually larger, ovate to ovate-lanceolate, margin serrate or crenulate. Cauline leaves subsessile or petiolate; lower leaves pinnatisect, with 2–6 pairs of segments; terminal segment  $\pm$  larger, broadly ovate to linear-lanceolate, 7–9  $\times$  5–6 cm, apex acuminate to long acuminate. Middle and upper leaves often undivided, or with 1 or 2 pairs of segments; terminal segment larger, ovate, ovate-lanceolate, or subrhombic, crenulate. Inflorescence corymbiform; peduncles densely hispidulous; lower involucral bracts with 1 or 2(–4) pairs of linear segments; upper bracts entire, linear, subequal to or longer than inflorescence. Calyx lobes conspicuous or inconspicuous, ovate, ovate-oblong, or ovate-deltoid, 0.1–0.3 mm. Corolla campanulate; tube 1.8–2.4 mm, 1.5–2 mm in diam. distally; lobes ovate or ovate-elliptic, 0.8–1.8  $\times$  ca. 1.6 mm. Stamens 4, exserted; longer filaments 3–3.6 mm; shorter filaments 1.9–3 mm; anthers oblong, ca. 1.2 mm. Ovary ovoid or oblong, 0.7–1.5 mm; style slightly curved, 2.3–2.7 mm; stigma peltate or capitate. Achenes oblong or obovoid, hispidulous, or glabrescent on one or both surfaces, apex truncate; bracteoles obovate, obovate-oblong, or obovate-elliptic, rarely elliptic, 5.5–6.2  $\times$  4.5–5.5 mm, 2(or 3)-veined, apex rounded, shallowly 3-lobed, or unequally 2-lobed on one lateral side. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 22^*$ .

• Grassy slopes, open woods, roadsides; 100–2600 m. Anhui, Chongqing, E Gansu (E of Yuzhong), Guizhou (Jiangkou), Hebei, Henan, W Hubei, Hunan, Jiangsu (Tianci Shan), Jiangxi (Lu Shan, Wuning, Xiushui), Jilin (Tongyu), Liaoning (Jianping, Suizhong), S Nei Mongol (Daqing Shan, Xinghe), S Ningxia (Tongxin), E Qinghai (Minhe), Shaanxi, Shandong (Mengshan, Taishan), Shanxi (Jiexiu, Lishi), Sichuan (Emei, Jinchuan, Nanping), Zhejiang (Tianmu Shan).

**3. *Patrinia intermedia*** (Hornemann) Roemer & Schultes, Syst. Veg. 3: 90. 1818.

中败酱 zhong bai jiang

*Fedia intermedia* Hornemann, Hort. Bot. Hafn. 1: 48. 1813.

Herbs, perennial, 10–40(–55) cm tall. Taproot to ca. 20 cm, to ca. 2 cm in diam., fleshy; caudex stout, multiple branched. Stems 10–55 cm tall, scaberulose. Basal leaves rosulate; petiole 1–10 cm; cauline leaves in 2–4 pairs, sessile or shortly petiolate; blade oblong to elliptic, ca. 10  $\times$  5.5 cm, pinnatisect or bipinnatisect; segments suborbicular or linear to linear-lanceolate, scaberulose or glabrescent, apex obtuse or acute; lower segments crenulate, upper segments entire. Inflorescence corymbiform-paniculiform, ca. 12 cm in diam.; lateral branches in 4–6 pairs, hispidulous; involucral bracts similar to upper cauline leaves, subsessile, to 10 cm; upper bracts smaller, pinnatifid or undivided. Calyx crateriform; lobes inconspicuous. Corolla yellow, campanulate; tube ca. 2 mm, ca. 2.2 mm in diam. above; lobes elliptic, oblong, or ovate, 2–3  $\times$  1.5–2.5 mm. Stamens 4; longer filaments 3.3–3.6 mm, shorter filaments 2.5–2.7 mm; anthers oblong, ca. 1.2 mm. Ovary oblong, 1.5–2.5 mm; style ca. 2.5 mm; stigma peltate or capitate, 0.5–0.7 mm in diam. Achenes oblong, 3.5–4.5 mm; pedicel 1–1.5 mm; bracteoles ovate, ovate-oblong, or elliptic-oblong, 6–8.5  $\times$  4.5–5.5 mm, 3-veined. Fl. Jun–Aug, fr. Jul–Sep.  $2n = 22$ .

Forest margins, meadows, steppes, thickets; 1000–3000 m. Xinjiang (Altay, Pamir, Tian Shan) [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia)].

**4. *Patrinia monandra*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 210. 1881.

少蕊败酱 shao rui bai jiang

*Patrinia formosana* Kitamura; *P. monandra* var. *formosana* (Kitamura) H. J. Wang; *P. monandra* var. *sinensis* Batalin; *P. punctiflora* P. S. Hsu & H. J. Wang; *P. punctiflora* var. *robusta* P. S. Hsu & H. J. Wang.

Herbs, perennial or biennial, 1.5–2.2 m tall. Taproots horizontal, oblique, or vertical. Stems slightly lignified at base, robust, uniformly retrorsely hispidulous or with 2 bilateral lines. Basal leaves wilted at anthesis; cauline leaves petiolate; petiole ca. 1 cm, reduced or absent above; blade oblong, 4–14.5  $\times$  2–9.5 cm, sparsely adpressed hispidulous, margin entire, or lyrate with 1 or 2(or 3) pairs of lateral segments, margin crenate or dentate. Inflorescence corymbiform or paniculiform, 20–25 cm in diam.; lateral branches in 4–6 pairs, densely hirsute; involucral bracts linear-lanceolate to lanceolate, ca. 8.5 cm, entire, or pinnately 3–5-segmented; terminal segment ovate-lanceolate, apex acute to acuminate. Calyx small, 5-dentate. Corolla yellow or pale yellow, rarely white, funnellform; tube 1.2–1.8 mm, 1.4–1.8 mm in diam.; limb 2–4 mm wide; lobes ovate to ovate-oblong, 0.6–1.8  $\times$  1–1.2 mm. Stamens 1–4, often one longer and exserted; filaments 1.5–3.3 mm; anthers oblong or ellipsoid, 0.5–0.8 mm. Ovary obovoid, 0.8–1.8 mm; style 1.7–2.8 mm; stigma capitate or peltate. Achenes ovoid-globose; sterile ovary locules thickened, obovoid-oblong, glabrous or sparsely hispidulous; fertile locule compressed ellipsoid, margin hispidulous; bracteoles broadly ovate to suborbicular, 5–7  $\times$  5–8 mm, 2(or 3)-veined, apex usually shallowly 3-lobed. Fl. Aug–Sep, fr. Sep–Oct.  $2n = 88$  (under *P. formosana*).

Grassy slopes, thickets, forests, forest margins, roadsides; 100–3100 m. Anhui, Chongqing, SE Gansu (Tianshui, Wenxian), Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu (Ganyu, Liyang, Yuntai Shan), Jiangxi, Liaoning (Dalian, Huanren), S Shaanxi, Shandong (Zoucheng), Sichuan, Taiwan (Nantou, Taizhong, Taoyuan), Yunnan, Zhejiang (Kaihua, Tiantai Shan, Yinxian) [Bhutan, India (Darjeeling, Sikkim), Nepal].

**5. *Patrinia rupestris*** (Pallas) Dufresne, Hist. Nat. Valér. 54. 1811.

岩败酱 yan bai jiang

*Valeriana rupestris* Pallas, Reise Russ. Reich. 3: 266. 1776.

Herbs, perennial, 20–100 cm tall. Taproot clavate, to ca. 1.5 cm in diam.; caudex slender, simple or several branched. Stems woody at base, covered with persistent old leaf remnants, new growth herbaceous, scaberulose. Basal leaves usually wilted at anthesis, subsessile or petiolate; petiole 2–4 cm; blade obovate-oblong, oblong, ovate, or obovate, 2–7  $\times$  1–2.5 cm, pinnatilobate, pinnatifid to pinnatisect, or undivided, margin crenulate; segments linear, oblong-lanceolate, or lanceolate; terminal segment usually crenulate, lobed or segmented. Cauline leaves sessile to shortly petiolate; blade oblong or elliptic, 3–7 cm, pinnatifid to pinnatisect; lateral segments usually in 3–6

pairs, linear or linear-lanceolate to oblong-lanceolate, sparsely crenulate or entire; terminal segment 3-partite, with 3 linear secondary segments. Inflorescence corymbiform, 2.5–20 cm in diam.; lateral branches in 3–7 pairs; lowermost bracts pinnatisect, with 3–5 pairs of linear segments; upper bracts smaller, linear, or with 1 or 2 pairs of filiform-linear segments. Calyx margin truncate, sinuous or shallowly 5-lobed; lobes ovate, 0.1–0.2 mm. Corolla yellow, funnelform-campanulate, 2.5–4 mm; tube 1.8–2 mm, 1.5–2 mm in diam. distally; limb 3–5.5 mm wide; lobes oblong, ovate-elliptic, ovate-oblong, ovate, or ovate-orbicular, 1.2–2 × 1–1.5 mm. Stamens 4; longer filaments 3–4 mm, shorter filaments 2.6–3.5 mm; anthers 0.7–0.8 mm. Ovary columnar, 0.5–1.3 mm, hispidulous, or glabrescent on one or both surfaces; style 2.2–3.3 mm; stigma peltate. Achenes obovoid-columnar, 2.4–2.6 × 1.5–1.8 mm, hispidulous to glabrescent; pedicel 0.5–1 mm; bracteoles oblong, ovate, or obovate, 3.5–5.1 × 3.5–3.6 mm, 3-veined, apex sometimes shallowly 3-lobed. Fl. Jul–Sep, fr. Aug–late Oct.  $2n = 22$ .

Stony slopes, meadows, margins of *Betula* or *Populus* forests; 200–2500 m. Chongqing (Chengkou, Wanyuan), E Gansu (E of Maxian Shan), Hebei (Weichang, Xiaowutai Shan, Zhangbei), E Heilongjiang, Henan (Huixian), E Jilin (Chunhua, Helong, Jilin), Liaoning (Jianping, Qianshan), NE Nei Mongol, Ningxia (Guyuan), Shaanxi (Wuqi, Zhidan), Shanxi (Luya Shan) [Mongolia, Russia (Far East, Siberia)].

**6. *Patrinia scabiosifolia* Link, Enum. Hort. Berol. Alt. 1: 131. 1821.**

败酱 bai jiang

*Fedia scabiosifolia* Treviranus; *F. serratulifolia* Treviranus; *Patrinia hispida* Bunge.

Herbs, perennial, 30–100(–200) cm tall. Rhizomes horizontal or oblique. Stems erect, yellow-green to yellow-brown, sometimes pale purplish, glabrate basally, hispidulous apically, hairs in 2 bilateral rows. Basal leaves rosulate, wilted at anthesis; petiole 3–12 cm; blade pale green abaxially, dark green adaxially, ovate, elliptic, or elliptic-lanceolate, 1.8–10.5 × 1.2–3 cm, simple to pinnatifid or pinnatisect, surfaces glabrate or hispidulous on veins, base cuneate, margin ciliate, entire to coarsely serrate, apex obtuse or acute. Cauline leaves sessile, broadly ovate to lanceolate, 5–15 cm, reduced above, both surfaces hispidulous to glabrescent, usually pinnatifid or pinnatisect, lateral segments in 2–5 pairs, terminal segment ovate, elliptic, or elliptic-lanceolate, margin coarsely serrate, apex acuminate. Inflorescence corymbiform, lateral branches in 5–7 pairs; peduncles densely hirsute abaxially; involucre bracts linear, ca. 1 mm. Calyx lobes inconspicuous. Corolla yellow, campanulate; tube ca. 1.5 × 1.5 mm, weakly gibbous; lobes ovate, ca. 1.5 × 1–1.3 mm. Stamens 4, longer filaments ca. 3.5 mm, shorter filaments 2–2.7 mm; anthers oblong, ca. 1 mm. Ovary ellipsoid-oblong, ca. 1.5 mm; style ca. 2.5 mm; stigma peltate, 0.5–0.6 mm in diam. Achenes oblong, 3–4 mm, 3-angular, compressed, sterile locules reduced; bracteoles inconspicuous. Seeds ellipsoid, compressed. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 22$ .

Forests, forest margins, thickets, grassy areas, roadsides; (below 100–)400–2600 m. Throughout China except Guangdong, Hainan, Ningxia, Qinghai, Xinjiang, and Xizang [Japan, Korea, Mongolia, Russia (Far East, Siberia)].

**7. *Patrinia scabra* Bunge, Pl. Mongholic-Chin. Dec. 1: 20. 1835.**

糙叶败酱 cao ye bai jiang

*Patrinia rupestris* Pallas subsp. *scabra* (Bunge) H. J. Wang.

Herbs, perennial, 30–60 cm tall. Taproot columnar, 0.5–2 cm in diam., fleshy; caudex simple or several branched. Stems densely scaberrulose. Basal leaves oblanceolate, pinnatifid, with 2–4 pairs of segments, wilted at anthesis. Cauline leaves petiolate; petiole 1–2 cm; blade ovate-lanceolate, 4–10 × 1–2 cm, leathery, scaberrulose, pinnatifid to pinnatisect, with 1–5 pairs of lateral segments; terminal segment larger, oblanceolate; lateral segments falcate-linear, entire, apices obtuse or acute. Inflorescence corymbiform; lateral branches 3 or 4, hispidulous; involucre bracts linear, entire or 2- or 3-segmented. Calyx reduced. Corolla yellow, funnelform, gibbous, 6.5–9 mm; limb 5-lobed, 5–7 mm wide. Stamens 4; longer filaments ca. 4 mm, shorter filaments ca. 3 mm. Ovary ca. 1 mm, scabridulous; style ca. 4 mm. Achenes columnar; bracteoles broadly ovate or oblong-orbicular, 7–9 × 5–7 mm, 2-veined, rarely 3-veined, apex rounded, entire or shallowly 3-lobed. Fl. Jul–Aug, fr. Aug–Sep.

• Sunny grassy slopes, forest margins; 300–1700 m. Hebei, W Henan, W Jilin (Baicheng, Zhenlai), W Liaoning (Jianping), SE Nei Mongol (Bairin Youqi, Chifeng, Ongniud Qi), N Shaanxi (Shenmu), Shanxi.

**8. *Patrinia sibirica* (Linnaeus) Jussieu, Ann. Mus. Natl. Hist. Nat. 10: 312. 1807.**

西伯利亚败酱 xi bo li ya bai jiang

*Valeriana sibirica* Linnaeus, Sp. Pl. 1: 34. 1753; *V. ruthenica* Willdenow.

Herbs, perennial, 5–25 cm tall. Taproot clavate, to 1.5 cm in diam. Caudices simple or branching, bark brown or dark brown, usually robust, with fibrous or lamellar remains of old leaf bases. Stems leafless or with a single leaf pair, pubescent, hairs in bilateral rows. Leaves rosulate; petiole 2–5 cm, glabrous or sparsely villous; blade oblong to linear, 2.5–5 × 0.3–2 cm, glabrous, entire or pinnatifid to pinnatisect; segments 2- or 3-paired, linear or linear-lanceolate, apex obtuse-rounded to acuminate; cauline leaves sessile, 1.5–6 cm, pinnatifid. Inflorescence corymbiform, 1.5–4 cm in diam. at anthesis; lateral branches 2–4 pairs; involucre bracts 1–3 cm, pinnatisect; segments sessile, linear; bracts obovate or ovate, ca. 2.4 × 2 mm. Calyx lobes obovate-oblong, oblanceolate, ovate, ovate-deltoid, or oblong, 0.2–1.8 mm. Corolla yellow, funnelform to campanulate; tube 2.5–3.2 mm, 2.5–3.2 mm in diam. distally; lobes ovate or ovate-elliptic, 1.5–2.3 × 1.4–2 mm. Stamens 4; longer filaments ca. 4.5 mm, shorter filaments ca. 4 mm; anthers oblong, ca. 1.5 mm. Ovary ovoid-oblong, 0.5–1.5 mm; style 3.3–3.7 mm; stigma obliquely capitate, ca. 0.6 mm in diam. Achenes narrowly ovoid, 3–4(–6) mm, sterile locules glabrous or hispidulous distally, fertile locule densely hispidulous on margin and proximally; bracteoles obovate, obovate-oblong, ovate, or ovate-oblong, 6–9 × 4.5–6.5 mm, 3- or 4-veined, entire or shallowly 3-lobed. Fl. May–Jun, fr. Jun–Jul.  $2n = 22, 44$ .

Forests, forest margins, meadows, alpine meadows and stony

slopes, stony riverbanks; below 1700 m. Heilongjiang, Nei Mongol [Japan, Mongolia, Russia (from European part to Far East)].

**9. *Patrinia speciosa*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 61: 21. 1924.

秀苞败酱 xiu bao bai jiang

Herbs, perennial, 8–30 cm tall. Rhizomes slender. Stems solitary, simple or sometimes branched, leafless or with 1 pair of leaves, sparsely villous. Basal leaves rosulate; petiole 1–2 cm, base sheathing; blade oblong-ob lanceolate or ovate-elliptic, 3–10 × 2–3 cm, slightly glaucous abaxially, glabrous or sparsely villous adaxially, pinnatifid; segments 3–5-pairs, ovate or oblong-lanceolate, base decurrent, margin coarsely serrate, apex acute; terminal lobe larger. Cauline leaves ovate or ovate-oblong to oblong, 3–8 × 1.5–2.5 cm, pinnatifid. Inflorescence corymbiform, 3–10 cm in diam. at anthesis; lateral branches in ca. 3 pairs; peduncles sparsely hirsute; involucre bracts elliptic, oblong, or ovate-oblong to lanceolate, 2–6 × ca. 2 cm, serrate, pinnatifid or pinnatifid, reduced apically; bracts ovate-oblong to obovate, 2.5–3 × 1.4–1.7 mm, apex usually unequally 2-lobed. Calyx lobes ovate-lanceolate, ovate, obovate, or oblanceolate, 0.2–1.6 mm, usually 1 or 2 prominently enlarged in fruit. Corolla yellow, campanulate, 5.5–6 mm; tube ca. 3 mm, 2.6–2.8 mm in diam. distally; lobes elliptic or obovate to ovate, ca. 2.5 × 2.5–3 mm. Stamens 4, exerted; longer filaments ca. 7.5 mm, shorter filaments ca. 6.5 mm; anthers oblong, 1.2–1.4 mm. Achenes ellipsoid or oblong, 3–4 × 2–3 mm; bracteoles irregularly obliquely ovate or obliquely obovate, occasionally 10–12 × 8–13 mm, 3(–5)-veined, apex shallowly 3-lobed, sometimes only one lateral side with 2 lobes. Fl. late Jul–Sep, fr. Sep–Oct.

• Stony, grassy, and/or sandy slopes, thickets; 3100–4100 m. SE Xizang (Bomi, Mêdog, Zayü), NW Yunnan (Gongshan).

**10. *Patrinia trifoliata*** L. Jin & R. N. Zhao, Acta Bot. Boreal.-Occid. Sin. 22: 667. 2002.

三叶败酱 san ye bai jiang

Herbs, perennial, 30–90 cm tall. Rhizomes horizontal, slightly ascending. Stems erect, scaberrulose. Basal leaves rosulate, 3–8 cm, long petiolate, pinnatifid to pinnatisect; segments 1–4-paired, ovate-orbicular; terminal segment usually larger, ovate to ovate-lanceolate; cauline leaves in whorls of 3, pinnatisect; segments 1–4-paired; terminal segment larger, ovate or lanceolate, 3–7 × 1–5 cm, sparsely scaberrulose, base cuneate, apex acuminate, margin crenulate; upper cauline leaves subsessile. Inflorescence corymbiform, lateral branches in 3–7 pairs, scaberrulose; involucre bracts with 1 or 2 pairs of linear segments. Calyx small, 5-lobed; lobes inconspicuous, 0.1–0.3 mm. Corolla campanulate, 3–5 mm, outside scaberrulose, inside glabrous; tube 1.8–3 mm; lobes 5, 0.8–1.5 × ca. 1 mm. Stamens 4, longer filaments ca. 3 mm, shorter filaments ca. 2 mm, glabrous or scaberrulose. Ovary obovoid, ca. 1 mm; style 2.3–2.7 mm; stigma truncate-capitate. Achenes oblong; bracteoles ovate, 2-veined, rarely 3-veined, shallowly 3-lobed. Fl. and fr. Jul–Aug.

• Grassy slopes, roadsides; 1100–2300 m. SE Gansu.

**11. *Patrinia villosa*** (Thunberg) Dufresne, Hist. Nat. Valér. 54. 1811.

攀倒甌 pan dao zeng

Herbs, perennial or biennial, 50–120 cm tall, rhizomatous or rarely stoloniferous. Stems with 2 bilateral, hispidulous lines, rarely uniformly hispidulous or glabrescent. Basal leaves rosulate, long petiolate; blade ovate, broadly ovate, or oblong-lanceolate to ovate-lanceolate, 4–25 × 2–18 cm, base decurrent, margin serrate or pinnatifid, with 1 or 2(–4) pairs of segments, apex acuminate. Cauline leaves petiolate; petiole 1–3 cm, upper leaves subsessile; blade similar to basal leaves or rhombic-ovate, hispidulous or glabrescent, base decurrent, margin coarsely serrate, apex caudate-acuminate or acuminate. Inflorescence paniculiform or corymbiform, lateral branches in 5 or 6 pairs, densely hirsute; involucre bracts ovate-lanceolate to linear. Calyx small, hispidulous, sometimes sparsely glandular hairy; limb sinuous; lobes 0.3–0.5 mm. Corolla white, campanulate; tube 1.5–2.6 × 1.7–2.3 mm, deeply 5-lobed; lobes dissimilar in shape, ovate, ovate-oblong, or ovate-elliptic, 0.7–2 × 1.1–1.8 mm. Stamens 4, exerted. Style shorter than stamens. Achenes obovoid; bracteoles obovate, ovate, obovate-oblong, or elliptic, sometimes orbicular, 2.8–6.5 × 2.5–8 mm, hispidulous between 2 main veins, 2(or 3)-veined, base cuneate or rounded, apex rounded, entire or slightly 3-lobed. Fl. Aug–Oct, fr. Sep–Nov.  $2n = 44$ .

Forests, forest margins, thickets, grassy areas, roadsides; below 100–2000 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, SE Liaoning, Taiwan, Zhejiang [Japan].

- 1a. Leaves without glands; lowest involucre bracts entire ..... 11a. subsp. *villosa*  
 1b. Leaves adaxially with minute brown-red glands; lowest involucre bracts usually with 1 or 2 pairs of segments ..... 11b. subsp. *punctifolia*

**11a. *Patrinia villosa* subsp. *villosa***

攀倒甌(原亚种) pan dao zeng (yuan ya zhong)

*Valeriana villosa* Thunberg in Murray, Syst. Veg., ed. 14, 81. 1784; *Patrinia dielsii* Graebner; *P. ovata* Bunge; *P. sinensis* (H. Léveillé) Koidzumi; *P. villosa* var. *japonica* H. Léveillé; *P. villosa* var. *sinensis* H. Léveillé.

Leaves without glands. Lowermost involucre bracts entire.

Forests, forest margins, thickets, grassy areas; below 100–2000 m. Anhui, Chongqing, Fujian, Guangdong (Liannan, Ruyuan, Yingde), Guangxi, Guizhou, Henan (Shangcheng), Hubei (Enshi, Hefeng), Hunan, Jiangsu (Liyang, Nanjing), Jiangxi, Taiwan, Zhejiang [Japan].

**11b. *Patrinia villosa* subsp. *punctifolia*** H. J. Wang, Acta Phytotax. Sin. 23: 380. 1985.

斑叶败酱 ban ye bai jiang

Leaves with minute brown-red glands adaxially. Lowermost involucre bracts usually with 1 or 2 pairs of segments.

• Grassy slopes, thickets, forest margins, roadsides; below 800 m. SE Liaoning (Benxi, Huanren, Kuandian).

### 3. VALERIANA Linnaeus, Sp. Pl. 1: 31. 1753.

缬草属 xie cao shu

Herbs, perennial. Plants hermaphroditic, gynodioecious, polygamo-dioecious, or dioecious, glabrous or variously pubescent, villous or hirsute, hairs 1- to several celled, white or translucent. Rhizomes elongate, with fibrous roots, or rhizomes reduced, with fascicled, often clavate, roots. Taproots absent (Chinese spp.). Stolons present or absent. Basal leaves rosulate, petiolate or spatulate, undivided, pinnate or pinnatifid, persistent or caducous. Cauline leaves opposite, petiolate to sessile; petiole length typically diminishing upward along stem; blade pinnate, pinnatifid, pinnatisect, or undivided. Inflorescence paniculiform or corymbiform, at anthesis: flowers in remote terminal clusters or in a densely capitate head, branches elongating in fruit; lowermost bracts often lobed, bracts otherwise simple and entire; bracteoles simple, similar to bracts; flowers bisexual, male (not in China?) or female. Calyx a ring at anthesis, unfurling into 5–15 white, plumose segments, 4–8 mm, in mature fruit. Corolla funnelform, rotate or salverform; tube usually gibbous near base; limb 5-lobed. Stamens 3 (4 in *Valeriana kawakamii*), inserted on corolla tube. Achene compressed dorsally, 3-veined on abaxial side, 1-veined on adaxial side, sterile locules reduced; crowned by persistent, plumose calyx, segments 2–7 mm.

About 300 species: Asia, Europe, North and South America; 21 species (13 endemic) in China.

A difficulty in the key is the rhizomes as unfortunately many collections do not have the rhizomes attached.

- 1a. Leaves undivided, or at least lower 2 or 3 pairs of cauline leaves undivided.
  - 2a. Rhizomes relatively stout, 0.5–1.5 cm in diam.; leaves cordate at base, 2–14 × 3–10 cm ..... 13. *V. jatamansi*
  - 2b. Rhizomes relatively slender, less than 0.5 cm in diam.; leaves not cordate at base.
    - 3a. Leaves all undivided.
      - 4a. Leaves entire or sparsely crenulate; plants less than 12 cm tall; achenes hairy ..... 21. *V. trichostoma*
      - 4b. Leaves serrate; plants more than 12 cm tall; achenes glabrous.
        - 5a. Inflorescences laxly paniculiform at anthesis, flowers clustered at branch tips; stem glabrous ..... 15. *V. lancifolia*
        - 5b. Inflorescences compact and capitate at anthesis; stem hirsute ..... 11. *V. hiemalis*
    - 3b. Upper cauline leaves divided.
      - 6a. Undivided leaves entire.
        - 7a. Plants 10–35 cm tall; leaf segments sparsely serrate ..... 5. *V. fedtschenkoi*
        - 7b. Plants 5–15 cm tall; leaf segments entire ..... 20. *V. tangutica*
      - 6b. Undivided leaves serrate.
        - 8a. Corolla less than 3 mm; upper cauline leaves usually pinnatisect, segments 5–7 ..... 16. *V. minutiflora*
        - 8b. Corolla 3.5–4 mm; upper cauline leaves 3-segmented, rarely 5-segmented, lateral segments much smaller than terminal segment ..... 2. *V. barbulate*
- 1b. Leaves all divided, or rarely lowest 1 or 2 pairs of cauline leaves undivided.
  - 9a. Rhizomes 2–8 cm, with marked internodes; roots fibrous, not fascicled; inflorescences lax, with several separate corymbs even at anthesis ..... 7. *V. flaccidissima*
  - 9b. Rhizomes reduced, without marked internodes; roots fascicled; inflorescences compact or lax at anthesis.
    - 10a. Leaf segments entire, rarely incised; plants 5–20(–50) cm tall; leaves all pinnatisect or at least middle and upper cauline leaves pinnatisect, with 4–11 pairs of segments; inflorescences compact at least at anthesis.
      - 11a. Plants 5–20(–30) cm tall; leaf segments rounded or obtuse; terminal segment ± larger than lateral ones.
        - 12a. Achenes hirsute on both sides; petiole of lowermost cauline leaves 3–6 cm ..... 12. *V. hirticalyx*
        - 12b. Achenes glabrous; petiole of lowermost cauline leaves 0.5–2 cm ..... 8. *V. flagellifera*
      - 11b. Plants 10–50 cm tall; leaf segments acute to acuminate at apex; terminal segments similar to or larger than lateral ones.
        - 13a. Corolla 1.5–3 mm; stems sparsely retrorsely puberulent; all leaf segments similar in shape and size, sparsely puberulent ..... 19. *V. stenoptera*
        - 13b. Corolla ca. 6 mm; stems glabrous; terminal leaf segment larger than lateral ones, glabrous or sometimes ciliate ..... 6. *V. ficariifolia*
    - 10b. Leaf segments always serrate (except *V. stenoptera*); plants more than (20–)30 cm tall; leaves pinnatisect or not, with 1–11 pairs of segments; inflorescences lax or compact.
      - 14a. Inflorescences lax, with several separate heads even at anthesis.
        - 15a. Leaves lyrate, terminal segment markedly larger, over 2 times wider than lateral ones; corolla rose or red, 3–4 mm ..... 10. *V. hengduanensis*
        - 15b. Leaves pinnatisect, terminal segments slightly wider than lateral ones; corolla white, 1.5–3.5 mm, or rose, 4–4.5 mm.
          - 16a. Corolla rose, 4–4.5 mm; inflorescence corymbiform; achenes ca. 4 mm ..... 18. *V. sichuanica*

- 16b. Corolla white, 1.5–3.5 mm; inflorescence paniculiform; achenes 2–2.5(–3) mm.  
 17a. Plants over 50 cm tall; leaf segments large, terminal ones over 3 cm ..... 9. *V. hardwickii*  
 17b. Plants usually less than 20 cm, rarely up to 30 cm tall; leaf segments smaller, terminal ones less than 2 cm ..... 3. *V. briquetiana*
- 14b. Inflorescences compact and capitate, at least at anthesis.  
 18a. Leaves usually lyrate, with 1–4 pairs of segments; terminal segment markedly larger than lateral segments.  
 19a. Corolla narrowly tubular, tube 4–6 × as long as lobes; achenes 1.5–2 mm ..... 4. *V. daphniflora*  
 19b. Corolla funnelform, tube nearly as long as lobes; achenes 2.5–3 mm.  
 20a. Roots fibrous, less than 1 mm in diam.; lateral leaf segments 1- or 2-paired; corolla lobes elliptic ..... 2. *V. barbulata*  
 20b. Roots ± carrot-shaped, 1.5–2 mm in diam.; lateral leaf segments 1–4-paired; corolla lobes ovate ..... 16. *V. minutiflora*
- 18b. Leaves pinnatisect, with 4–11 pairs of segments; terminal segment equal to or slightly larger than lateral segments.  
 21a. Leaf segments usually entire, rarely incised, acute to acuminate at apex ..... 19. *V. stenoptera*  
 21b. Leaf segments always serrate, obtuse or acute at apex.  
 22a. Plants 10–20 cm tall; corolla white, tubular, ca. 2.7 mm ..... 14. *V. kawakamii*  
 22b. Plants over 50 cm tall; corolla rose or white, funnelform, 3–6 cm.  
 23a. Plants glandular-hairy at upper part of stems and inflorescence rachises; inflorescence capitate ..... 1. *V. amurensis*  
 23b. Plants without glandular hairs; inflorescence corymbiform ..... 17. *V. officinalis*

**1. *Valeriana amurensis*** P. Smirnov ex Komarov, *Izv. Bot. Sada Akad. Nauk S.S.S.R.* 30: 214. 1932.

黑水缬草 *hei shui xie cao*

*Valeriana amurensis* f. *leiocarpa* H. Hara; *V. officinalis* Linnaeus var. *incisa* Nakai ex Mori.

Plants 80–150 cm tall. Rhizomes reduced; roots fascicled, 1–2 mm in diam. Stems solitary, erect, simple, hispidulous, glandular pubescent above. Leaves cauline, in 5–11 pairs; petiole of lowermost leaves to 4 cm; blade 9–12 × 4–10 cm, pinnatisect; segments 7–10, ovate to ovate-lanceolate, puberulent, margin coarsely serrate; upper leaves similar but smaller. Inflorescence capitate at anthesis, expanding in fruit; peduncles and pedicels glandular pubescent; bracts lanceolate or linear, glandular pubescent, apex acute or acuminate. Corolla rose, funnelform, 3–5 mm. Achenes triangular-ovoid, ca. 3 mm, hispid. Fl. Jun–Jul, fr. Jul–Aug.

Meadows, *Larix* or *Betula* forests. Heilongjiang, Jilin [Korea, Russia (Far East)].

*Valeriana amurensis* differs from *V. officinalis* only in having glandular hairs at the upper part of the stems, inflorescence rachises, and bracts. A population study is needed to clarify if *V. amurensis* is just a variant of the latter or a distinct species.

**2. *Valeriana barbulata*** Diels, *Notes Roy. Bot. Gard. Edinburgh* 5: 295. 1912.

髯毛缬草 *ran mao xie cao*

Plants 5–25 cm tall. Rhizomes reduced; roots fascicled, fibrous, less than 1 mm in diam. Stems solitary, erect, simple. Cauline leaves 5–8 pairs; lowermost often undivided; petiole 1–3.5 cm; blade broadly ovate to elliptic, 0.5–1.6 × 0.5–1 cm, sparsely serrate; upper leaves with petiole 1–1.2 cm, 3(–5)-segmented; terminal segment ovate-orbicular or broadly elliptic, 0.8–2 × 0.5–1.2 cm, petiole and abaxial surface sparsely pubescent, margin ciliate; lateral segments reduced. Inflorescence capitate at anthesis, 1–1.5 cm in diam.; bracts and bracteoles

linear-lanceolate to lanceolate. Corolla rose, reddish purple, or pink, 2.5–4 mm; lobes broadly elliptic, 0.7–1.5 mm, glabrous or villous at throat. Stamens and style exserted. Achenes narrowly ovoid or ellipsoid, 2.5–3 mm, pubescent or glabrous. Fl. Jul–Sep, fr. Aug–Sep.

Alpine meadows or stony sites; 3000–4600 m. SW Sichuan, SE Xizang, NW Yunnan [Bhutan, Myanmar, Nepal].

**3. *Valeriana briquetiana*** H. Léveillé, *Cat. Pl. Yun-Nan*, 277. 1917.

滇北缬草 *dian bei xie cao*

Plants up to 30 cm tall. Rhizomes reduced; roots fascicled, ± thickened, clavate, ca. 1.5 mm in diam. Stems erect or ascending, simple or rarely branched, densely villous below, sparsely villous to glabrate above. Basal and lower cauline leaves usually wilted at anthesis; occasionally lower 1 or 2 cauline pairs persistent; petiole to 2.5 cm; blade obovate-orbicular, ca. 2 × 1.5 cm; middle cauline leaves: petiole 1–3 cm, sparsely villous; blade pinnatisect, sparsely hispidulous adaxially, hirsute abaxially; terminal segment elliptic to linear-elliptic, 10–20 × 3–11 mm, margin usually serrate; lateral lobes 2 or 4, similar but smaller; uppermost 1 or 2 pairs of cauline leaves smaller, subsessile or sessile, otherwise similar. Inflorescence paniculiform, flowers and fruit in remote, terminal, dichasial clusters; peduncles to 15 cm, lax in fruit; bracts leaflike to linear-subulate; bracteoles linear, entire. Corolla funnelform, 2.5–3.5 mm; tube ca. 2 mm; lobes oblong-ovate. Stamens and style prominently exserted. Achenes ovoid-lanceolate, 2.5–3 mm, puberulent on anterior side, glabrous on posterior side. Fl. and fr. Jul.

• 2600–2800 m. NE Yunnan.

**4. *Valeriana daphniflora*** Handel-Mazzetti, *Acta Horti Gothob.* 9: 179. 1934.

瑞香缬草 *rui xiang xie cao*

Plants 15–40 cm tall. Rhizomes reduced; roots 3–6, fascicled, 1.5–2 mm in diam. Stolons rarely present. Stems soli-

tary, erect, simple, sparsely puberulent. Lowermost cauline leaves long petiolate; blade orbicular to broadly elliptic, 1–2 × 1–1.5 cm, undivided, entire or sparsely and irregularly serrate apically. Middle and upper cauline leaves petiolate to subsessile; blade ovate, 1.5–2 × 0.8–1 cm, pinnatifid; segments 3–7, glabrous or hispidulous on veins abaxially, margin irregularly serrate; terminal segment rhombic or elliptic, 1–1.2 × 0.4–0.6 cm; lateral segments smaller, linear-elliptic to linear. Inflorescence capitate at anthesis, 1.5–2.5 cm in diam., becoming lax and ca. 5 cm in diam. in fruit; bracts linear; bracteoles linear, subequal to achenes in length. Corolla rose or pink, tubular, 4.5–6 × ca. 1 mm; lobes ca. 1 mm. Stamens and style exserted. Achenes ovoid-ellipsoid, 1.5–2 × ca. 1 mm, glabrous or sparsely villous. Fl. (late Jul–)Aug, fr. Sep.

• Grassy slopes; 2600–3000(–4500) m. SW Sichuan, Xizang, NW Yunnan (Binchuan, Lijiang).

**5. *Valeriana fedtschenkoi*** Coincy, Ecl. Pl. Hisp. 2: 15. 1895.

新疆缬草 xin jiang xie cao

*Valeriana longiflora* Regel & Schmalhausen, Trudy Imp. S.-Peterburgsk. Bot. Sada 7: 384. 1880, not Willkomm (1851).

Plants 10–35 cm tall, subglabrous throughout. Rhizomes horizontal or ascending, 1–2 cm, apex covered with fibrous remains of old leaves; roots fibrous. Stems erect. Basal leaves in 1–3 pairs; petiole 3–6 cm; blade ovate-orbicular, 1–2.5 × 1–2 cm, simple, subentire to crenulate; cauline leaves 2- or 3-paired; petiole 0.5–2.5 cm; blade obovate-oblong, ca. 4 × 2–4 cm, lyrate; lobes 3–5, terminal lobe ovate or suborbicular, 2–3.5 cm; lateral lobes smaller, lanceolate to linear. Inflorescence capitate at anthesis, ca. 1.5 cm in diam., becoming lax and broader in fruit; bracts and bracteoles linear-lanceolate. Corolla rose, funnelform, 5–6 mm; lobes oblong, 2–2.5 mm. Stamens and style exserted. Achenes ovoid-ellipsoid, glabrous. Fl. Jun–Jul, fr. Jul–Aug. *2n* = 16.

Forests, alpine meadows; 2300–3900 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, N Pakistan].

The Chinese record of *Valeriana turczaninowii* Grubov (in FRPS 73(1): 41. 1986) is referable to *V. fedtschenkoi*.

**6. *Valeriana ficariifolia*** Boissier, Fl. Orient. 3: 89. 1875.

芥叶缬草 jie ye xie cao

Plants 30–40 cm tall. Rhizomes reduced; roots fascicled, more than 1 mm in diam. Stems solitary, erect or ascending, glabrous. Basal leaves long petiolate; petiole 3–9 cm; blade broadly ovate or cordate, 1.5–4 × 1.5–4.5 cm, glabrous or hispidulous, subentire. Lower cauline leaves in 2 or 3 pairs; petiole 2–4 cm, clasping and sheathing; blade lyrate; terminal lobe orbicular to broadly elliptic, 2–3 × 1.5–2 cm, margin entire or irregularly sinuous; lateral lobes 2- or 3-paired, remote, broadly ovate, 1.2–1.4 × ca. 0.8 cm, smaller toward base. Upper leaves similar but smaller. Inflorescence capitate at anthesis, 1–2 cm in diam., expanding and lax in fruit; peduncles glabrous or puberulent; bracts and bracteoles linear-lanceolate, margin ciliate basally. Corolla reddish, ca. 6 mm. Stamens and style exserted. Achenes narrowly ovoid, 5–6 mm, glabrous. Fl. Jul, fr. Jul–Aug. *2n* = 16, 18.

Mountain slopes; 2800–3000 m. Xinjiang (Yecheng) [Afghanistan, Kazakhstan, Tajikistan; SW Asia (Iran)].

The Chinese record of *Valeriana sisymbriifolia* Vahl (in FRPS 73(1): 43. 1986) is referable to *V. ficariifolia*.

**7. *Valeriana flaccidissima*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 12: 228. 1867.

柔垂缬草 rou chui xie cao

*Valeriana faberi* Graebner; *V. nokozanensis* Yamamoto; *V. tripteroides* Handel-Mazzetti (1934), not (Neuman) Kreyer (1930).

Plants 20–80 cm tall, stoloniferous. Rhizomes 2–8 cm; roots fibrous, less than 0.5 mm in diam.; stolons terminating in leafy rosettes. Stems erect, simple, glabrous. Basal leaves simple or 3-lobed, margin crenulate or entire, apex obtuse. Cauline leaves ovate, pinnatisect, glabrous, or puberulent along veins abaxially; segments 3–7, remote; terminal segment ovate or lanceolate, 2–4 × 1–2 cm, glabrous or pubescent abaxially, margin coarsely serrate, apex obtuse or acuminate; lateral segments similar but smaller. Inflorescence paniculiform; involucre bracts and bracteoles linear to linear-lanceolate; bracteoles equal to or slightly shorter than achenes. Corolla reddish, purple, or white, funnelform, 2.5–3.5 mm; lobes oblong to ovate-oblong, shorter than corolla tube. Stamens and style usually exserted. Achenes narrowly ovoid, ca. 3 mm, glabrous or hispidulous. Fl. (Mar–)Apr–Jun, fr. May–Aug.

Forest margins, grassy areas, by streams; 400–3600 m. Anhui (Shucheng), Chongqing, SE Gansu, Guizhou, SE Henan (Shangcheng), W Hubei, Hunan (Xinning), Sichuan, Taiwan (Gaoxiong, Nantou, Xinzhu), Yunnan [Japan].

**8. *Valeriana flagellifera*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 374. 1894.

秀丽缬草 xiu li xie cao

*Valeriana pseudodioica* Pax & K. Hoffmann; *V. venusta* L. C. Chiu; *V. xiaheensis* L. C. Chiu.

Plants 5–20(–30) cm tall. Rhizomes reduced; roots fascicled, fibrous, 0.5–1 mm in diam. Stolons present or absent. Stems solitary, erect, sparsely puberulent. Basal leaves caducous; cauline leaves in 6–9 pairs, glabrous adaxially, hispidulous along veins abaxially; petiole of lowermost 1 or 2 pairs 0.5–2 cm; blade undivided, obovate, ca. 1.5 × 1–1.2 cm, margin entire, ciliate, apex rounded; middle leaves 3-lobed, lateral lobes reduced; upper leaves pinnatisect, 1–3 × 0.5–1.5 cm; lateral segment in 4–10 pairs, margin entire or rarely coarsely serrate, sparsely ciliate, apex rounded or obtuse, terminal lobe similar but slightly larger. Inflorescence capitate at anthesis; bracts and bracteoles linear-lanceolate, bracteoles shorter than achenes. Flowers polygamous; corolla rose, red, purplish red, pink, or white, funnelform, ca. 3.5 mm (bisexual) or 2.5–3 mm (female); lobes oblong, 1–1.5 mm. Stamens exserted in bisexual flowers, vestigial in female flowers; style exserted. Achenes not seen. Fl. Jun–Jul, fr. Aug.

• Moist slopes; 3300–4300 m. S Gansu (Xiahe), Qinghai (Tongde), W Sichuan (Dawu, Sertar), NW Yunnan (Dêqên).

**9. *Valeriana hardwickii*** Wallich in Roxburgh, Fl. Ind. 1: 166. 1820.

长序缬草 chang xu xie cao

*Valeriana barbulata* Diels var. *gymnostoma* Handel-Mazetti; *V. hardwickii* var. *hoffmeisteri* Klotzsch; *V. hardwickii* var. *leiocarpa* Miquel; *V. helictes* Graebner; *V. rhodoleuca* H. B. Chen & C. Y. Cheng; *V. rosthornii* Graebner; *V. udicola* Briquet.

Plants to 150 cm tall. Rhizomes short; roots slender, ca. 1 mm in diam. Stolons 1 to several, or absent. Stems erect, often hispidulous below, glabrous above except at nodes. Basal leaves long petiolate; petiole to 9 cm; blade pinnatisect or pinnatifid, rarely simple and cordate; terminal segment ovate to ovate-lanceolate, 3.5–7 × 1.5–3 cm, hispidulous to glabrate, base subrounded, margin entire or serrate, apex acuminate; lateral segments 4 or 6, remote, reduced toward petiole. Cauline leaves similar, gradually reduced apically. Inflorescence paniculiform, flowers and fruit in remote dichasial clusters, primary peduncles to 70 cm; bracts linear-subulate; bracteoles deltoid-ovate, ca. 1/2 as long as achenes, margin entire or crenulate. Corolla white, pinkish white, or purplish, campanulate to funnelform, 1.5–2.5(–3.5) mm, tube and lobes of equal length. Stamens and style subequal to corolla in length or slightly exserted. Achenes broadly ovoid to ovoid, 2–3 × 1–1.2 mm, hispidulous or less frequently glabrous. Fl. Jun–Aug, fr. Jul–Oct.  $2n = 14, 16, 28, 32$ .

Grassy slopes, forest margins, by streams; 900–3800 m. Chongqing (Nanchuan), Fujian (Chong'an), Guangxi (Damiao Shan), Guizhou, SW Hubei, W Hunan (Qianyang, Xinning, Xuefeng Shan), Jiangxi (Wugong Shan), Sichuan, S and SE Xizang, Yunnan [Bhutan, India, Indonesia, Laos, Myanmar, Nepal, Pakistan, Thailand, N Vietnam].

**10. *Valeriana hengduanensis*** D. Y. Hong, Acta Phytotax. Sin. 30: 373. 1992.

横断山缬草 *heng duan shan xie cao*

Plants 40–100 cm tall. Rhizomes reduced; roots fascicled, 1–1.5 mm in diam. Stolons sometimes present. Stems solitary, erect, simple, glabrous or sparsely puberulent. Basal leaves caducous; lower 1 or 2 pairs of cauline leaves with petiole 2–9 cm; blade simple, broadly elliptic or obovate, 3–8 × 2–4.5 cm, subentire or serrate; upper leaves petiolate to subsessile; petiole to 7 cm; blade 5–10 × 3–5 cm, glabrous or sparsely villous, lyrate; segments 3–7, crenulate or serrate; terminal segment broadly elliptic to orbicular, much larger than others, 4–8 × 2–5 cm. Inflorescence laxly capitate; bracts linear. Corolla rose or red, funnelform, 3–4.5 mm. Achenes lanceolate, 3–3.5 mm, glabrous.

• Forests, ravines; 3100–3700 m. SW Sichuan (Muli), NW Yunnan (Dêqên, Weixi, Zhongdian).

**11. *Valeriana hiemalis*** Graebner, Bot. Jahrb. Syst. 29: 600. 1901.

全缘叶缬草 *quan yuan ye xie cao*

Plants 20–50 cm tall. Rhizomes reduced; roots fascicled, 0.5–1.5 mm in diam. Stems solitary, simple, hirsute. Leaves simple; basal leaves spatulate, caducous; cauline leaves in 3–5 pairs; lower leaves petiolate, petiole 0.5–3 cm; upper leaves subsessile to sessile; blade ovate or oblong, 1–5 × 0.7–3 cm, hirsute, margin entire or serrate, apex obtuse to acute. Inflorescence capitate at anthesis, 1–2 cm in diam., ca. 5 cm in diam. in fruit; bracts linear, 0.7–1.1 cm. Corolla white or light pink, funnelform, 2.5–3.5 mm; lobes ca. 1 mm. Achenes narrowly ovoid,

3–3.5 mm, glabrous. Fl. late Jun–Aug, fr. Sep.

• Forests; 2000–3000 m. Shaanxi (Taibai Shan), NW Sichuan.

**12. *Valeriana hirticalyx*** L. C. Chiu, Acta Phytotax. Sin. 17(3): 124. 1979.

毛果缬草 *mao guo xie cao*

Plants 5–18 cm tall, stoloniferous. Rhizomes reduced; roots fascicled, fibrous, ca. 1 mm in diam.; stolons terminating in leafy rosettes. Stems solitary, erect, simple, glabrous or sparsely hirsute except at nodes. Rosette leaves long petiolate; blade orbicular, entire, caducous. Cauline leaves in 2 or 3 pairs, lowermost long petiolate; petiole 3–6 cm, subsessile apically; blade obovate, 1.5–3 × 1–1.5 cm, pinnatisect; segments 3–9, oblong to obovate, margin entire and ciliate; terminal segment 1–1.5 × 0.6–0.8 cm; lateral segments reduced. Inflorescence capitate at anthesis, ca. 1 cm in diam., expanding to 3–4 × 2–3 cm in fruit; bracts and bracteoles spatulate to lanceolate; bracteoles slightly shorter than fruit. Corolla red, tubular, ca. 5 mm, inside villous, lobes elliptic-oblong, ca. 2 mm. Stamens and style exserted. Achenes ellipsoid-ovoid, 3.5–4 × ca. 2 mm, both surfaces hirsute. Fl. Jul–Aug, fr. Aug–Sep.

• Grassy slopes with shrubs, stony places; 4000–5000 m. Qinghai (Henan, Nangqên, Qilian, Zadoi), NE Xizang (Amdo, Biru, Sogxian).

**13. *Valeriana jatamansi*** W. Jones, Asiat. Res. 2: 416. 1790.

蜘蛛香 *zhi zhu xiang*

*Valeriana harmsii* Graebner; *V. jatamansi* var. *frondosa* Handel-Mazzetti; *V. jatamansi* var. *glabra* Merrill; *V. jatamansi* var. *hygrobia* (Briquet) Handel-Mazzetti; *V. hygrobia* Briquet; *V. mairei* Briquet; *V. wallichii* Candolle; *V. wallichii* var. *violifolia* Franchet.

Plants 20–70 cm tall. Rhizomes short, robust, usually 0.5–2 cm in diam., nodes crowded; roots fibrous. Stems 1 to several, erect, glabrate to pubescent, more densely so at nodes. Basal leaves persistent, rosulate; petiole 4–10 cm; blade simple, cordate to cordate-ovate, 2–14 × 3–10 cm, hispidulous or glabrous, margin irregularly crenulate, crenate, or dentate, apex acute. Cauline leaves in 2 or 3 pairs, sessile or subsessile, 1–3 cm, simple or trifoliolate; lateral lobes reduced; terminal lobe ovate. Inflorescence corymbiform, villous at nodes; bracts subulate, margin scarious; bracteoles ca. as long as achenes. Corolla white or pinkish, funnelform; flowers polygamous; bisexual flowers 3–4 mm, female flowers ca. 1.5 mm. Stamens and style exserted. Achenes narrowly ovoid, 2–2.5 × 1–1.5 mm, both sides villous. Fl. (Apr–)May–Jul, fr. Jun–Sep.  $2n = 16, 32$ .

Grassy slopes, forests, by streams; below 2500(–3100) m. Chongqing (Kaixian, Nanchuan), Gansu, Guizhou (Leishan, Zunyi), Henan (Xixia), W Hubei, Hunan (Longshan), Sichuan (Emei Shan), Xizang (Zayü), Yunnan [Bhutan, E and N India, Nepal, N Thailand, Vietnam].

**14. *Valeriana kawakamii*** Hayata, Icon. Pl. Formosan. 5: 82. 1915.

高山缬草 *gao shan xie cao*

Plants 10–20 cm tall, stoloniferous. Rhizomes short, slender. Stems simple, glabrous. Lower cauline leaves long petiolate; petiole ca. as long as leaf blade, semiamplexicaul; blade obovate-spatulate, 2–3 × 0.8–1 cm, pinnatisect; terminal lobe

ovate, ca.  $10 \times 7$ – $10$  mm, puberulent, ultimately glabrescent, base cuneate, margin entire or remotely dentate, ciliate, apex obtuse to acute; lateral lobes similar but smaller, ca.  $4 \times 2$  mm, gradually reduced distally; upper leaves remote, smaller; leaflets 3–5. Inflorescence corymbiform, 1–2 cm in diam.; bracts linear, ca.  $4 \times 0.5$  mm, base dilated and amplexicaul, auriculate, ciliate, margin entire, apex obtuse. Flowers sessile. Corolla tubular-campanulate, ca.  $2.7 \times 1.5$  mm; lobes oblong-deltoid, ca.  $0.7 \times 0.7$  mm, glabrous, apex obtuse. Filaments inserted at middle part of corolla tube, ca. 1 mm, included, glabrous. Stamens 4, inserted distally in tube. Style exserted, 1–1.5 mm; stigma clavate. Achenes oblong-ovoid, ca. 3 mm. Fl. Apr–Jul, fr. Jul.

- Forests; high elevations. Taiwan.

**15. *Valeriana lancifolia*** Handel-Mazzetti, Acta Horti Gothob. 9: 181. 1934.

披针叶缬草 pi zhen ye xie cao

Plants 15–50 cm tall. Rhizomes reduced; roots fascicled, 0.5–1 mm in diam. Stems solitary, erect, simple, glabrous or subglabrous except at nodes. Leaves in 3 or 4 pairs near base of stem, sessile or shortly petiolate; blade oblong or lanceolate, 2– $10 \times 0.5$ –3 cm, base truncate, rounded, or broadly cuneate, margin coarsely serrate, apex rounded to acute. Inflorescence laxly paniculiform at anthesis; branches elongating in fruit, to ca. 30 cm; bracts spatulate, margin incised-dentate. Corolla rose, funnelform, 3–4 mm; lobes ovate, ca. 1/2 as long as tube. Stamens slightly exserted. Style evidently exserted. Achenes sublanceolate,  $2.5$ – $3 \times 1$  mm, glabrous; calyx segments ca. 5.5 mm. Fl. Jun–Jul, fr. Jul–Aug.

- Grassy slopes; 3200–4300 m. W Sichuan.

**16. *Valeriana minutiflora*** Handel-Mazzetti, Acta Horti Gothob. 13: 233. 1939.

小花缬草 xiao hua xie cao

Plants 8–45 cm tall. Rhizomes reduced; roots fascicled, clavate, 1.5–2 mm in diam.,  $\pm$  fleshy. Stems solitary, erect, simple. Cauline leaves in 3–5 pairs; petiole of lowermost leaves 1.5–3 cm; blade obovate to elliptic,  $1.2 \times 0.7$ –1.5 cm, sparsely pubescent, base rounded, margin coarsely serrate or crenulate, apex obtuse. Middle and upper leaves with shorter petiole; blade lyrate; terminal segment ovate to elliptic, 1–2 cm, margin sparsely serrate or crenulate, apex obtuse or acute; lateral segments much smaller, in 1 or 2 pairs. Inflorescence capitate at anthesis; bracts and bracteoles linear, entire or serrate, subequal to achenes in length. Corolla whitish rose, white, rose-purple, or pink, funnelform, 2.5–3 mm (bisexual) or ca. 1.5 mm (female), glabrous or pilose within; lobes ovate, equal to tube in length. Achenes ovoid-oblong, ca. 2.5 mm, glabrous or partially pilose. Fl. Jul–Aug, fr. Aug–Sep.

- Forests, grassy or stony slopes; 3000–4100 m. Qinghai, W Sichuan (Kangding, Qianning, Xiangcheng), Xizang, NW Yunnan.

**17. *Valeriana officinalis*** Linnaeus, Sp. Pl. 1: 31. 1753.

缬草 xie cao

*Valeriana alternifolia* Bunge; *V. alternifolia* f. *angustifolia* (Komarov) Kitagawa; *V. alternifolia* var. *angustifolia* (Komarov) S. H. Li; *V. alternifolia* f. *verticillata* (Komarov) S. X. Li;

*V. chinensis* Kreyer ex Komarov; *V. coreana* Briquet; *V. coreana* subsp. *leiocarpa* (Kitagawa) Voroschilov; *V. dubia* Bunge; *V. fauriei* Briquet; *V. fauriei* var. *leiocarpa* (Kitagawa) Kitagawa; *V. leiocarpa* Kitagawa; *V. nipponica* Nakai ex Kitagawa; *V. officinalis* var. *alternifolia* (Bunge) Ledebour; *V. officinalis* var. *latifolia* Briquet; *V. pseudofficinalis* C. Y. Cheng & H. B. Chen; *V. stubendorffii* Kreyer ex Komarov; *V. stubendorffii* f. *angustifolia* Komarov; *V. stubendorffii* f. *verticillata* Komarov; *V. subbipinnatifolia* A. I. Baranov; *V. tianschanica* Kreyer ex Handel-Mazzetti.

Plants up to 150 cm tall, infrequently stoloniferous. Rhizomes reduced; roots fascicled, clavate, 1.5–2.5 mm in diam. Stems hirsute or hispidulous, particularly at nodes, rarely glabrous. Basal and lowermost cauline leaves usually wilted at anthesis; cauline leaves petiolate to sessile; petiole 0–8 cm; blade ovate to broadly ovate, 5–15  $\times$  3–8 cm, pinnatisect; segments 7–15, lanceolate or linear, glabrous or  $\pm$  hispidulous, base decurrent, margin entire or coarsely serrate; terminal and lateral segments similar in shape and size. Inflorescence corymbiform, large and compact even in fruit, or with 2 distinct, secondary lateral inflorescences; bracts leaflike below, small and linear-lanceolate otherwise; bracteoles elliptic-oblong, oblanceolate, or linear-lanceolate, margin scarious-ciliate, apex awned. Corolla purplish red, pink, or white, funnelform, 4–6 mm; lobes elliptic. Stamens and style strongly exserted. Achenes narrowly ovoid, 4–5 mm, both sides glabrous or pubescent. Fl. May–Jul, fr. Jun–Oct.  $2n = 14, 28, 42, 56$ .

Grassy slopes, forests, by streams; below 2500 m, but up to 4000 m in Qinghai, Sichuan, and Xizang. Anhui, Chongqing, Gansu, Guizhou (Fanjing Shan, Huangping, Kaili), Hebei, Henan, W Hubei, W Hunan (Sangzhi, Xinning), Jiangxi (Lu Shan), N and SE Nei Mongol, Qinghai, Shaanxi, Shandong (Changqing, Kunyu Shan, Taishan), Shanxi, Sichuan, Taiwan, Xizang (Jomda, Qamdo, Riwoqê), Zhejiang (Tianmu Shan) [Japan, Russia; Europe].

*Valeriana officinalis* is a very variable species for which several infraspecific taxa have been described.

**18. *Valeriana sichuanica*** D. Y. Hong, Acta Phytotax. Sin. 30: 371. 1992.

川缬草 chuan xie cao

Plants 25–55 cm tall. Rhizomes reduced; roots fascicled, fibrous, ca. 1 mm in diam. Stolons sometimes present. Stems solitary, erect, simple, densely retrorsely hispid below, gradually sparsely so upward. Leaves all cauline, sparsely hispidulous adaxially; lower 1 or 2 pairs with petiole 2–3 cm; blade ovate to elliptic, 2–5  $\times$  1.2–2 cm, margin subentire to serrate; upper leaves pinnatisect, segments 4- or 5-paired, linear to elliptic, 1.5–3  $\times$  0.2–0.7 cm; terminal segment similar or slightly broader. Inflorescence laxly corymbiform; peduncles 8–14 cm; bracts linear; bracteoles ca. as long as achenes. Corolla rose, funnelform, 4–4.5 mm; tube ca. 2.5 mm, inside villous; lobes 1.5–2  $\times$  ca. 1 mm. Stamens and style exserted. Achenes narrowly ovoid, ca. 4 mm, sparsely hispid. Fl. Jul, fr. Aug.

- Mountain slopes; ca. 3600 m. SW Sichuan (Muli).

**19. *Valeriana stenoptera*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 295. 1912.

窄叶缬草 zhai ye xie cao

*Valeriana stenoptera* var. *cardaminea* Handel-Mazzetti.

Plants ca. 10 cm tall, infrequently stoloniferous. Rhizomes reduced; roots 3–6, fascicled, 1.5–2 mm in diam. Stems solitary, simple, erect, sparsely retrorsely puberulent below and at nodes above. Lower cauline leaves long petiolate; petiole 3–4 cm; blade obovate to ovate, 1–2 cm, undivided or with 1 or 2 pairs of small segments at base, margin serrulate. Middle and upper cauline leaves long petiolate to shortly petiolate or sessile; blade oblong or oblong-lanceolate, 2–5 × 1–2 cm, pinnatisect; segments 5–15, linear to linear-lanceolate, 12–20 × 1–2 mm, sparsely puberulent, margin entire or incised. Inflorescence capitate, becoming lax in fruit, 6–12 × 2–8 cm; bracts linear-lanceolate, sparsely dentate; bracteoles as long as or slightly shorter than achenes. Corolla rose, funnelform; tube 1.5–3 × 0.8–1.2 mm, inside villous; lobes elliptic, 1.5–2 × ca. 1 mm. Stamens and style exserted. Achenes ovoid-ellipsoid, ca. 4 mm, often pubescent. Fl. Jul–Aug, fr. Aug–Sep.

• Grassy slopes, forest margins, by water; 3000–4000 m. W Sichuan, Xizang, NW Yunnan.

**20. *Valeriana tangutica*** Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 375. 1894.

小纈草 xiao xie cao

Plants 10–20 cm tall, glabrous throughout. Rhizomes ascending, 0.5–2 cm, usually covered with fibrous remains of old leaves; roots fibrous, ca. 0.5 mm in diam. Stems erect, simple. Basal and lower cauline leaves long petiolate; petiole to 5 cm; blade broadly ovate to oblong-ovate, 1–4 × 1–1.5 cm, margin entire. Middle cauline leaves lyrate; terminal lobe orbicular or oblong, ca. 1 × 1 cm; lateral lobes 1- or 2-paired, reduced, elliptic to linear-elliptic, margin entire, apex obtuse. Upper cauline

leaves pinnatifid; segments 5–7, linear-lanceolate, entire; terminal one larger. Inflorescence semiglobose, 1–2 cm in diam.; bracts and bracteoles lanceolate, membranous. Corolla white, rose, pink, or sometimes purplish, funnelform, 5–6 mm; lobes obovate, nearly as long as tube. Stamens and style exserted. Achenes ovoid-ellipsoid, ca. 3 × 1 mm, glabrous. Fl. Jun–Jul, fr. Jul–Aug.

• Meadows, forests; 2000–3900(–4200) m. Gansu (Jiayuguan, Lintan, Sunan), SW Nei Mongol (Alxa Zuoqi), NW Ningxia (Helan Shan), N and NE Qinghai, Sichuan (Xiangcheng).

**21. *Valeriana trichostoma*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 60: 117. 1923.

毛口纈草 mao kou xie cao

*Valeriana muliensis* S. K. Wu.

Plants less than 12 cm tall, stoloniferous. Rhizomes reduced; roots fascicled. Stems solitary, erect, simple, glabrous. Basal leaves not seen; cauline leaves undivided; petiole of lowermost leaves 2–5 cm; leaves shortly petiolate to subsessile above; blade orbicular to orbicular-elliptic, 8–13(–30) mm, hispidulous, 3–5-veined, base rounded, margin entire or those of upper leaves coarsely crenulate, apex rounded. Inflorescence capitate, 1.3–2.5 cm in diam.; peduncles ca. 1 cm; bracts linear-spatulate, ca. 6 mm, sparsely ciliate. Corolla rose or pink, funnelform, ca. 7 mm; tube ca. 4 mm, inside hirsute; lobes obovate-oblong. Stamens ca. as long as corolla. Ovary densely hirsute; style exserted by ca. 2 mm. Achenes not seen. Fl. Jul–Aug, fr. Sep.

• Grassy slopes; 3600–4600 m. SW Sichuan (Muli), NW Yunnan (Lijiang, Zhongdian).

## ANNONACEAE

番荔枝科 fan li zhi ke

Li Bingtao (李秉滔 Li Ping-tao)<sup>1</sup>; Michael G. Gilbert<sup>2</sup>

Trees, shrubs, or climbers, wood and leaves often aromatic; indument of simple or less often (*Uvaria*, *Annona*) stellate hairs. Leaves alternate, normally distichous. Stipules absent. Petiole usually short; leaf blade simple, venation pinnate, margin entire. Inflorescences terminal, axillary, leaf-opposed, or extra-axillary [rarely on often underground suckerlike shoots]. Flowers usually bisexual, less often unisexual, solitary, in fascicles, glomerules, panicles, or cymes, sometimes on older wood, usually bracteate and/or bracteolate. Sepals hypogynous, [2 or] 3, imbricate or valvate, persistent or deciduous, rarely enlarging and enclosing fruit, free or basally connate. Petals hypogynous, 3–6(–12), most often in 2 whorls of 3 or in 1 whorl of 3 or 4[or 6], imbricate or valvate, sometimes outer whorl valvate and inner slightly imbricate. Stamens hypogynous, usually many, rarely few, spirally imbricate, in several series; filaments very short and thick; anther locules 2, contiguous or separate, rarely transversely locular, adnate to connective, extrorse or lateral, very rarely introrse, opening by a longitudinal slit; connectives often apically enlarged, usually  $\pm$  truncate, often overtopping anther locules, rarely elongated or not produced. Carpels few to many, rarely solitary, free or less often connate into a 1-locular ovary with parietal placentas; ovules 1 or 2 inserted at base of carpel or 1 to several in 1 or 2 ranks along ventral suture, anatropous; styles short, thick, free or rarely connate; stigmas capitate to oblong, sometimes sulcate or 2-lobed. Fruit usually apocarpous with 1 to many free monocarps, these sometimes moniliform (constricted between seeds when more than 1-seeded), often fleshy, indehiscent, rarely dehiscent (*Anaxagorea*, *Xylopia*), and often with base extended into stipe, rarely on slender carpophore (*Disepalum*), less often syncarpous with carpels completely connate and seeds irregularly arranged and sometimes embedded in fleshy pulp. Seeds 1 to many per monocarp or many per syncarp, often arillate; endosperm copious, ruminate; embryo minute, near hilum.

About 129 genera and over 2,300 species: tropics and subtropics, especially in Old World; 24 genera (one endemic, three introduced) and 120 species (41 endemic, 11 introduced) in China.

The flowers often open before the petals have fully expanded making it easy to underestimate floral dimensions.

One of the major studies of the Annonaceae of tropical Asia was by Suzanne Jovet-Ast (1914–2006), who published an account of the Indochinese species under her maiden name, Ast (Fl. Indo-Chine, Suppl. 1: 62–121. 1938). Unfortunately, she failed to provide Latin descriptions for her many new taxa, none of the names of which was therefore validly published. Her new combinations were validly published, however, and she did subsequently validate a few species of *Goniothalamus* under her maiden name; but she did not validate most of her new species until after she married and took up the name “Jovet-Ast.” These later names form the major part of all her publications, so we have chosen to cite her as “Jovet-Ast [“Ast”]” for those taxa validated under her maiden name.

Tsiang Ying & Li Ping-t'ao. 1979. Annonaceae. In: Tsiang Ying & Li Ping-t'ao, eds., Fl. Reipubl. Popularis Sin. 30(2): 10–175.

- 1a. Fruit syncarpous, with completely united carpels and seeds embedded in pulp (usually cultivated as fruit trees).
  - 2a. Outer petals usually free, abaxially flat ..... 23. *Annona*
  - 2b. Outer petals connate at base, abaxially spurred or winged ..... 24. *Rollinia*
- 1b. Fruit apocarpous, with carpels forming free, often stipitate, monocarps.
  - 3a. Sepals or inner petals and sometimes also outer petals clearly imbricate; stellate hairs often present.
    - 4a. Trees or self-supporting shrubs; stellate hairs absent; sepals imbricate; petals valvate or very minutely imbricate; ovules 1 per carpel ..... 15. *Trivalvaria*
    - 4b. Climbing shrubs; stellate hairs present; sepals valvate; inner petals and sometimes also outer petals imbricate; ovules 2 or more per carpel.
      - 5a. Petals spreading at anthesis; torus depressed ..... 2. *Uvaria*
      - 5b. Petals incurved at anthesis, not opening widely; torus flattened, margin prominent ..... 3. *Cyathostemma*
  - 3b. Sepals and inner and outer petal whorls all valvate or rarely very narrowly imbricate at tip only (only 1 whorl of petals present in *Dasymaschalon*); simple hairs usually present, less often plant glabrous.
    - 6a. Climbing shrubs.
      - 7a. Peduncles and fruiting pedicels hooklike ..... 20. *Artabotrys*
      - 7b. Peduncles and fruiting pedicels not hooklike.
        - 8a. Monocarps ellipsoid, moniliform when more than 1-seeded; petals basally constricted to form enclosed floral chamber around stamens and carpels ..... 6. *Desmos*
        - 8b. Monocarps globose to cylindric, never moniliform; petals not constricted.

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In addition, extensive contributions were received from Richard M. K. Saunders (*Dasymaschalon*, *Desmos*, *Mitrephora*, and *Pseuduvaria*), Wang Jing (王静; *Dasymaschalon*), Aruna D. Weerasooriya (*Mitrephora*), Yvonne C. F. Su (许传芳; *Pseuduvaria*), and Ng Kwok Wun (吴帼媛; *Desmos*); School of Biological Sciences, The University of Hong Kong, Pokfulam Road, Hong Kong, People's Republic of China.

- 9a. Monocarp stipes 5.3–7.5 cm; outer petals usually much larger than inner petals; stamen connectives apically truncate (flowers of *F. hainanensis* unknown) ..... 21. *Friesodielsia*
- 9b. Monocarp stipes 0.3–4 cm; outer petals only slightly larger than inner petals; stamen connectives apically acuminate to obtuse ..... 22. *Fissistigma*
- 6b. Trees or erect shrubs.
- 10a. Petals (2 or) 3, in 1 whorl ..... 7. *Dasymaschalon*
- 10b. Petals 6, in 2 whorls.
- 11a. Inner petals basally clawed or stipitate, laminas vaulted and connate into an apical cap at least initially.
- 12a. Outer petals 2–7 mm, usually smaller than inner petals and similar to sepals (inner and outer petals subequal in *Orophea hainanensis* and *O. yunnanensis*).
- 13a. Inner petals with a long basal claw, usually apically lozenge-shaped and cohering by their margins into a cap over stamens and carpels, sometimes with their tips conspicuously recurved; pedicel 0.2–1.2 cm ..... 4. *Orophea*
- 13b. Inner petals with a short basal claw, shallowly saccate, at first cohering by their margins but soon free; pedicel usually 1.4–10 cm (0.5–0.7 cm in *M. glochidioides*) ..... 5. *Milusa*
- 12b. Outer petals more than 12 mm, equaling or longer than inner petals, conspicuously different from sepals.
- 14a. Stamens linear-oblong; inner petals each with a short claw or stipe ..... 8. *Goniothalamus*
- 14b. Stamens cuneate; inner petals each with a long claw or stipe.
- 15a. Outer petals 1.6–2.5(–3.4) cm, longer than inner petals ..... 9. *Mitrephora*
- 15b. Outer petals 1–1.5 cm, shorter than inner petals ..... 10. *Pseuduvaria*
- 11b. Inner petals not basally clawed, spreading or connivent and apically 3-edged.
- 16a. Stamen connectives apically acuminate.
- 17a. Petals 5–8 cm, linear to linear-lanceolate ..... 19. *Cananga*
- 17b. Petals 0.7–1 cm, ovate-triangular to ovate-oblong, usually saccate and incurved at base
- 18a. Monocarps dehiscent, stipe clavate; ovules 2 per carpel ..... 1. *Anaxagorea*
- 18b. Monocarps indehiscent, stipe not clavate; ovules 5–22 per carpel ..... 18. *Alphonsea*
- 16b. Stamen connectives apically truncate, rounded, or broadly 3-angular.
- 19a. Ovules 1 or 2(or 3) per carpel, basally or nearly basally inserted.
- 20a. Inner petals concave and incurved to cover stamens; fruiting carpels free but usually connivent ..... 17. *Popowia*
- 20b. Inner petals spreading; fruiting carpels free and not connivent
- 21a. Monocarp bases extended into stipes, not articulate at base ..... 14. *Polyalthia*
- 21b. Monocarps on slender carpophores, articulate between apex of carpophore and base of monocarp ..... 16. *Disepalum*
- 19b. Ovules many per carpel, ventrally inserted.
- 22a. Flower buds lanceolate, apically long beaked and 3-angled; sepals connate at base or beyond into a cup; petals elongated, concave at base, narrowly convex below middle; anther locules transversely septate ..... 11. *Xylopia*
- 22b. Flower buds ovoid, apically rounded; sepals connate at base but not into a cup; petals flat or cucullate; anther locules not transversely septate.
- 23a. Petals flat; stamen connectives apically rounded; stigmas subcapitate, not constricted at base; monocarps almost sessile (Chinese species) ..... 12. *Meiogyne*
- 23b. Petals cucullate; stamen connectives apically truncate to subtruncate; stigmas ovoid, constricted at base; monocarps long stipitate ..... 13. *Chieniodendron*

# 1. ANAXAGOREA A. Saint-Hilaire, Nouv. Bull. Sci. Soc. Philom. Paris 1825: 91. 1825.

蒙蒿子属 meng hao zi shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs or small trees. Inflorescences terminal, leaf-opposed, axillary, or extra-axillary, fasciculate or 1-flowered. Flowers pedicellate. Torus convex. Sepals 3, valvate, connate at base. Petals 6, in 2 whorls, with each whorl valvate, erect to spreading flat, subequal or outer larger than inner. Stamens many, all fertile or inner stamens sometimes reduced to staminodes; anther locules

linear-oblong; connectives apically apiculate. Carpels few to many; ovules 2 per carpel, basal; stigmas subglobose to oblong. Fruit apocarpous; monocarps long stipitate, clavate, dehiscent. Seeds 1 or 2 per monocarp, black and very shiny, without an aril.

About 27 species: tropical Asia and America; one species in China.

Both molecular (Richardson et al., *Philos. Trans.*, Ser. B, 359: 1495–1508. 2004) and morphological studies (Scharaschkin & Doyle, *Amer. J. Bot.* 93: 36–54. 2006) show that *Anaxagorea* is the sister group to the rest of the family.

**1. *Anaxagorea luzonensis*** A. Gray, U.S. Expl. Exped., Phan. 27. 1854.

蒙蒿子 meng hao zi

Shrubs 1–2 m tall, erect, glabrous except for flowers. Petiole 0.6–2 cm; leaf blade oblong to broadly elliptic, 9–16 × 3–7 cm, membranous, yellowish when dry, secondary veins 7 or 8 on each side of midvein, base rounded, apex acute to obtuse. Inflorescences leaf-opposed, 1- or 2-flowered. Flowers ca. 1.2 cm. Pedicel ca. 6 mm. Sepals rounded to ovate, outside puber-

lent. Petals greenish; outer petals ovate, slightly longer and ca. 2 × broader than inner petals; inner petals 8–9 × 4–5 mm. Stamens many. Carpels 2–4, ovoid-oblong, puberulent. Monocarp stipes clavate; monocarps 2–3 × 0.5–0.7 cm, dehiscing on dorsal side, apex acute. Seeds reddish when young, shiny dark brown upon maturity, obovate, flat, 8–11 × 6–7 mm. Fl. Jun–Oct, fr. Oct–Jan.

Densely forested slopes; 500–700 m. S Guangxi, Hainan [India, Indonesia, Laos, Myanmar, Philippines, Sri Lanka, Thailand].

## 2. *UVARIA* Linnaeus, Sp. Pl. 1: 536. 1753.

紫玉盘属 zi yu pan shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Narum* Adanson; *Uva* Kuntze.

Shrubs, climbing, sometimes erect or small trees, indument with stellate hairs. Inflorescences terminal, axillary, extra-axillary, leaf-opposed, or rarely on older branches; flowers mostly solitary or paired, rarely in short racemes or few-flowered cymes. Torus depressed, pubescent or tomentose. Sepals 3, valvate, usually connate at base. Petals 6, in 2 whorls, sometimes connate at very base, each whorl imbricate. Stamens many; anther locules often oblong or linear; connectives apically truncate to rounded. Carpels many, rarely few, linear-oblong; ovules many per carpel or rarely 2 or 3, in 1 or 2 series; styles outside often pilose; stigmas usually apically 2-cleft, involute. Fruit apocarpous; monocarps mostly ± stipitate, oblong, ovoid, or subglobose, fleshy and berrylike. Seeds several per monocarp or 1 by abortion, subhorizontal, with or without a short aril.

About 150 species: Old World tropics; eight species (one endemic) in China.

L. L. Zhou et al. (*Syst. Biodivers.* 7: 249–258. 2009) include *Cyathostemma* in *Uvaria* on the basis of a recent molecular study, but this is not accepted by one of us (Li). See the account of *Cyathostemma* for more details.

- 1a. Leaf blade abaxially glabrous or inconspicuously and sparsely stellate pubescent but soon glabrescent.
  - 2a. Leaf blade oblong to oblong-ovate, abaxially glabrous; ovules 6–8 per carpel ..... 1. *U. boniana*
  - 2b. Leaf blade obovate-lanceolate, abaxially inconspicuously and sparsely stellate pubescent, glabrescent; ovules 2 per carpel.
    - 3a. Fruit ca. 1 cm in diam., smooth; leaf blade secondary veins 8–12 on each side of midvein ..... 2. *U. tonkinensis*
    - 3b. Fruit ca. 3.5 cm in diam., densely tuberculate; leaf blade secondary veins 12–14 on each side of midvein ..... 3. *U. kweichowensis*
- 1b. Leaf blade abaxially distinctly tomentose or pubescent, hairs simple or stellate.
  - 4a. Flowers 9–10 cm in diam.; monocarps cylindric, 4–6 cm, slightly constricted between seeds ..... 6. *U. grandiflora*
  - 4b. Flowers 1.5–4 cm in diam.; monocarps globose to ovoid-ellipsoid, 2–3.8 cm, not constricted between seeds.
    - 5a. Monocarps with soft and dense spines; petals yellowish and leaf blade thinly leathery to thickly papery ..... 4. *U. calamistrata*
    - 5b. Monocarps unarmed; petals dark red to purple, or if yellow then leaf blade membranous.
      - 6a. Leaf blade membranous; petals yellow to yellowish ..... 5. *U. kurzii*
      - 6b. Leaf blade thinly leathery or leathery; petals dark red to purple.
        - 7a. Leaf blade apex acuminate, secondary veins adaxially flat; flowers ca. 1.5 cm in diam. .... 7. *U. rufa*
        - 7b. Leaf blade apex acute, obtuse, or rounded, secondary veins adaxially impressed; flowers 2.5–4 cm in diam. .... 8. *U. macrophylla*

**1. *Uvaria boniana*** Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 71. 1906.

光叶紫玉盘 guang ye zi yu pan

Shrubs to 5 m tall, climbing, glabrous except for flowers. Petiole 2–8 mm; leaf blade oblong to oblong-ovate, 4–15 × 1.8–5.5 cm, papery, secondary veins 8–10 on each side of midvein and slightly prominent on both surfaces, base cuneate to

rounded, apex acuminate to acute. Inflorescences extra-axillary, often leaf-opposed, 1- or 2-flowered. Pedicel 2.5–5.5 cm, bracteolate below middle. Sepals ovate, 2.5–3 mm, margin ciliate. Petals purple, leathery, puberulent; outer petals broadly ovate, ca. 1 × 1 cm; inner petals slightly smaller than outer petals, inside concave. Stamen connectives apically truncate, papillary. Carpels oblong, incurved, densely yellow pubescent; ovules 6–8 per carpel; stigmas horseshoe-shaped, apex 2-cleft. Monocarp stipes 4–5.5 cm; monocarps purple, globose to ellipsoid-ovoid, ca. 1.3 cm in diam. Fl. May–Oct, fr. Jun–Apr.

Moist secondary forests, thickets; 100–800 m. Guangdong, Guangxi, Guizhou, Hainan, Jiangxi [Vietnam].

**2. *Uvaria tonkinensis*** Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 74. 1906.

东京紫玉盘 *dong jing zi yu pan*

*Melodorum subglabrum* Bân; *M. vietnamense* Bân; *M. vietnamense* var. *calcareum* Bân; *Uvaria tonkinensis* var. *subglabra* Finet & Gagnepain.

Shrubs to 6 m tall, climbing. Branchlets sparsely stellate pubescent, glabrescent. Petiole 5–10 mm; leaf blade obovate, obovate-lanceolate, oblong, or elliptic, 12–21 × 4–7 cm, papery, abaxially sparsely stellate hairy but soon glabrescent, adaxially glabrous, secondary veins 8–12 on each side of midvein, base rounded to slightly cordate, apex long to shortly acuminate or rarely acute. Inflorescences terminal or leaf-opposed, 1-flowered. Pedicel 1.5–4.5 cm, sparsely stellate hairy. Sepals broadly obovate, 3–4 mm, outside densely stellate, inside concave and glabrous. Petals purple, 1.5–1.9 × 1.5–1.9 cm; outer petals obovate, broadly ovate, or orbicular, outside densely stellate pubescent; inner petals smaller than outer petals. Stamen connectives glabrous or hairy. Carpels cylindric, stellate pubescent or with hairs only at base and apically; ovules 2 per carpel; stigmas apically entire or 2-cleft. Monocarp stipes 2.5–5 cm; monocarps purple, globose, ca. 1 cm in diam.; epicarp smooth. Fl. Feb–Sep, fr. Aug–Dec.

Thickets, open forests; 200–600 m. Guangdong, W Guangxi, Hainan, S Yunnan [Vietnam].

**3. *Uvaria kweichowensis*** P. T. Li, Acta Phytotax. Sin. 14(1): 107. 1976.

贵州紫玉盘 *gui zhou zi yu pan*

Shrubs to 5 m tall, climbing. Branchlets sparsely stellate pubescent, glabrescent, lenticellate. Petiole 5–6 mm; leaf blade obovate to elliptic, 8–18 × 3.5–8 cm, papery, glossy, glabrous except for sparsely stellate pubescent veins, secondary veins 10–14 on each side of midvein and at ca. 45° to midvein, base rounded to broadly cuneate, apex acute and mucronate. Inflorescences leaf-opposed. Flowers not seen. Monocarp stipes ca. 1 cm, stout; monocarps ovoid, ca. 5.5 × 3.5 cm, densely stellate tomentose, apex rounded; epicarp tuberculate. Fl. Aug, fr. Sep–Oct.

• Secondary forests; ca. 1000 m. W Guangxi, SW Guizhou, Yunnan.

*Uvaria kweichowensis* is listed as Endangered (EN A2c) by the

IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 6 Oct 2010).

**4. *Uvaria calamistrata*** Hance, J. Bot. 20: 77. 1882.

刺果紫玉盘 *ci guo zi yu pan*

Shrubs to 8 m tall, climbing. Branchlets sparsely stellate pubescent, glabrescent. Petiole 5–10 mm, stellate tomentose; leaf blade oblong, elliptic, or obovate-oblong, 5–17 × 2–7 cm, thinly leathery to thickly papery, abaxially densely stellate pubescent, adaxially sparsely stellate pubescent, secondary veins 8–10 on each side of midvein, base obtuse, apex long acuminate to acute. Inflorescences axillary or leaf-opposed, fasciculate, 1–4-flowered. Flowers ca. 1.8 cm in diam. Sepals ovate, ferruginous tomentose. Petals yellowish; outer petals oblong, ca. 8 × 5 mm, ± equal to or slightly larger than inner petals, pubescent. Stamen connectives apically rounded to obtuse, puberulent. Carpels 7–15, pubescent; ovules 6–9 per carpel. Monocarps red, ellipsoid, 2–3.5 × 1.5–2.5 cm; epicarp densely softly spiny. Seeds brown, compressed, 3-angular, 10–12 × 8–9 mm. Fl. May–Jul, fr. Jul–Dec.

Forests or scrub on very steep slopes; 200–800 m. Guangdong, Guangxi, Hainan [Vietnam].

The fine, strong bast fibers obtained from the inner bark of *Uvaria calamistrata* is used for cordage and sack manufacturing.

**5. *Uvaria kurzii*** (King) P. T. Li, Acta Phytotax. Sin. 14(1): 106. 1976.

黄花紫玉盘 *huang hua zi yu pan*

*Uvaria hamiltonii* J. D. Hooker var. *kurzii* King in Ridley, Mat. Fl. Malay. Penins. 1(4): 263. 1892.

Shrubs to 16 m tall, climbing, densely stellate tomentose to stellate pubescent\*throughout. Petiole ca. 5 mm; leaf blade oblong-obovate, oblong-elliptic, or obovate, 9.5–21 × 4–8.5 cm, membranous, secondary veins 13–18 on each side of midvein, base narrowly and shallowly cordate, apex acuminate, obtuse, or sometimes rounded. Inflorescences leaf-opposed, 1- or 2-flowered; bracts ovate, ca. 7 × 3.5 mm. Flowers ca. 3.5 cm in diam. Pedicel 2.5–4 cm, bracteolate at middle. Sepals broadly ovate, ca. 5 × 5–6 mm. Petals yellow to yellowish; outer petals ovate to obovate-oblong, ca. 1.6 × 1.1–1.2 cm, apex rounded; inner petals as large as outer petals. Anthers oblong, ca. 3 mm; connectives apically truncate, puberulent. Carpels oblong, ca. 4 mm; ovules 10 per carpel, in 2 series; stigmas horseshoe-shaped, apex 2-cleft. Monocarps ovoid to subglobose, 2–3 × ca. 2 cm; epicarp densely tawny brown pubescent, not spiny. Fl. May, fr. Jul–Aug.

Dense forests; 400–1300 m. Guangxi, Yunnan [India].

Material of this species has been misidentified as *Cyathostemma yunnanense*.

**6. *Uvaria grandiflora*** Roxburgh ex Hornemann, Suppl. Hort. Bot. Hafn. 141. 1819.

大花紫玉盘 *da hua zi yu pan*

*Unona grandiflora* Leschenault ex Candolle; *Uvaria platy-petala* Champion ex Benthams; *U. purpurea* Blume; *U. rhodantha* Hance.

Shrubs to 10 m tall, climbing, densely stellate pubescent to ferruginous tomentose throughout. Petiole 5–8 mm; leaf blade oblong-obovate, 7–30 × 3.5–12.5 cm, papery to thinly leathery, secondary veins 10–17(–24) on each side of midvein and at ca. 60° to midvein, base shallowly cordate, apex acute, shortly acuminate, or sometimes caudate. Inflorescences leaf-opposed, cymose, 1(–3)-flowered; bracts 2, ovate to obovate, ca. 3 × 2.5 cm. Flowers 7–10 cm in diam. Pedicel 0.5–5 cm. Sepals broadly ovate, 2–2.5 × 2.5–3.5 cm, connate for basal third, membranous, inside glabrous, apex obtuse to acute. Petals dark red to vermilion red, turning purplish with age, obovate to oval-obovate, 4–4.5 × 2.5–3.5 cm, puberulent. Stamens oblong to linear, 6–7 mm; connectives apically truncate, glabrous. Carpels oblong to linear, ca. 8 mm; ovules 30–50 per carpel, in 2 series; stigmas apically involute and 2-cleft. Monocarp stipes 1.5–3 cm; monocarps orange, cylindric, 4–6 × 1.5–2 cm, slightly constricted between seeds, fleshy, apex mucronate; epicarp not spiny, minutely tomentose. Seeds pale brown, ovoid, flattened. Fl. Mar–Nov, fr. May–Dec.

Open forests, thickets; 400–1000 m. S Guangdong, SE Guangxi, Hainan [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

**7. *Uvaria rufa* Blume, Fl. Javae, Annonaceae, 19. 1830.**

小花紫玉盘 xiao hua zi yu pan

Shrubs to 5 m tall, climbing. Branches stellate tomentose, hairs rust-colored when dry. Petiole 5–10 mm; leaf blade elliptic to ovate-oblong, 5–15 × 2.5–6 cm, thinly leathery, abaxially stellate tomentose, secondary veins ca. 12 on each side of midvein, base cordate, apex acuminate. Inflorescences leaf-opposed or extra-axillary, cymose, 1–4-flowered. Flowers ca. 1.5 cm in diam., stellate pubescent. Petals purple to dark red, ovate, 8–12 × 6–7 mm, apex rounded. Stamens oblong; connectives apically truncate, glabrous. Carpels oblong; stigmas apically 2-cleft. Monocarp stipes 1–2 cm; monocarps ovoid-ellipsoid to sometimes globose, ca. 2 × 1–1.5 cm, not constricted between seeds, apex rounded; epicarp not spiny. Fl. Mar–Jun, fr. Jun–Oct.

Sparsely forested slopes; 400–1700 m. Hainan, Yunnan [Cam-

bodia, India, Indonesia, Laos, Malaysia, Philippines, Thailand, Vietnam].

**8. *Uvaria macrophylla* Roxburgh, Fl. Ind. 2: 663. 1824.**

紫玉盘 zi yu pan

*Guatteria cordata* Dunal; *Uvaria badiiflora* Hance; *U. cordata* (Dunal) Alston (1931), not Schumacher & Thonning (1827); *U. dolichoclada* Hayata; *U. macchurei* Diels; *U. macrophylla* var. *microcarpa* (Champion ex Benth) Finet & Gagnepain; *U. microcarpa* Champion ex Benth; *U. obovatifolia* Hayata; *U. synsepala* Miquel.

Shrubs to 18 m tall, climbing, stellate pubescent throughout or stellate tomentose when young and glabrescent, hairs ferruginous in dried specimens. Petiole 5–10 mm; leaf blade obovate, oblong-obovate, elliptic, or broadly oblong, 9–30 × 3–15 cm, leathery, secondary veins 9–14(–22) on each side of midvein, abaxially elevated, and usually adaxially impressed when dry, base shallowly cordate, truncate, rounded, or rarely cuneate, apex acute, obtuse, or rounded and mostly apiculate. Inflorescences leaf-opposed or rarely extra-axillary, sometimes cymose, 1- or 2(or more)-flowered; bracts ovate to broadly elliptic, 4–7 mm. Flowers 2–3.8 cm in diam. Pedicel 0.5–4 cm. Sepals ovate to broadly ovate, 4–5 × 4–5 mm. Petals dark red, purple, or purplish, subovate to oblong-elliptic, 1.2–2 × 0.6–1.3 cm, spreading, apex rounded to obtuse. Stamens oblong, ca. 9 mm; connectives ovoid, apex puberulent or glabrous; outer stamens sterile, oblanceolate, ca. 7 mm. Carpels oblong, ca. 5 mm; stigmas horseshoe-shaped, apex 2-cleft and involute. Monocarps orange, ovoid to subterete, 1–3 × 1–1.5 cm, not constricted between seeds; epicarp not spiny, hairy or glabrous. Seeds globose, 6.5–7.5 mm in diam. Fl. Mar–Sep, fr. Jul–Mar.  $2n = 22$ .

Open forests, scrub; 400–1400 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, SE Yunnan [Bangladesh, Indonesia, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

The fine strong bast fiber obtained from the bark of *Uvaria macrophylla* is used for making sacks. The roots are used as a sedative, to stop vomiting, and for rheumatism. The leaves are used to relieve pain and to reduce swellings.

**3. CYATHOSTEMMA Griffith, Not. Pl. Asiat. 4: 707. 1854.**

杯冠木属 bei guan mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs, climbing. Inflorescences terminal, extra-axillary, or often leaf-opposed; flowers solitary or in pendulous and few-flowered cymes from branches or trunk. Flowers bisexual or unisexual, subglobose. Pedicel bracteate. Torus flattened, margins prominent. Sepals 3, valvate, connate at base, usually hirsute. Petals 6, biseriate, short, subequal or inner smaller, imbricate at apex, valvate at base remaining incurved. Stamens numerous, oblong; anthers subintrorse; connectives oblique, incurved. Carpels numerous; ovules few to numerous per carpel, in 2 series; styles cylindric, glabrous; stigma conical, 2-cleft at apex. Fruit apocarpous, pedicellate; monocarps stipitate, oblong or ovoid. Seeds several per monocarp, in 2 series.

About ten species: China, Indonesia, Malaysia, Thailand, Vietnam; one species in China.

*Cyathostemma* was included in *Uvaria* on the basis of a recent molecular study by L. L. Zhou et al. (Syst. Biodivers. 7: 249–258. 2009). This study included 25 species of *Uvaria* and seven species of *Cyathostemma* (but not *C. yunnanense*) and showed the *Cyathostemma* spp. to form two separate groups nested within *Uvaria* and separated by four species of *Uvaria*. One of us (Gilbert) believes that this shows Zhou et al. were right to transfer all species of *Cyathostemma* to *Uvaria*.

1. *Cyathostemma yunnanense* Hu, Bull. Fan Mem. Inst. Biol. 10: 121. 1940.

杯冠木 bei guan mu

*Cyathostemma vietnamense* Bân; *Uvaria yunnanensis* (Hu) L. L. Zhou, Y. C. F. Su & R. M. K. Saunders (2009), not Li (1978).

Shrubs to 5 m tall, climbing, brownish pubescent throughout, often glabrescent. Petiole 5–8 mm; leaf blade obovate, 13–20 × 4.5–9 cm, membranous to papery, secondary veins 13–15 on each side of midvein, abaxially distinctly elevated, and adaxially slightly elevated and sparsely stellate pubescent or glabrous, base rounded to shallowly cordate, apex acute to obtuse. Inflorescences axillary, cymose, several flowered. Flowers small. Pedicel 1–1.5 cm, densely stellate pubescent; bracteoles 1 or 2, oblong to obovate, 4–13 mm. Calyx cupular; sepals reni-

form, densely stellate pubescent. Petals yellowish green; outer petals broadly ovate, ca. 7 × 7 mm; inner petals ca. 6 × 5 mm. Stamens ca. 3.5 mm; connectives broadly conic, puberulent. Carpels ca. 3.5 mm, densely pubescent; ovules 4–14 per carpel, in 2 series; stigmas conic, glabrous. Fruiting pedicel 0.7–4 cm; monocarpis ellipsoid, 4–7 × 3–4 cm; epicarp tubercular and densely tomentose to glabrous. Fl. Jun–Jul, fr. Aug–Oct.

Scrub on slopes; ca. 1000 m. S Yunnan [Vietnam].

*Cyathostemma yunnanense* is known in China only from the type collection. Other Chinese records are based on misidentifications of material of *Uvaria kurzii*. *Uvaria yunnanensis* (Hu) L. L. Zhou, Y. C. F. Su & R. M. K. Saunders (Syst. Biodivers. 7: 255. 2009) appears to be a later homonym of *U. yunnanensis* Li (Pl. Fossils China: Tertiary 3: 19, pl. 24, t. 7, f. 4. 1978, not seen), based on fossil material. A new epithet would be required if *Cyathostemma* was included within *Uvaria* because of the blocking name *U. vietnamensis* Meade (2005).

#### 4. OROPHEA Blume, Bijdr. 18. 1825.

澄广花属 cheng guang hua shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Mezzettiopsis* Ridley.

Trees or erect shrubs. Leaf blade often with pellucid dots. Inflorescences axillary or superaxillary, cymose, pedunculate or sessile, 1- or several flowered. Flowers bisexual. Sepals 3, smaller than outer petals. Petals 6, in 2 whorls, free, each whorl valvate; outer petals ovate or obovate, usually smaller than inner petals (± equal in *Orophea hainanensis* and *O. laui*); inner petals with base narrowly clawed, apical limbs lozenge-shaped and cohering by margins to form a mitriform cap, apex usually acute or acuminate and sometimes extended, thickened, and recurved. Stamens 3–14; anther locules ovoid, extrorse; connectives apically acute or obtuse but not truncate. Carpels 3–15, free; ovules 1–4 per carpel; stigmas sessile or subsessile, capitate or ellipsoid. Fruit apocarpous; monocarpis shortly stipitate, usually globose or oblong, sometimes constricted between seeds. Seeds 1–4 per monocarp.

About 37 species; S and SE Asia; six species (three endemic) in China.

All the Chinese species of *Orophea* belong to *O.* subg. *Sphaerocarpon* Kessler, distinguished by carpels with 2(or 3) ovules per carpel producing globose monocarpis with hemispherical seeds. *Mezzettiopsis* is included here following Leonardia and Kessler (Blumea 46: 141–163. 2001).

- 1a. Leaf blade base oblique; petals reddish or reddish yellow.
  - 2a. Shrubs to 4 m tall; leaf blade base shallowly cordate, abaxially hirsute; carpels 3–6; monocarpis villous ..... 1. *O. hirsuta*
  - 2b. Trees to 10 m tall; leaf blade base rounded, abaxially glabrous or glabrescent; carpels 12; monocarpis glabrous ..... 2. *O. polycarpa*
- 1b. Leaf blade base equilateral; petals white, yellowish green, or greenish.
  - 3a. Leaf blade leathery; stamens 9–14; carpels hairy.
    - 4a. Secondary veins of leaves 10–15 on each side of midvein; carpels 3; inner petals ± as long as outer petals ..... 3. *O. yunnanensis*
    - 4b. Secondary veins of leaves 7–11 on each side of midvein; carpels 9–18; inner petals much longer than outer petals, tips conspicuously recurved and thickened ..... 6. *O. laui*
  - 3b. Leaf blade papery; stamens 6–9; carpels glabrous.
    - 5a. Shrubs 2–4 m tall; petioles, leaf blades abaxially, sepals, and petals outside pubescent; inner petals clearly longer than outer petals; carpels 3 ..... 4. *O. multiflora*
    - 5b. Trees 6–8 m tall; petioles, leaf blades, sepals, and petals glabrous; inner and outer petals subequal; carpels 6 ..... 5. *O. hainanensis*

1. *Orophea hirsuta* King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 61(2): 81. 1892.

毛澄广花 mao cheng guang hua

Shrubs to 4 m tall. Branchlets, petioles, leaf blades abaxially, and peduncles persistently ferruginous hispid. Petiole 1–2 mm; leaf blade elliptic to oblong, 3.5–12 × 1.5–5 cm, papery, secondary veins 7–11 on each side of midvein, base obliquely shallowly cordate, apex acuminate to acute. Inflorescences superaxillary, cymose, 1–3-flowered; peduncle 1–1.5 cm. Pedicel

ca. 4.5 mm, with 1 or 2 bracteoles at base. Sepals broadly ovate, puberulent. Petals reddish; outer petals broadly ovate, 3–4 mm, outside puberulent; inner petals ca. 8 mm, inside sparsely puberulent, basally long clawed, apically lozenge-shaped. Stamens 6. Carpels 3–6, glabrous; ovules 2 or 3 per carpel. Monocarp stipes 1–2 mm; monocarpis globose, 0.8–1.3 cm in diam., sparsely villous. Fl. Apr–Jul, fr. Jul–Dec.

Forested slopes; 300–600 m. Hainan, S Yunnan [Cambodia, India, Laos, Malaysia, Vietnam].

**2. *Orophea polycarpa*** A. Candolle, Mém. Soc. Phys. Genève 5: 215. 1832.

广西澄广花 *guang xi cheng guang hua*

*Orophea anceps* Pierre; *O. gracilis* King; *O. polycarpa* var. *anceps* (Pierre) Jovet-Ast ["Ast"]; *O. polycarpa* var. *undulata* (Pierre) Jovet-Ast ["Ast"]; *O. polycephala* Pierre; *O. undulata* Pierre.

Trees to 10 m tall. Branchlets grayish brown, pubescent when young, glabrescent. Petiole 1.5–3 mm, glabrous or glabrescent; leaf blade elliptic to oblong-elliptic, 4–10 × 1.5–4.5 cm, thickly papery, glabrous or abaxially glabrescent, secondary veins 8–10 on each side of midvein, base obliquely rounded, apex shortly acuminate to obtuse. Inflorescences axillary, 1-flowered. Flowers small. Pedicel filiform, 5–10 mm, bracteolate near base. Sepals triangular, ca. 2 × 1.5 mm, outside puberulent, inside glabrous. Petals reddish; outer petals elliptic to orbicular, 4–5 × 3–4 mm, outside puberulent, inside glabrous; inner petals rhombic, 8–9 × ca. 5 mm, glabrous, base long clawed, margin apically ciliate and revolute toward apex. Stamens 6; connectives apically conic. Carpels 12, glabrous; ovules 2 per carpel. Monocarp stipes 5–7 mm; monocarps globose, 0.5–1.9 cm in diam. Fl. Jul–Sep, fr. Aug–Nov.

Open forests; ca. 600 m. Guangxi, Hainan, SE Yunnan [Bangladesh, Cambodia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

**3. *Orophea yunnanensis*** P. T. Li, Acta Phytotax. Sin. 14(1): 106. 1976.

云南澄广花 *yun nan cheng guang hua*

Shrubs ca. 2 m tall. Bark grayish black. Branchlets glabrous. Petiole ca. 3 mm; leaf blade oblong-elliptic to oblong-ovate, 2.5–7.5 × 1–2.3 cm, leathery, glabrous except abaxially puberulent on midvein, midvein adaxially flat, secondary veins 10–15 on each side of midvein and slightly elevated on both surfaces, base attenuate to broadly cuneate, apex acuminate. Inflorescences axillary, 1- or 2-flowered. Flowers ca. 3 mm in diam. Pedicel 2–5 mm, bracteolate at base or to near middle. Sepals triangular, outside puberulent, inside glabrous. Petals greenish yellow; outer petals ovate-triangular, 2.5–3 × 1.5–2 mm, outside pubescent, inside glabrous; inner petals ± as long as outer petals. Stamens ca. 12, ovoid; connectives apically acute. Carpels 3, densely villous; ovules 3 per carpel; stigmas capitate. Fruit not seen. Fl. Apr, fr. May–Jul.

● Forested slopes; ca. 600 m. Yunnan (Jiangchuan).

*Orophea yunnanensis* is listed as Critically Endangered (CR B1ab(i,ii,v)) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 6 Oct 2010).

**4. *Orophea multiflora*** Jovet-Ast, Notul. Syst. (Paris) 9: 85. 1940.

多花澄广花 *duo hua cheng guang hua*

*Orophea chinensis* S. Z. Huang.

Shrubs to 4 m tall, erect. Bark grayish brown. Branchlets hispid when young, glabrescent. Petiole ca. 2 mm, hispid; leaf blade elliptic to oblong-elliptic, 5–9 × 2–3.5 mm, thickly pa-

pery, abaxially sparsely hispid or glabrous, adaxially glabrous, secondary veins 6–9 on each side of midvein, base rounded, apex acuminate. Inflorescences axillary, cymose, 1–3-flowered. Flowers ca. 5 mm in diam. Pedicel ca. 2 mm, hispid. Sepals ovate-triangular, 1–2 × ca. 1 mm, outside pubescent, inside glabrous. Petals greenish yellow; outer petals orbicular, ca. 3 × 2–3 mm, outside pubescent, inside glabrous; inner petals ovate-triangular, 5–8 × 2–4 mm, outside densely pubescent, inside glabrous. Stamens 9; filaments very short. Carpels 3, glabrous; ovules 2 or 3 per carpel; stigmas capitate. Monocarps globose, ca. 1 cm in diam. Fl. Mar, fr. Apr–Jun.

Forests on limestone; ca. 500 m. SW Guangxi [Vietnam].

The name *Orophea multiflora* was first published in 1938 (Fl. Indo-Chine, Suppl. 1: 121) but not validly so.

**5. *Orophea hainanensis*** Merrill, J. Arnold Arbor. 6: 132. 1925.

澄广花 *cheng guang hua*

Trees to 8 m tall. Branchlets sparsely pubescent or glabrous. Petiole 2–3 mm, glabrous or glabrescent; leaf blade elliptic to ovate, 4–9.5 × 2–4 cm, thickly papery, glabrous, secondary veins 4–7 on each side of midvein, base broadly cuneate, apex shortly acuminate to acute. Inflorescences axillary or superaxillary, usually 1–3-flowered, sparsely pubescent; peduncle 4–20 cm; bracts ciliate. Flowers 3–5 mm in diam. Pedicel 4–10 mm. Sepals ovate-triangular, 1.5–2 × 1–1.5 mm, golden pubescent, apex acute. Petals greenish white; outer petals broadly ovate to orbicular, ca. 4 × 4 mm, margin ciliate, apex acute; inner petals 7–8 mm, basal half a long and incurved claw, apex rhombic to ovate-triangular. Stamens 6; connectives apically incurved and mucronulate. Carpels 6–10, glabrous; ovules 2 per carpel; stigmas subcapitate, puberulent. Monocarp stipes 2–5 mm; monocarps globose, 7–8 mm in diam. Fl. Apr–Jul, fr. Jun–Dec.

● Dense woodlands; 400–700 m. Hainan, Guangxi.

**6. *Orophea laui*** Leonardía & Kessler, Blumea 46: 157. 2001.

蚁花 *yi hua*

Shrubs or small trees, 2.5–15 m tall. Branchlets slender, sparsely pubescent or glabrous. Petiole 3–7 mm; leaf blade oblong, narrowly oblong, or lanceolate, 5.5–19 × 2.2–7.5 cm, ± thickly papery to thinly leathery, sparsely pubescent or glabrous, midvein abaxially sometimes hispid and adaxially flat to slightly sunken, secondary veins 7–11 on each side of midvein, base cuneate, apex acute to shortly acuminate. Inflorescences axillary, cymose, 6-flowered or more, densely pubescent; peduncle 4–15 mm. Pedicel 0.9–1.2 cm, bracteolate near base. Sepals triangular to broadly ovate, 2–2.5 × ca. 2 mm, outside densely puberulent. Outer petals sepal-like, ovate, 3–4 × 3–4 mm, outside greenish white, slightly warty, and pubescent; inner petals 13–16 × 2–4 mm, slightly warty, sparsely hairy, basally clawed, limb strongly recurved and thickened. Stamens 9 in a single whorl or 12 (or 14) in 2 whorls; connectives apically rounded. Carpels 9–18, sparsely hairy, glabrescent; ovules 2–6 per carpel; stigmas capitate. Fruiting pedicel 4–9 mm, 1.5–2 mm thick; monocarp stipes 6–10 × ca. 1 mm; monocarps ca. 10, globose, 1–1.3(–2) cm in diam., glabrous. Seeds 1 or 2 per monocarp.

- Forested slopes; 400–1200 m. Hainan, S Yunnan.

This species was originally included within *Orophea creaghii* (Ridley) Leonardia & Kessler (*Mezzettiopsis creaghii* Ridley), but Leonardia and Kessler believe that the Chinese material originally iden-

tified as that species (Merrill, Lingnan Sci. J. 14: 5. 1935) is better treated as a distinct species endemic to China. *Orophea creaghii* s.s. differs by the leaves drying dark reddish brown and with shortly caudate tips and is found in Indonesia, Malaysia, and the Philippines.

## 5. MILIUSA Leschenault ex A. Candolle, Mém. Soc. Phys. Genève 5: 213. 1832.

野独活属 *ye du huo shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Saccopetalum* Bennett.

Trees or erect shrubs. Inflorescences axillary or superaxillary, fasciculate or cymose, 1-flowered. Flowers mostly bisexual. Pedicel slender, usually elongate. Torus elevated, usually long pubescent. Sepals 3, small, valvate, connate at base. Petals 6, in 2 whorls, with each whorl valvate; outer petals similar to sepals; inner petals large, erect, thin, base shallowly saccate and shortly clawed, margin initially cohering but readily free, apex usually revolute. Stamens many; connectives narrow and not concealing anther locules, apex subapiculate. Carpels many, oblong; ovules 1–8 per carpel; stigmas capitate, ovoid, or globose. Fruit apocarpous; monocarps many, subsessile to long stipitate, globose to ovoid. Seeds 1 to several per monocarp.

About 38 species: tropical and subtropical Asia and Australia; seven species (three endemic) in China.

- 1a. Leaf blade broadest above middle; ovules 1 per carpel.
  - 2a. Leaf blade apex acuminate to shortly acuminate, secondary veins obscure and 7–9 on each side of midvein; pedicel 1–1.4 cm ..... 1. *M. tenuistipitata*
  - 2b. Leaf blade apex obtuse, secondary veins raised and 12–15 on each side of midvein; pedicel 2–3 cm ..... 2. *M. cuneata*
- 1b. Leaf blade broadest at or below middle; ovules 2–8 per carpel.
  - 3a. Shrubs; leaf blade glabrous or with larger veins only sparsely puberulent and glabrescent; sepals and petals sparsely pubescent.
    - 4a. Leaf blade secondary veins 13–20 on each side of midvein; pedicel 0.5–0.7 cm, superaxillary; inner petals ca. 0.3 cm ..... 3. *M. glochidioides*
    - 4b. Leaf blade secondary veins 10–12 on each side of midvein; pedicel 4–6.5 cm, axillary; inner petals ca. 1.8 cm ..... 4. *M. balansae*
  - 3b. Trees; leaf blade abaxially pubescent or tomentose; sepals and petals pubescent or tomentose.
    - 5a. Leaf blade 5–10 cm wide, base obliquely cordate; flowers 3–6 in leaf-opposed cymes or on short and few-leaved branches; carpels glabrous ..... 5. *M. velutina*
    - 5b. Leaf blade 1.8–5 cm wide, base obtuse to rounded and slightly oblique; flowers 1–3 and axillary; carpels pubescent.
      - 6a. Pedicel 3.5–7.5 cm; outer petals as long as sepals; ovules 2 per carpel; monocarps glabrous ..... 6. *M. sinensis*
      - 6b. Pedicel 1.5–3 cm; outer petals longer than sepals; ovules 8 per carpel; monocarps puberulent ..... 7. *M. horsfieldii*

1. *Miliusa tenuistipitata* W. T. Wang, Acta Phytotax. Sin. 6: 200. 1957.

云南野独活 *yun nan ye du huo*

Trees to 12 m tall, d.b.h. to 30 cm, most parts pubescent. Petiole 1–4 mm; leaf blade obovate-elliptic to obovate-oblong, 7.5–19 × 2.8–7 cm, membranous, secondary veins 7–9 on each side of midvein and inconspicuous on both surfaces, base rounded to broadly cuneate and sometimes slightly oblique, apex acuminate to shortly acuminate. Inflorescences axillary, 1-flowered; bracts lanceolate, ca. 3 mm. Flowers ca. 1 cm. Pedicel 1–1.4 cm. Sepals ovate-oblong, ca. 4 × 1.5 mm. Outer petals 2.5–5 × ca. 2 mm; inner petals ovate, ca. 9 × 5 mm, puberulent. Stamen connectives slightly elevated. Carpels 4–8, oblong, puberulent; ovule 1 per carpel; stigmas globose, glabrous. Fruiting pedicel 1.7–3.5 cm; monocarp stipes 0.9–2.1 cm; monocarps globose, ca. 7 mm in diam., glabrous, tuberculate. Seeds 1 per monocarp. Fl. May, fr. Jun.

- Mixed forests, scrub; 700–1500 m. SE Xizang, S Yunnan.

2. *Miliusa cuneata* Craib, Bull. Misc. Inform. Kew 1912: 145. 1912.

楔叶野独活 *xie ye ye du huo*

*Miliusa bannaensis* X. L. Hou.

Trees to 6 m tall. Branchlets grayish brown, reticulately striate brown tomentose or glabrous. Petiole 3–4(–8) mm; leaf blade oblanceolate to broadly oblanceolate, 4–18(–26) × 1.5–8(–10) cm, papery, more densely pubescent on veins but sometimes glabrous, secondary veins 12–15 on each side of midvein, base cuneate to rounded, apex obtuse to bluntly acuminate. Inflorescences axillary at leafless nodes, 2–6-flowered; peduncle 1–2 mm; bracts 1 or 2, broadly ovate, 1.5–2 × 1.5–2 mm. Pedicel (1–)2–3 cm, pendulous; bracteoles 1 or 2 at base of pedicel and 1 below middle, similar to bracts, persistent. Sepals triangular to broadly lanceolate, ca. 2 mm, outside pubescent. Petals pale purple; outer petals similar to sepals, ca. 3.5 × 0.7–1 mm, pubescent; inner petals broadly lanceolate to oblong, ca. 2 × 1.3 cm, outside pubescent, inside puberulent and basally

concave. Stamens 14–16, in 2 series, ca. 1.5 mm; connectives apically shortly cuspidate. Carpels many, ellipsoid to ovoid, sparsely white pubescent; ovule 1 per carpel; stigmas terete, glabrous. Fruiting peduncle ca. 2 mm, thicker than long; monocarp stipes 0.7–1.4 cm; monocarps 8–14, drying blackish, subglobose to ellipsoid-ovoid, 7–9 × ca. 5 mm, glabrous; epicarp tuberculate, glabrous. Seed 1 per monocarp. Fl. Apr–Sep, fr. Jun–Feb.

Open forests; 500–1500 m. S Yunnan [N Thailand].

**3. *Milium glochidioides*** Handel-Mazzetti, *Sinensia* 3: 185. 1933.

广西野独活 *guang xi ye du huo*

Shrubs to 1.5 m tall. Branchlets terete, ferruginous pilose to glabrescent. Petiole to 2 mm; leaf blade elliptic to narrowly ovate-lanceolate, 3–8 × 1–3 cm, sparsely pilose to glabrescent, secondary veins 13–20 on each side of midvein, base obliquely rounded, apex shortly acuminate. Inflorescences superaxillary, 1- or 2-flowered; bracts ovate, 0.5–1 mm, sericeous. Pedicel filiform, 0.5–0.7 cm, glabrous. Sepals broadly ovate, ca. 1 mm, outside minutely strigose, inside glabrous. Outer petals as long as sepals; inner petals ovate, ca. 3.5 × 2.5 mm, outside minutely strigose, inside glabrous. Stamens ca. 20; filaments as long as anther locules; connectives broader than anther locules, subangular. Carpels ca. 10, glabrous. Fruit not seen. Fl. Jul, fr. Aug–Oct.

• Forested slopes; below 900 m. Guangxi.

The Annonaceae Checklist (Rainer & Chatrou, eds., *AnnonBase* in *Species 2010* & *ITIS Catalogue of Life*; <http://herbarium.botanik.univie.ac.at/annonaceae/listTax.php>; accessed on 1 Oct 2010) treats this species as a synonym of *Orophea polycarpa*. The short pedicels are certainly anomalous among other Chinese species of *Milium* and more typical of *Orophea*, but there are serious discrepancies in the descriptions of these two taxa within China, most notably in petal sizes and stamen numbers, such that we do not wish to follow the checklist here.

**4. *Milium balansae*** Finet & Gagnepain, *Bull. Soc. Bot. France* 53(Mém. 4): 149. 1906.

野独活 *ye du huo*

*Milium chunii* W. T. Wang; *M. filipes* Merrill & Chun (1935), not Ridley (1920).

Shrubs 2–5 m tall. Branchlets slightly pubescent. Petiole 2–3 mm; leaf blade elliptic, elliptic-oblong, or oblong, 7–15 × 2.5–4.5 cm, membranous, glabrous or sparsely puberulent on midvein and secondary veins but glabrescent, secondary veins 10–12 on each side of midvein, base cuneate to rounded and oblique, apex acuminate to shortly acuminate. Inflorescences axillary, 1-flowered. Flowers 1.3–1.6 cm in diam. Pedicel filiform, 4–6.5 cm, pendulous, glabrous. Sepals ovate, ca. 2 mm, slightly pubescent. Petals red; outer petals slightly longer than sepals; inner petals ovate, 1.2–2.5 × 0.7–1.5 cm, apex reflexed. Anthers ovoid to obovoid. Carpels oblong to lens-shaped, slightly pubescent; ovules 2 or 3 per carpel; stigmas terete, puberulent. Fruiting peduncle 4–7.5 cm, slender; monocarp stipes 1–2 cm; monocarps globose, 7–10 mm in diam. Seeds 1–3 per monocarp. Fl. Apr–Jul, fr. Jul–Dec.

Forests or scrub in valleys; 500–1800 m. Guangdong, Guangxi, Guizhou, Hainan, S Yunnan [Vietnam].

**5. *Milium velutina*** (Dunal) J. D. Hooker & Thomson, *Fl. Ind.* 1: 151. 1855.

大叶野独活 *da ye ye du huo*

*Uvaria velutina* Dunal, *Monogr. Anonac.* 91. 1817; *Guarteria velutina* (Dunal) A. Candolle; *U. villosa* Roxburgh.

Trees to 20 m tall. Branches tomentose when young. Petiole 2–7 mm, tomentose; leaf blade elliptic, ovate, or oblong, 8–15[–30] × 5–10[–16] cm, secondary veins ca. 16 on each side of midvein, base obliquely rounded to cordate, apex acute to shortly acuminate. Inflorescences leaf-opposed or on short few-leaved branches, cymose, 3–6-flowered. Peduncle 6–25 mm, tomentose; bracts minute, caducous. Pedicel 5–10 cm, slender; bracteoles similar to bracts. Torus glabrous. Sepals and outer petals ovate-triangular, 2–8 × 1.5–3.5 mm; inner petals dark brown, ovate-lanceolate to lanceolate-rhombic, ca. 10[–18] × 6[–10] mm, outside with very dense appressed golden hairs, inside glabrous. Carpels many, pubescent; ovules 2 per carpel, stigma clavate. Monocarp stipes 5–8 mm; monocarps globose to ovoid, ca. 20 × 16 mm, pilose. Fl. May, fr. Jul.  $2n = 18$ .

Forested slopes; 500–700 m. S Yunnan [Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

**6. *Milium sinensis*** Finet & Gagnepain, *Bull. Soc. Bot. France* 53(Mém. 4): 151. 1906.

中华野独活 *zhong hua ye du huo*

*Evodia lvi* H. Léveillé.

Trees to 6 m tall, most parts pubescent and densely so when young. Petiole 2–3 mm; leaf blade elliptic, oblong-elliptic, or rarely oblong, 5–13 × 2–5 cm, thinly papery to membranous, secondary veins 9–11 on each side of midvein, base obtuse to rounded and slightly oblique, apex acuminate to obtuse. Inflorescences axillary, erect to pendulous, 1-flowered; bracts 2–4, pubescent. Flowers 1–1.5 cm in diam. Pedicel 3.5–7.5 cm; bracteoles 2–4, near pedicel base. Sepals lanceolate, ca. 3 mm, apex obtuse and spreading. Outer petals as long as sepals; inner petals purplish red, ovate, 10–15 × 6–8 mm. Stamen connectives apically apiculate. Carpels ovoid, pubescent; ovules 2 per carpel; stigmas ovoid to subcapitate, glabrous. Monocarp stipes 1.3–2.1 cm, pendulous, puberulent; monocarps globose to obovoid, 7–10 × 7–8 mm, glabrous. Seeds 1 or 2 per monocarp. Fl. Apr–Sep, fr. Jul–Dec.

• Dense forests, scrub; 500–1500 m. Guangdong, Guangxi, Guizhou, S Yunnan.

**7. *Milium horsfieldii*** (Bennett) Pierre, *Fl. Forest. Cochinch.* t. 38. 1881.

囊瓣木 *nang ban mu*

*Saccopetalum horsfieldii* Bennett, *Pl. Jav. Rar.* 165. 1840; *Alphonsea prolifica* Chun & F. C. How; *Milium prolifica* (Chun & F. C. How) P. T. Li; *M. tectona* C. E. Parkinson; *S. arboreum* Elmer; *S. lineatum* Craib; *S. prolificum* (Chun & F. C. How) Tsing; *S. unguiculatum* Fischer.

Trees to 15[–35] m tall, evergreen, d.b.h. to 50 cm. Bark ochre-colored. Branches villous. Petiole ca. 2 mm, villous; leaf blade elliptic to oblong, 4–13 × 1.8–4 cm, papery, abaxially villous, adaxially sparsely pubescent but densely so on veins, secondary veins 10–14 on each side of midvein, base rounded and slightly oblique, apex acute to acuminate. Inflorescences axillary, cymose, 1–30-flowered. Pedicel 1.5–3 cm, recurved. Sepals broadly triangular, ca. 3(–10) × 1–2 mm. Petals dark red; outer petals lanceolate, ca. 7(–13) × 1–2 mm, reflexed at anthesis; inner petals ovate-lanceolate, 20–26(–40) × 5–10(–15) mm, incurved, with a conspicuous midvein. Stamens ca. 1 mm. Carpels incurved crescent, densely sericeous; ovules 8 per carpel, in 2 series; stigmas ovoid, glabrous. Monocarp stipes 1–

1.5 cm; monocarps 5–20, dark red at maturity, globose to subglobose, 1–2 cm in diam., puberulent. Seeds 2–8 per monocarp, reniform, ca. 11 × 5 mm. Fl. Mar–Jun, fr. Jul–Aug.

Dense forests, woodlands; 300–1000 m. Guangdong, Hainan [India (Andaman and Nicobar Islands), Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand; Australia].

The timber from *Miliusa horsfieldii* is straight, hard, non-splitting, and fine grained and is used for vehicle construction, agricultural implements, machinery, etc. Merrill and Chun (Sunyatsenia 2: 230. 1935) misidentified material of this species as *Alphonsea mollis* Dunn.

*Miliusa horsfieldii* is listed as Vulnerable (VU A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 6 Oct 2010, as *Saccopetalum prolificum*).

## 6. DESMOS Loureiro, Fl. Cochinch. 1: 329 [“*Desmis*”], 352. 1790.

假鹰爪属 *jia ying zhua shu*

Li Bingtao (李秉滔 Li Ping-tao); Ng Kwok Wun (吴帼媛), Richard M. K. Saunders

Shrubs, erect or scandent, rarely treelets, indument of simple hairs. Petiole short; leaf blade venation arcuately looped near margin. Inflorescences solitary, axillary, superaxillary, or leaf-opposed, 1- or 2-flowered. Flowers bisexual. Sepals 3, valvate. Petals 6, in 2 whorls; each whorl valvate, subequal or outer whorl slightly larger than inner whorl; inner whorl basally constricted around reproductive organs to form enclosed floral chamber. Stamens many; connectives apically truncate or rounded; pollen inaperturate, in monads. Carpels many, free; ovary densely hairy; ovules 1–8 per carpel; stigmas oblong or ovoid, bent, with 1 U-shaped opening and a groove continued down adaxial side of carpel. Fruit apocarpous; monocarps many, shortly stipitate, fleshy, ellipsoid when 1-seeded or moniliform (rarely only slightly so) when more than 1-seeded. Seeds subglobose or ellipsoid.

About 25–30 species: tropical and subtropical Asia; five species (two endemic) in China.

- 1a. Outer petals significantly smaller than inner petals; sepals ca. 1 mm; multi-seeded monocarps only slightly moniliform.
  - 2a. Leaf blade secondary veins 10–14 on each side of midvein; monocarps hairy ..... 4. *D. yunnanensis*
  - 2b. Leaf blade secondary veins 7–11 on each side of midvein; monocarps glabrous ..... 5. *D. saccopetaloides*
- 1b. Outer petals slightly larger than or subequal to inner petals; sepals 4–11 mm; multi-seeded monocarps distinctly moniliform.
  - 3a. Young branches densely hairy; leaf blade abaxially with erect hairs ..... 1. *D. dumosus*
  - 3b. Young branches subglabrous to hairy; leaf blade abaxially with appressed hairs.
    - 4a. Leaf blade 15–28 × 5.5–8 cm, secondary veins 12–17 on each side of midvein; inflorescences to 4-flowered; fruit pedicel 6–8 cm ..... 2. *D. grandifolius*
    - 4b. Leaf blade 6–14 × 2–6.5 cm, secondary veins 7–12 on each side of midvein; inflorescences 1-flowered; fruit pedicel 2–6 cm ..... 3. *D. chinensis*

**1. *Desmos dumosus* (Roxburgh) Safford, Bull. Torrey Bot. Club 39: 506. 1912.**

毛叶假鹰爪 *mao ye jia ying zhua*

*Unona dumosa* Roxburgh, Fl. Ind. 2: 670. 1824.

Climbers to 4 m tall, woody. Branches densely hairy when young. Petiole 5–10 mm; leaf blade obovate-elliptic to oblong, 5–16 × 2–7 cm, membranous to thinly papery, abaxially densely erect hairy, secondary veins 9–15 on each side of midvein, base shallowly cordate to truncate, apex shortly acuminate to acute. Inflorescences extra-axillary or leaf-opposed, 1-flowered. Pedicel 1–3 cm. Flowers pendulous. Sepals ovate to lanceolate, 4–11 × 2.5–6.5 mm. Outer petals ovate to obovate, 4–6.5 × 1.5–3.5 cm; inner petals ovate to lanceolate, 3–4(–6.5) × 0.5–0.8(–2) cm. Stamen connectives apically truncate to rounded. Carpels many; stigmas clavate, apex 2-cleft. Fruiting pedicel 2–4 cm; monocarp stipes 4–7 mm; monocarps ellipsoid or monili-

form, 0.8–5.5 × 0.5–0.8 cm, sparsely to densely hairy. Fl. Apr–Aug, fr. Jul–Apr.

Open forests, thickets; 500–1700 m. Guangxi, Guizhou, S Yunnan [Bhutan, India, Laos, Singapore, Thailand, Vietnam].

**2. *Desmos grandifolius* (Finet & Gagnepain) C. Y. Wu ex P. T. Li, Acta Phytotax. Sin. 14(1): 104. 1976.**

大叶假鹰爪 *da ye jia ying zhua*

*Unona desmos* Dunal var. *grandifolia* Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 81. 1906; *Desmos cochinchinensis* Loureiro var. *grandifolius* (Finet & Gagnepain) Jovet-Ast [“Ast”].

Climbers to 5 m tall, woody. Branches subglabrous to hairy when young. Petiole 5–10 mm; leaf blade oblong, 15–28 × 5.5–8 cm, papery to thinly leathery, abaxially sparsely to densely appressed hairy, secondary veins 12–17 on each side of

midvein and adaxially flattened, base shallowly cordate to truncate, apex shortly acuminate. Inflorescences fasciculate, (1-)4-flowered. Flowers pendulous. Pedicel 2.5–8 cm, puberulent, glabrescent; bracteoles near pedicel base, ovate, ca. 2.5 mm, abaxially puberulent, adaxially sparsely puberulent. Sepals ovate, 4–10 × 4–7 mm. Outer petals elliptic to lanceolate, 3.5–6 × 1.5–3 cm; inner petals lanceolate, 3–5 × 0.6–1 cm, puberulent on both surfaces. Anthers oblong, ca. 1.5 mm; connectives apically truncate to rounded. Carpels ca. 15; stigmas clavate, apex 2-cleft. Fruiting pedicel 6–8 cm; monocarp stipes ca. 1.6 cm; monocarps ellipsoid or moniliform, 1–5 × ca. 0.6 cm, hairy. Fl. Mar–Apr, fr. May–Sep.

Dense forests or thickets in valleys; 100–500 m. Guangxi, S Yunnan [Vietnam].

**3. *Desmos chinensis*** Loureiro, Fl. Cochinch. 1: 352. 1790.

假鹰爪 jia ying zhua

*Artabotrys esquirolii* H. Léveillé; *Unona chinensis* (Loureiro) Candolle; *U. discolor* Vahl.

Climbers to 4 m tall, woody. Branches stout, sparsely hairy when young, with raised grayish white lenticels. Petiole 3–8 mm; leaf blade oblong to elliptic, rarely broadly ovate, 6–14 × 2–6.5 cm, membranous to thinly papery, abaxially glaucous and sparsely appressed hairy, adaxially glossy, secondary veins 7–12 on each side of midvein, base rounded to slightly oblique, apex acute to acuminate. Inflorescences superaxillary or leaf-opposed, 1-flowered. Flowers 3–6 cm wide, pendulous. Pedicel 2–6.5 cm. Sepals ovate to lanceolate, 4–10 × 2–4.5 mm. Outer petals oblong to oblong-lanceolate, 3–6.5 × 1–2 cm; inner petals lanceolate, 4–7 × 1–2 cm. Stamen connectives apically truncate to rounded. Carpels 25–35; stigmas clavate, apex 2-cleft. Fruiting pedicel 2–6 cm; monocarp stipes 4–14 mm; monocarps ellipsoid or moniliform, 0.8–6 cm × 4–6 mm, with 2–6 joints; joints yellowish brown, subglobose, ca. 7 × 6 mm, sparsely hairy, apex of terminal obtuse to shortly rostrate. Fl. Apr–Oct, fr. Jun–Dec.  $2n = 20$ .

Wastelands and thickets in valleys; 100–1500 m. Guangdong, Guangxi, S Guizhou, Hainan, SE Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Philippines, Thailand, Vietnam].

The bast fibers of *Desmos chinensis* are used for cordage; the roots and leaves are used medicinally; and the leaves are used in brewing liquor in Hainan.

**4. *Desmos yunnanensis*** (Hu) P. T. Li, Fl. Reipubl. Popularis Sin. 30(2): 51. 1979.

云南假鹰爪 yun nan jia ying zhua

*Phaeanthus yunnanensis* Hu, Bull. Fan Mem. Inst. Biol. 10: 125. 1940; *Dasymaschalon yunnanense* (Hu) Bân.

Climbers, to 6 m tall, woody. Branches densely hairy when young. Petiole 3–8 mm; leaf blade oblong to obovate-oblong, 10–16 × 3.5–6.8 cm, membranous to thinly papery, abaxially appressed hairy, secondary veins 10–14 on each side of midvein and adaxially elevated, base rounded, apex acuminate. Inflorescences axillary, 1-flowered. Pedicel to 2.5 cm. Sepals broadly ovate, ca. 1 mm. Outer petals ovate, ca. 3 mm; inner petals ovate to obovate, ca. 2.8 × 2 cm, outside densely puberulent, inside sparsely puberulent. Stamen oblong, ca. 2 mm; connectives apically truncate. Carpels ca. 13, oblong, ca. 2 mm, glabrous, very sparsely hairy, or pilose; ovules 2–5 per carpel; stigmas globose. Monocarp stipes ca. 1 cm; monocarps slightly moniliform, to 3.5 × 0.5 cm, with 2 or 3 joints; joints cylindric to ellipsoid, pilosulose. Fl. Oct, fr. Aug.

• Mixed forests; 1000–1400 m. S Yunnan (Xishuangbanna).

The taxonomic placement of this species within *Desmos* is questionable and requires further research.

**5. *Desmos saccopetaloides*** (W. T. Wang) P. T. Li, Guihaia 13: 314. 1993.

亮花假鹰爪 liang hua jia ying zhua

*Phaeanthus saccopetaloides* W. T. Wang, Acta Phytotax. Sin. 6: 199. 1957.

Trees or woody climbers, to 6 m tall. Branches appressed ferruginous pubescent when young, glabrescent. Petiole 3.5–5 mm; leaf blade elliptic, oblong, or ovate-oblong, 5.5–13.5 × 2–4.5 cm, membranous, abaxially sparsely hairy but glabrescent, adaxially glabrous except for puberulent midvein, secondary veins 7–11 on each side of midvein, base cuneate, apex acuminate. Inflorescences leaf-opposed, 1-flowered. Pedicel 2–2.2 cm. Sepals ovate-triangular, ca. 1 × 1 mm. Outer petals ovate-triangular, ca. 4 mm; inner petals ovate-oblong to lanceolate, 2.7–3.5 × 1–1.3 cm, outside pubescent, inside densely pubescent. Stamen connectives apically truncate. Carpels ca. 12, ca. 2.2 mm, densely tomentose; ovules ca. 8 per carpel; stigmas sessile, globose. Monocarp stipes 4–6 mm; monocarps slightly moniliform, 1.8–2.7 × 1–1.2 cm, with 3–5 joints, glabrous. Fl. Aug–Sep, fr. Oct–Nov.

• Forested slopes; 1200–2300 m. S Yunnan (Xishuangbanna).

The taxonomic placement of this species within *Desmos* is questionable and requires further research.

**7. *DASYMASCHALON*** (J. D. Hooker & Thomson) Dalla Torre & Harms, Gen. Siphon. 174. 1901.

皂帽花属 zao mao hua shu

Li Bingtao (李秉滔 Li Ping-tao); Wang Jing (王静), Richard M. K. Saunders

*Unona* sect. *Dasymaschalon* J. D. Hooker & Thomson, Fl. Ind. 1: 134. 1855.

Small trees [rarely climbers], indument of simple hairs. Petiole short; leaf blade venation arcuately looped near margin. Inflorescences axillary, 1-flowered. Flowers bisexual. Sepals 3, valvate. Petals (2 or) 3, in 1 whorl alternate with sepals, valvate, apically connivent to form a mitriform dome (floral chamber) over reproductive organs and often with very small basal apertures between

petals. Stamens many; connectives apically truncate or apiculate; pollen inaperturate, in monads. Carpels many, free; ovary densely hairy; ovules 1 to many per carpel. Fruit apocarpous; monocarp stipitate, ellipsoid when 1-seeded or moniliform when more than 1-seeded, fleshy, with a terminal apiculus. Seeds 1–6 per monocarp, globose or ellipsoid.

About 30 species: tropical and subtropical Asia; six species (two endemic) in China.

*Dasymaschalon* was included within *Desmos* in FRPS (30(2): 45–53. 1979) but is supported by molecular studies and is easily distinguished morphologically by the absence of an inner whorl of petals (J. Wang et al., Syst. Bot. 34: 252–265. 2009).

- 1a. Leaf blade midvein adaxially hairy; petiole densely hairy; sepals ovate, 7–16 × 4–9 mm; fruiting pedicel densely hairy ..... 1. *D. trichophorum*
- 1b. Leaf blade midvein adaxially glabrous; petiole glabrous or sparsely hairy; sepals triangular, 1–4 × 1.5–4 mm; fruiting pedicel glabrous or sparsely hairy.
  - 2a. Leaf blade 6–8.5 cm; petiole 2.3–3.3 mm; stamen connectives apically apiculate; pollen verrucate; monocarp stipes 2.5–3 mm; seeds 5–6 mm ..... 2. *D. robinsonii*
  - 2b. Leaf blade 10.5–21.5 cm; petiole 4.4–11 mm; stamen connectives apically truncate to rounded; pollen echinate; monocarp stipes 4–18 mm; seeds 6.5–24 mm.
    - 3a. Leaf blade base slightly cordate; floral chamber ca. 20% of petal length ..... 3. *D. glaucum*
    - 3b. Leaf blade base rounded or slightly attenuate; floral chamber 50%–90% of petal length.
      - 4a. Petiole glabrous; petals ca. 7 cm; monocarps 8.5–10 mm wide; monocarp stipes ca. 1.8 cm ..... 4. *D. tibetense*
      - 4b. Petiole sparsely hairy; petals 2–4.5 cm; monocarps 4.5–8 mm wide; monocarp stipes 0.6–1.3 cm.
        - 5a. Floral chamber ca. 50% of petal length; monocarps 1.1–2 cm; seeds globose, ca. 1.3 × as long as wide ..... 5. *D. rostratum*
        - 5b. Floral chamber ca. 90% of petal length; monocarps 3–5 cm; seed ellipsoid, 3.5–6 × as long as wide ..... 6. *D. sootense*

1. *Dasymaschalon trichophorum* Merrill, Lingnan Sci. J. 6: 326. 1930.

皂帽花 zao mao hua

Trees to 3.5 m tall. Branches very densely hairy when young. Petiole 2.5–5.5 mm, densely hairy; leaf blade elliptic to obovate, 7–15 × (2.5–)4–8 cm, papery, abaxially glaucous and sparsely to densely hairy, adaxially glabrous or sparsely hairy, midvein hairy and abaxially more densely so, secondary veins 10–14 on each side of midvein and adaxially impressed, base rounded to shallowly cordate, apex acute. Flowers axillary or terminal on young growth. Pedicel 1–2 cm, densely hairy. Sepals 7–16 × 4–9 mm. Petals purplish red, triangular to ovate, 1.6–3 × 0.7–1 cm, papery, not twisted, outside densely hairy; floral chamber 4–6.5 mm, 20%–30% of petal length. Stamens 40–70 per flower; connectives apically apiculate; pollen echinate. Carpels 15–25, hispid; stigmas sparsely papillate. Fruiting pedicel 1–2.4 cm, densely hairy; monocarp stipes 3.5–6.5 mm; monocarps dark purple, subglobose when 1-seeded or moniliform when more than 1-seeded, 8.5–13 × 2.7–5.5 mm, with grayish white bristles, glabrescent, terminal apiculus 0.2–0.8 mm; joints 3–8, subglobose, 5–6 × ca. 5 mm, constrictions 1.2–2.3 mm wide, 25%–35% of monocarp width. Seeds 3–8 per monocarp, subglobose, 5.2–6 × 4.8–5 mm. Fl. Apr–Jul, fr. Jul–Dec.

● Sparsely forested slopes on sandy soil; below 100 m. Guangdong, Guangxi, Hainan.

Specimens of *Dasymaschalon trichophorum* have previously been misidentified as *D. macrocalyx* Finet & Gagnepain (*Desmos macrocalyx* (Finet & Gagnepain) P. T. Li), which does not occur in China.

2. *Dasymaschalon robinsonii* Jovet-Ast, Notul. Syst. (Paris) 9: 84. 1940.

钝叶假鹰爪 dun ye jia ying zhua

*Desmos robinsonii* (Jovet-Ast) P. T. Li.

Trees to 2 m tall. Branches sparsely hispid when young, glabrescent. Petiole 2.3–3.3 mm, sparsely hairy; leaf blade elliptic, 4–10 × 1.5–3.5 cm, thinly leathery, both surfaces glabrous, abaxially glaucous, midvein abaxially very sparsely hairy and adaxially glabrous, secondary veins 7–9(–11) on each side of midvein and adaxially impressed, base rounded to slightly cordate, apex acute, obtuse, or subrounded. Flowers axillary or subterminal on young growth. Pedicel ca. 4.5(–11) mm, very sparsely hairy. Sepals 2.7–3.7 × 2.2–2.7 mm. Petals triangular, 2.3–2.6 × ca. 0.6 cm, leathery, not twisted, outside very sparsely hairy; floral chamber ca. 1.2 cm, ca. 50% of petal length. Stamens ca. 60; connectives apically apiculate; pollen verrucate. Carpels ca. 12; stigmas densely papillate. Fruiting pedicel 6–8 mm, very sparsely hairy; monocarp stipes 2.5–3 mm; monocarps moniliform, with 3–5 subglobose joints, glabrous, ca. 4.5 mm wide, constrictions 2.5–2.9 mm wide, terminal apiculus ca. 0.8 mm. Seeds 3–5 per monocarp, subglobose, 5.3–5.8 × 4.4–4.9 mm. Fl. Apr–Jun, fr. Jun–Oct.

Open forests on limestone; ca. 600 m. Guizhou (Libo) [Vietnam].

The name *Dasymaschalon robinsonii* was first published in 1938 (Fl. Indo-Chine, Suppl. 1: 115) but not validly so.

3. *Dasymaschalon glaucum* Merrill & Chun, Sunyatsenia 2: 227. 1935.

白叶皂帽花 bai ye zao mao hua

*Dasymaschalon rostratum* Merrill & Chun var. *glaucum* (Merrill & Chun) Bân.

Trees to 8 m tall. Branches glabrous or hairy when young. Petiole 4.5–10 mm, sparsely hairy; leaf blade elliptic to obovate, 10.5–21 × 4–8 cm, leathery to subleathery, both surfaces glabrous, abaxially glaucous, midvein abaxially glabrous and

adaxially sparsely hairy, secondary veins 8–15 on each side of midvein and flush or adaxially slightly impressed, base slightly cordate, apex acuminate. Flowers on young growth. Pedicel 1.7–1.9 cm, very sparsely hairy. Sepals 2.5–3 × 2.5–3 mm. Petals purplish red, ovate, 2.6–4.2 × 0.8–1 cm, leathery, spirally twisted, outside densely hairy; floral chamber ca. 6 mm, ca. 20% of petal length. Stamens many; connectives apically truncate to rounded; pollen echinate. Carpels many; stigmas with sparse hairs. Fruiting pedicel 0.7–5.5 cm, glabrous or sparsely hairy; monocarp stipes 4–15 mm; monocarps red to brown, ellipsoid when 1-seeded or moniliform when more than 1-seeded, 1.6–5.5 cm × 5–8 mm, terminal apiculus 0.3–4 mm; constrictions 1.2–3.5 mm wide. Seeds 1–6 per monocarp, ellipsoid, 6.5–13 × 4.8–7 mm. Fl. Aug–Oct, fr. Apr–Feb.

Forested slopes on limestone or sandstone; 200–2400 m. Guangxi, Hainan [Laos, Thailand, Vietnam].

**4. *Dasymaschalon tibetense*** X. L. Hou, *Nordic J. Bot.* 23: 276. 2005.

西藏皂帽花 xi zang zao mao hua

Trees to 5 m tall. Branches glabrous or hairy when young. Petiole 0.9–1.1 cm, glabrous; leaf blade oblong, 13.5–20 × 4.5–5.5 cm, papery, both surfaces glabrous, abaxially glaucous, midvein glabrous on both surfaces, secondary veins ca. 12 on each side of midvein and adaxially flush, base slightly cuneate, apex acuminate. Flowers on young growth. Pedicel 1.2–1.5 cm, sparsely hairy. Sepals ca. 1.5 × 1.5 mm. Petals triangular, ca. 7 × 1.2 cm, leathery, not twisted, outside sparsely hairy; floral chamber ca. 5.5 mm, ca. 80% of petal length. Stamens ca. 100; connectives apically rounded; pollen echinate. Carpels not seen. Fruiting pedicel 1–2.3 cm, glabrous; monocarp stipes ca. 1.8 cm; monocarps ellipsoid when 1-seeded or moniliform when more than 1-seeded, ca. 2.1 × 1 cm, terminal apiculus ca. 0.2 mm; constrictions ca. 6 mm wide. Seeds 1 or 2 per monocarp, ellipsoid, 16–19 × ca. 10 mm. Fl. Mar–Jul, fr. Jun–Aug.

• Semi-evergreen subtropical forests; 500–1300 m. SE Xizang.

**5. *Dasymaschalon rostratum*** Merrill & Chun, *Sunyatsenia* 2: 8. 1934.

喙果皂帽花 hui guo zao mao hua

*Desmos rostratus* (Merrill & Chun) P. T. Li.

Trees to 4 m tall. Branches sparsely hairy when young. Petiole 5–10 mm, sparsely hairy; leaf blade elliptic to oblong, 13–21.5 × 3.5–7.5 cm, papery, both surfaces glabrous or very sparsely hairy, abaxially glaucous, midvein abaxially sparsely

hairy and adaxially glabrous, secondary veins 10–16 on each side of midvein and adaxially flush, base rounded to slightly attenuate, apex acute to acuminate. Flowers on young growth. Pedicel 1.2–4 cm, sparsely hairy. Sepals 2–3.5 × 1.5–3.5 mm. Petals ovate, 2–4 × 0.7–1.2 cm, leathery, generally not twisted, outside densely hairy; floral chamber 1–2 cm, ca. 50% of petal length. Stamens ca. 120; connectives apically truncate; pollen echinate. Carpels ca. 10; stigmas glabrous. Fruiting pedicel 2–5 cm, very sparsely hairy; monocarp stipes 6–13 mm; monocarps orangish red, subglobose when 1-seeded or moniliform when more than 1-seeded, 1.1–2 × 0.6–0.8 cm, terminal apiculus 2–4 mm; constrictions 2–3 mm wide. Seeds 1 or 2 per monocarp, subglobose, 8–9 × 6–7 mm. Fl. Apr–Oct, fr. Jul–Dec.

Sparsely forested slopes; 300–1000 m. ?Fujian, Guangdong, Guangxi, Hainan, SE Xizang, S Yunnan [Vietnam].

*Dasymaschalon rostratum* has been reported from Fujian (X. L. Hou & S. J. Li, *J. Trop. Subtrop. Bot.* 11: 171–173. 2003), but two of us (Wang and Saunders) believe the identity of this report is suspect and needs to be confirmed.

**6. *Dasymaschalon sootepense*** Craib, *Bull. Misc. Inform. Kew* 1912: 144. 1912.

黄花皂帽花 huang hua zao mao hua

*Desmos sootepensis* (Craib) J. F. Maxwell.

Trees to 10 m tall. Branchlets pilose, glabrous or glabrescent with age. Petiole 5–9 mm, sparsely hairy; leaf blade elliptic, 10–18 × 3–7 cm, papery, abaxially glaucous and very sparsely hairy, adaxially glabrous or very sparsely hairy, midvein abaxially sparsely hairy and adaxially glabrous, secondary veins 9–12(–18) on each side of midvein and flush or adaxially impressed, base rounded to very slightly attenuate, apex acuminate. Flowers on young growth. Pedicel 1–3 cm, sparsely hairy, bracteolate at base. Sepals broadly ovate, 1–2.5(–3) × 2.2–2.6(–3) mm. Petals yellow, ovate, 2.5–4.5 × 1.1–1.3(–2) mm, papery, not twisted, outside sparsely hairy; floral chamber to 3.7 mm, ca. 90% of petal length. Stamens ca. 140; connectives apically truncate; pollen echinate. Carpels ca. 20, oblong, ca. 3 mm; ovules 2–7 per carpel; stigmas glabrous or sparsely hairy. Fruiting pedicel 1.5–3 cm, glabrous or sparsely hairy; monocarp stipes 6–12 mm; monocarps red, ellipsoid when 1-seeded or moniliform when more than 1-seeded, 3–6 × 0.4–0.7 cm, terminal apiculus 1.5–2.5 mm; constrictions 2–2.5 mm wide. Seeds 1–4 per monocarp, ellipsoid, 17–24 × 4–5 mm. Fl. Apr–Jul, fr. Jun–Sep.

Evergreen broad-leaved forests on rocky/sandy alluvium; 600–1300 m. S Yunnan [N Thailand].

## 8. *GONIOTHALAMUS* (Blume) J. D. Hooker & Thomson, *Fl. Ind.* 1: 105. 1855.

哥纳香属 ge na xiang shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Polyalthia* sect. *Goniothalamus* Blume, *Fl. Javae, Annonaceae*, 71, 79. 1830.

Trees or erect shrubs. Petiole short; leaf blade large, secondary veins arcuately looped near margin. Inflorescences axillary or extra-axillary, 1-flowered or several flowers in fascicles. Pedicel bracteolate at base. Sepals 3, valvate. Petals 6, in 2 whorls, with each whorl valvate; outer petals flat, thick; inner petals small, base shortly clawed, apex forming a cap. Stamens many; anther locules linear or oblong, extrorse; connectives oblong or clavate, 3-angular, apex truncate or rarely rounded. Carpels many; ovules 1–10 per

carpel,  $\pm$  basal; styles elongate; stigmas entire or apex 2-lobed. Fruit apocarpous; monocarps sessile to shortly stipitate, oblong-ellipsoid or ovoid. Seeds 1–10 per monocarp.

About 130–140 species: tropical and subtropical Asia; 11 species (five endemic) in China.

A record of *Goniothalamus macrophyllus* (Blume) J. D. Hooker & Thomson from the Flora area (X. L. Hou, <http://www.abclunwen.com/lunwen-free-387606/>; accessed on 25 Nov 2010) was based on a misidentification of *Polyalthia simiarum*.

- 1a. Leaf blade margin and midvein abaxially densely rust-colored hirsute.
  - 2a. Leaf blade 56–76  $\times$  13–19 cm; monocarps 6–9  $\times$  ca. 2 cm ..... 1. *G. cheliensis*
  - 2b. Leaf blade 20–41  $\times$  5.5–11.5 cm; monocarps 2–3  $\times$  0.6–0.8 cm ..... 2. *G. donnaiensis*
- 1b. Leaf blade glabrous throughout.
  - 3a. Inflorescences 3- or 4-flowered; leaf blade abaxially grayish green; inner petals ca. 2  $\times$  as long as outer petals ..... 11. *G. laoticus*
  - 3b. Inflorescences 1- or 2-flowered; leaf blade abaxially green, sometimes drying brownish; inner petals much shorter than outer petals.
    - 4a. Leaf blade narrowly lanceolate to oblong-lanceolate.
      - 5a. Branchlets and petioles pubescent; stigmas deeply 2-cleft ..... 3. *G. chinensis*
      - 5b. Branchlets and petioles glabrous; stigmas entire or shallowly 2-cleft.
        - 6a. Ovaries pubescent; ovules 2 per carpel ..... 4. *G. gardneri*
        - 6b. Ovaries glabrous; ovules 1 per carpel ..... 5. *G. gabriacianus*
    - 4b. Leaf blade oblong, oblong-elliptic, elliptic, or obovate.
      - 7a. Leaf blade thinly papery, secondary veins adaxially flat to depressed; inflorescences 2-flowered.
        - 8a. Pedicel ca. 4 mm; styles ca. 2  $\times$  as long as ovaries; ovules basal; leaf blade secondary veins 7–9 on each side of midvein ..... 6. *G. yunnanensis*
        - 8b. Pedicel 9–15 mm; styles 1–1.5  $\times$  as long as ovaries; ovules lateral; leaf blade secondary veins 9–21 on each side of midvein ..... 7. *G. leiocarpus*
      - 7b. Leaf blade papery to leathery, secondary veins adaxially raised; inflorescences 1-flowered.
        - 9a. Petioles and monocarps pubescent to puberulent ..... 8. *G. amuyon*
        - 9b. Petioles and monocarps glabrous.
          - 10a. Flowers to 7 cm, ca. 5.5 cm in diam.; outer petals oblong-lanceolate; ovules 2 per carpel; monocarps ca. 1.5  $\times$  1.3 cm ..... 9. *G. calvicarpus*
          - 10b. Flowers to 2.5 cm, ca. 2.5 cm in diam.; outer petals broadly ovate; ovules 6 per carpel; monocarps 3–6  $\times$  2–2.5 cm ..... 10. *G. howii*

**1. *Goniothalamus cheliensis*** Hu, Bull. Fan Mem. Inst. Biol. 10: 122. 1940.

景洪哥纳香 jing hong ge na xiang

Trees to 5 m tall. Branches dark gray hispid. Petiole 2–2.5 cm, stout, rust-colored hirsute; leaf blade obovate, 56–76  $\times$  13–19 cm, papery, abaxially sparsely hispid, adaxially glabrous, midvein densely rust-colored hirsute, secondary veins 26–30 on each side of midvein and prominent on both surfaces, base cuneate, margin densely rust-colored hirsute, apex caudate with a ca. 5 cm acumen. Flowers not seen. Fruiting carpels oblong-elliptic, 6–9  $\times$  1.5–2 cm, densely rust-colored hirsute, lenticellate, acuminate on both ends. Seeds 4, oblong, ca. 2.5  $\times$  1.5 cm. Fl. Mar, fr. Apr–Sep.

• Forested slopes; ca. 1500 m. S Yunnan.

*Goniothalamus cheliensis* is listed as Endangered (EN A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 6 Oct 2010).

**2. *Goniothalamus donnaiensis*** Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 121. 1906.

田方骨 tian fang gu

Trees to 5 m tall, most parts densely rust-colored hirsute when young. Petiole 1–1.5 cm, stout; leaf blade obovate-lanceolate to oblong-lanceolate, 20–41  $\times$  5.5–11.5 cm, papery,

adaxially glabrous or hirsute along midvein, secondary veins 17–22 on each side of midvein, base cuneate, apex caudate with a 1–3 cm acumen. Flowers solitary. Pedicel short. Sepals broadly ovate, ca. 8  $\times$  6 mm, inside glabrous. Petals reddish; outer petals ovate-lanceolate to oblong-lanceolate, ca. 2.3  $\times$  0.5 cm; inner petals ovate-triangular, ca. 1.5  $\times$  0.5 cm, inside glabrous, base attenuate into a ca. 3 mm claw. Stamens oblong, ca. 2 mm; anther locule with transverse stripes; connectives apically rounded to subtruncate. Carpels cylindric-ovoid, ca. 4.5 mm, hirsute; ovules 2 per carpel, subbasal; style oblong,  $\pm$  long as ovary, glabrous. Monocarps 4–12, connate, ovate-oblong, 2–3  $\times$  0.6–0.8 cm, both ends acuminate. Seeds 1 or 2 per monocarp, yellowish, ovoid, ca. 1.5  $\times$  5 mm, ribbed at bilateral plane. Fl. May–Sep, fr. Aug–Oct.

Densely forested slopes; 200–800 m. SW Guangxi, S Guizhou, SE Yunnan [Vietnam].

The bark of *Goniothalamus donnaiensis* is used as medicine for traumatic injuries and fractures.

**3. *Goniothalamus chinensis*** Merrill & Chun, Sunyatsenia 2: 6. 1934.

哥纳香 ge na xiang

Shrubs to 4 m tall. Branchlets pubescent when young, glabrescent. Petiole 5–12 mm, robust, pubescent or glabrous; leaf blade oblong-elliptic to oblong-lanceolate, 13–30  $\times$  3–8 cm,

papery, glabrous, secondary veins 12–14 on each side of midvein, base broadly cuneate, apex shortly acuminate to obtuse. Inflorescences axillary, 1- or 2-flowered. Pedicel ca. 1 cm, with several bracteoles at base. Sepals broadly ovate, 5–6 × 5–6 mm, puberulent. Petals yellowish green; outer petals narrowly lanceolate, 2.2–3 × ca. 0.7 cm, outside puberulent; inner petals ovate, ca. 1.2 cm, apex acute to acuminate. Stamens linear-oblong, ca. 2 mm; connectives apically truncate. Carpels cylindric, brown hispid; ovules 2 per carpel; styles as long as ovary; stigmas apically 2-cleft. Monocarps shortly stipitate, oblong-ellipsoid, 10–18 × 5–6 mm, sparsely hispid to glabrescent, apex obtuse. Fl. Jul–Sep, fr. Jul–Oct.

- Forested slopes; 300–600 m. S Guangxi, Hainan.

**4. *Goniothalamus gardneri*** J. D. Hooker & Thomson, Fl. Ind. 1: 107. 1855.

长叶哥纳香 *chang ye ge na xiang*

Trees to 5 m tall, all parts glabrous. Branches brown when young, striate with age. Petiole 0.4–2 cm, swollen; leaf blade narrowly oblong-lanceolate, 10–39 × 2.5–8 cm, leathery, midvein adaxially depressed, secondary veins 14–20 on each side of midvein and inconspicuous, base cuneate, apex acuminate to acute. Inflorescences axillary, 1-flowered. Pedicel 5–10 mm, bracteolate at base. Sepals broadly ovate, ca. 1.5 × 1 cm. Petals green turning brownish yellow, leathery; outer petals oblong-lanceolate, 5–6 × 1–1.5 cm; inner petals elliptic, ca. 1.5 × 1 cm. Stamens linear but obconic when dry, ca. 1.8 mm; connectives apically flat to very slightly convex, puberulent. Carpels cylindric, pubescent; ovules 2 per carpel; styles slender; stigmas entire. Monocarps to 20, ovoid, 1–1.7 × 0.5–0.8 cm. Seeds 1 or 2 per monocarp, pale reddish brown, ovoid, slightly compressed. Fl. May–Nov, fr. Nov–Feb.

Densely forested slopes; 200–700 m. Hainan [India, Sri Lanka, Vietnam].

R. M. K. Saunders (in litt.) believes that *Goniothalamus gardneri* is endemic to Sri Lanka and that the Chinese and other material so named has been misidentified. The Sri Lankan material differs by the sparsely puberulent stems, slightly smaller sepals (0.8–1.2 cm), and shorter petals (outer 2.4 to less than 5 cm, abaxially puberulent; inner 0.9–1.4 cm).

**5. *Goniothalamus gabriacianus*** (Baillon) Jovet-Ast ["Ast"] in Lecomte, Fl. Indo-Chine, Suppl. 1: 95. 1938.

保亭哥纳香 *bao ting ge na xiang*

*Oxymitra gabriaciana* Baillon, Adansonia 10: 106. 1871; *Goniothalamus saigonensis* Pierre ex Finet & Gagnepain.

Trees to 5 m tall, glabrous except for flowers. Petiole 5–8 mm; leaf blade narrowly oblong-lanceolate, 12.5–22 × 2–4 cm, leathery, midvein adaxially depressed, secondary veins obscure, base cuneate, apex obtuse. Inflorescences axillary, 1-flowered. Pedicel short, bracteolate at base. Sepals broadly ovate, outside puberulent, inside glabrous. Petals greenish; outer petals oblong-triangular, ca. 1.2 cm, hispidulous; inner petals ovate, ca. 1 cm, outside hispidulous, inside glabrous. Stamens oblong; anther locules longitudinally striate; connectives apically subcapitate, puberulent. Carpels cylindric, glabrous; ovule 1 per carpel,

basal; styles terete; stigmas apically shallowly 2-cleft. Monocarps oblong-ellipsoid to ellipsoid, 1–1.8 × 0.5–0.8 cm, glabrous. Seed 1 per monocarp. Fl. May–Jul, fr. May–Nov.

Densely forested slopes; 300–800 m. Hainan [Cambodia, Laos, Thailand, Vietnam].

**6. *Goniothalamus yunnanensis*** W. T. Wang, Acta Phytotax. Sin. 6: 209. 1957.

云南哥纳香 *yun nan ge na xiang*

*Goniothalamus lii* X. L. Hou & Y. M. Shui.

Trees to 5 m tall. Bark brown. Branches pale brown, glabrescent. Petiole 5–13 mm, drying blackish, slightly rugose; leaf blade oblong-elliptic, oblong, or sometimes obovate-oblong, 7–23 × 2.8–7 cm, thinly papery, glabrous, secondary veins 7–15(–21) on each side of midvein and adaxially depressed to slightly raised, base broadly cuneate, apex acute to acuminate. Inflorescences axillary, sometimes from leafless nodes, 1- or 2-flowered; peduncle 1–2 mm; bracts 2–4, ovate, 1–2 mm. Pedicel (2–)4–9(–13) mm, sparsely pubescent. Sepals broadly ovate-triangular, 5–8 × 4–8 mm, outside puberulent, inside glabrous. Petals reddish yellow; outer petals broadly lanceolate, 2–2.5 × 0.7–1.3 cm, rust-colored pubescent, inside densely rust-colored tomentulose; inner petals obovate to oblong-ovate, 7–11 × 4–5 mm, connate above middle, pubescent, base attenuate to a ca. 2 mm claw. Stamens many, (1.5–)2.2–3 mm; connectives apically truncate. Carpels ca. 14, ca. 3 mm, puberulent or glabrous; ovules 2 per carpel, basal; styles ca. 2 × as long as ovaries. Monocarp stipes ca. 4 mm; monocarps 5–16, ellipsoid, 1.8–2.5 × 0.8–0.9 cm, glabrous, minutely punctate, apex shortly cuspidate. Seeds (1 or)2 per monocarp. Fl. Apr–Jun, fr. Nov.

- Forested slopes; 100–800 m. S Yunnan.

**7. *Goniothalamus leiocarpus*** (W. T. Wang) P. T. Li, Acta Phytotax. Sin. 14(1): 112. 1976.

金平哥纳香 *jin ping ge na xiang*

*Mitrephora leiocarpa* W. T. Wang, Acta Phytotax. Sin. 6: 207. 1957.

Trees to 5 m tall, glabrous except for flowers. Branches lenticellate. Petiole 6–10 mm, ca. 2 mm thick; leaf blade obovate-oblong to sometimes oblong, 6–29 × 4.5–9 cm, papery, secondary veins 9–18 on each side of midvein, base cuneate to broadly cuneate, apex shortly acuminate to acute. Inflorescences axillary, 2-flowered. Flowers ca. 1.6 cm. Pedicel ca. 1.5 cm, puberulent, bracteolate at base. Sepals broadly ovate, ca. 5 mm, outside sparsely puberulent, inside glabrous. Petals reddish yellow; outer petals ovate, 1.8–2.3 × 1.1–1.5 cm, thickly leathery, outside sparsely puberulent, inside rust-colored tomentulose, base shortly clawed, apex acute; inner petals obovate, ca. 1.3 × 0.8 cm, leathery, outside glabrous, inside pubescent, base with a ca. 3.5 mm claw, margin densely pubescent, apex acute. Stamens ca. 1.5 mm; connectives apically truncate. Carpels ca. 18, linear, ca. 4 mm, glabrous; ovules 10 per carpel, in 2 series; styles clublike, as long as ovaries. Monocarps solitary or several fasciculate, ovoid, 4–7 × 2.2–4.2 cm, glabrous. Seed 1 per monocarp, reniform, 2.5–3 × ca. 2 cm. Fl. May–Jul, fr. Aug–Nov.

- Forested slopes; 700–1600 m. S Yunnan.

**8. *Goniothalamus amuyon*** (Blanco) Merrill, Philipp. J. Sci., C, 10: 264. 1915.

台湾哥纳香 *tai wan ge na xiang*

*Uvaria amuyon* Blanco, Fl. Filip. 463. 1837; *Polyalthia sasakii* Yamamoto.

Shrubs or small trees, 2–5 m tall. Petiole 6–8 mm, sparsely pubescent; leaf blade oblong-elliptic to elliptic, 8–16 × 3–5.5 cm, papery, glabrous, abaxially with brown specks, secondary veins 8–11 on each side of midvein and adaxially slightly prominent, base broadly cuneate, apex obtuse. Inflorescences axillary. Pedicel ca. 6 mm. Sepals ovate-triangular, outside pubescent. Outer petals lanceolate, ca. 3.5 × 0.7 cm, thick, outside pubescent; inner petals ovate, smaller than outer petals. Stamens many; connectives broadly 3-angular. Carpels cylindric; ovules 1–3 per carpel; styles linear, ca. 3.5 mm. Fruiting carpels ovoid to ellipsoid, 1–1.8 × 0.6–0.9 cm. Seeds 1 or 2 per monocarp. Fl. May–Jul, fr. Jul–Oct.

Mixed woods; 300–500 m. S Taiwan [Philippines].

**9. *Goniothalamus calvicarpus*** Craib, Bull. Misc. Inform. Kew 1922: 227. 1922.

大花哥纳香 *da hua ge na xiang*

Trees to 8 m tall. Branchlets pubescent, glabrescent. Petiole 0.7–1.5 cm, robust; leaf blade oblong, 17–35 × 5.5–9 cm, papery, glabrous, midvein stout and adaxially depressed, secondary veins 14–20 on each side of midvein and slightly elevated on both surfaces, base rounded to broadly cuneate, apex obtuse to shortly acuminate. Inflorescences axillary or extra-axillary, 1-flowered. Pedicel 1–1.5 cm, glabrous, many bracteolate at base. Sepals broadly ovate, 2–2.5 cm, glabrous. Outer petals oblong-lanceolate, 5–6.5 × ca. 1.5 cm, puberulent; inner petals oblong-ovate, ca. 2 × 0.8 cm, puberulent. Stamens oblong, ca. 4 mm; connectives 3-angular. Carpels cylindric, ca. 6 mm, pubescent; ovules 2 per carpel; styles elongate; stigmas apically 2-cleft. Monocarps fasciculate, subsessile, ovoid, ca. 1.5 × 0.8 cm, puberulent. Seed 1 per monocarp. Fl. Apr–Aug, fr. Aug–Nov.

Forested slopes; 800–1500 m. S Yunnan [N Thailand].

Saunders and Chalermglin (Bot. J. Linn. Soc. 156: 359–363. 2008) regard the Chinese material identified as *Goniothalamus griffithii* J. D. Hooker & Thomson to be more correctly placed in *G. calvicarpus*, treating *G. griffithii* as a local species restricted to S Myanmar and adjacent W Thailand. The Chinese material is somewhat intermediate

between the two, and clearly the situation needs more detailed investigation.

**10. *Goniothalamus howii*** Merrill & Chun, Sunyatsenia 5: 60. 1940.

海南哥纳香 *hai nan ge na xiang*

Trees to 15 m tall, glabrous except for flowers. Petiole 7–10 mm; leaf blade oblong to sometimes elliptic, 10–25 × 4–8 cm, papery, brownish when dry, secondary veins 10–15 on each side of midvein, base cuneate to rounded, apex shortly acuminate to obtuse. Inflorescences axillary, 1-flowered. Pedicel 1–2 cm, puberulent, several bracteolate at base. Sepals broadly ovate, ca. 5 mm, outside puberulent. Petals yellowish green; outer petals broadly ovate, 2.2–2.5 × 1.6–1.8 cm, leathery, sparsely pubescent; inner petals broadly ovate to subrhomboid, 1.3–1.5 cm, thickly leathery, densely hispid. Stamens oblong; connectives orbicular. Carpels 15–18, pubescent; ovules 6 per carpel, in 1 series; styles oblong, as long as ovary; stigmas apically 2-cleft. Monocarps ovoid to cylindric-ovoid, 3–6 × 2–2.5 cm, glabrous. Fl. Mar–Sep, fr. May–Jan.

- Forested slopes; 300–800 m. Hainan, S Yunnan.

**11. *Goniothalamus laoticus*** (Finet & Gagnepain) Bân, Bot. Zhurn. (Moscow & Leningrad) 59: 554. 1974.

柄芽银钩花 *bing ya yin gou hua*

*Mitrephora laotica* Finet & Gagnepain, Bull. Soc. Bot. France 54(Mém. 5): 87. 1907.

Trees to 10 m tall, glabrous except for flowers. Branches robust. Petiole ca. 7 mm; leaf blade oblong, 13–18 × 3–5 cm, leathery, abaxially pale gray/glaucous, adaxially glossy, midvein adaxially concave, secondary and reticulate veins obscure, base attenuate, apex obtuse and shortly cuspidate. Inflorescences 3- or 4-flowered. Flowers ca. 1.2 cm. Pedicel 6–7 mm, robust, bracteolate at base. Sepals broadly ovate to suborbicular, erect, outside puberulent, inside glabrous. Outer petals lanceolate, suberect, both surfaces pubescent; inner petals obovate, ca. 2 × as long as outer petals, both surfaces pubescent, base clawed, margin ciliate. Stamens many; connectives semiorbicular, papillose. Carpels 10, cylindric, glabrous; ovules 8–10 per carpel; stigmas fusiform, papillose. Fruit not seen. Fl. Apr–Jun, fr. Jul–Oct.

Dense woods; ca. 700 m. S. Yunnan [Laos, C and N Thailand].

Weerasooriya and Saunders (Syst. Bot. 30: 262. 2005) follow Bân and exclude this species from *Mitrephora*.

## **9. MITREPHORA** J. D. Hooker & Thomson, Fl. Ind. 1: 112. 1855, not *Mitrophora* Necker ex Rafinesque (1813), nor Lévêillé (1846) [Fungi].

银钩花属 *yin gou hua shu*

Li Bingtao (李秉滔 Li Ping-tao); Aruna D. Weerasooriya, Richard M. K. Saunders

*Uvaria* sect. *Mitrephorae* Blume, Fl. Javae, Annonaceae, 13. 1830; *Kinginda* Kuntze.

Trees to 40 m tall. Petiole short; leaf blade venation arcuately looped near margin, secondary veins 4–24 on each side of midvein. Flowers terminal, leaf opposed, or extra-axillary, solitary or in cymes; sympodial rachides simple or branched, internodes short or long. Flowers bisexual, pendent. Pedicel short or long, with basal bracts and submedian bracteoles. Sepals 3, valvate, basally ±

connate. Petals 6, in 2 whorls, free, with each whorl valvate; outer petals usually smaller than inner petals, without a basal claw; inner petals with base clawed, apically connivent to form a mitriform dome. Stamens many; anthers cuneate, extrorse; connectives apically truncate. Carpels few to many, free; ovules several per carpel, in 2 series. Fruit apocarpous; monocarps sessile or stipitate, globose, obovoid, or cylindric, sometimes longitudinally ridged, smooth or rarely warty.

About 47 species: tropical and subtropical Asia; three species in China.

- 1a. Petioles and abaxial surface of leaf blades densely hairy; bracteoles  $4.5\text{--}7.5 \times 3.5\text{--}9$  mm; sepals  $5\text{--}9 \times 5\text{--}9$  mm; carpels 12–17; monocarps subglobose, without a longitudinal ridge ..... 1. *M. tomentosa*  
 1b. Petioles and abaxial surface of leaf blades subglabrous to sparsely hairy; bracteoles  $1.5\text{--}3.5 \times 1\text{--}4$  mm; sepals  $3\text{--}4 \times 3\text{--}4.5$  mm; carpels 7–10; monocarps  $\pm$  elongate, with a longitudinal ridge.  
 2a. Leaf blade secondary veins 7–9 on each side of midvein; outer petal margin never undulate; monocarp stipes  $1.4\text{--}1.8$  cm ..... 2. *M. macclurei*  
 2b. Leaf blade secondary veins 10–14 on each side of midvein; outer petal margin undulate in older flowers; monocarp stipes  $0.9\text{--}1.3$  cm ..... 3. *M. wangii*

**1. *Mitrephora tomentosa*** J. D. Hooker & Thomson, Fl. Ind. 1: 113. 1855.

银钩花 yin gou hua

*Kinginda thorelii* (Pierre) Kuntze; *K. tomentosa* (J. D. Hooker & Thomson) Kuntze; *Mitrephora bousigoniana* Pierre; *M. collinsae* Craib; *M. edwardsii* Pierre; *M. thorelii* Pierre; *M. thorelii* var. *bousigoniana* (Pierre) Finet & Gagnepain; *M. thorelii* var. *microphylla* Finet & Gagnepain; ?*M. vandiflora* Kurz.

Trees to 20 m tall. Branches densely hairy when young. Petiole 4–12.5 mm, densely hairy; leaf blade ovate, lanceolate, or rarely oblong,  $6.5\text{--}21.5 \times 3\text{--}10$  cm, leathery, abaxially densely hairy, adaxially glabrous, secondary veins (8–)14–20 on each side of midvein, base rounded to slightly cordate, apex acute to shortly acuminate. Inflorescence rachides unbranched, internodes short. Pedicel  $1.1\text{--}2.3$  cm; bracteoles  $4.5\text{--}7.5 \times 3.5\text{--}9$  mm. Sepals ovate,  $5\text{--}9 \times 5\text{--}9$  mm. Outer petals pale yellow turning dark yellow, lanceolate to oblanceolate,  $1.6\text{--}2\text{--}(3.4) \times 0.7\text{--}1.8$  cm, margin undulate on older flowers; inner petals cream to yellow with apical purple streaks,  $0.8\text{--}1.7 \times 0.7\text{--}1.3$  cm. Stamens  $1\text{--}1.3$  mm. Carpels 12–17,  $1.5\text{--}1.7$  mm; ovules 10–12 per carpel. Fruiting pedicel  $1.5\text{--}3.4$  cm; monocarp stipes  $1.6\text{--}3\text{--}(3.9)$  cm; monocarps subglobose,  $1.2\text{--}2.3 \times 0.8\text{--}2$  cm, densely hairy, smooth, without longitudinal ridge. Seeds ca.  $12 \times 8$  mm. Fl. Jan–Apr, fr. May–Sep.

Wet and dry evergreen broad-leaved forests; below 100–1200 m. W Guangxi, S Guizhou, Hainan, S Yunnan [Cambodia, India (Assam), Laos, Thailand, Vietnam].

The wood of *Mitrephora tomentosa* is used for building carts and as structural timbers. The bark is a source of saponins and is used as a soap.

**2. *Mitrephora macclurei*** Weerasooriya & R. M. K. Saunders, Syst. Bot. 30: 251. 2005.

山蕉 shan jiao

Trees to 10 m tall. Branches densely hairy when young. Petiole 6–8.5 mm, sparsely hairy; leaf blade lanceolate, (8–)10–14  $\times 3\text{--}4.5$  cm, leathery, abaxially subglabrous to sparsely hairy, adaxially glabrous, secondary veins 7–9 on each side of midvein, base broadly cuneate, apex acute. Inflorescence rachides unbranched, internodes short. Pedicel  $1.2\text{--}2$  cm; bracte-

oles  $1.5\text{--}3.5 \times 2\text{--}4$  mm. Sepals ovate,  $3\text{--}4 \times 3\text{--}3.5$  mm. Outer petals white turning yellow, elliptic to ovate,  $1.8\text{--}2.5 \times 1.1\text{--}2$  cm, margin never undulate; inner petals purple,  $1.1\text{--}1.3 \times 0.6\text{--}0.9$  cm. Stamens  $1.5\text{--}1.9$  mm. Carpels 7 or 8,  $2\text{--}2.5$  mm; ovules 8–10 per carpel. Fruiting pedicel ca.  $1.3$  cm; monocarp stipes  $1.4\text{--}1.8$  cm; monocarps obovoid, ca.  $3.8 \times 2.5$  cm, sparsely hairy, smooth, with longitudinal ridge. Seeds ca.  $1.2 \times 1$  cm. Fl. Mar–May, fr. Sep–Oct.

Riverine forests; ca. 800 m. Guangxi, S Guizhou, Hainan, S Yunnan [Laos, Malaysia (peninsular), Vietnam].

Previous workers (e.g., FRPS 30(2): 58. 1979) have confused *Mitrephora macclurei* with *M. teysmannii* Scheffer (generally under the synonym *M. maingayi* J. D. Hooker & Thomson). They are most easily distinguished by the outer petals, which in *M. teysmannii* are cream-colored with reddish streaks (becoming dark yellow with reddish brown streaks with age) and have undulate margins, whereas in *M. macclurei* the outer petals are uniformly white (becoming yellow with age) and lack undulate margins. The Chinese material corresponds to *M. macclurei*. It is cultivated in Guangdong.

**3. *Mitrephora wangii*** Hu, Bull. Fan Mem. Inst. Biol. 10: 123. 1940.

云南银钩花 yun nan yin gou hua

Trees to 10 m tall. Branches densely hairy when young. Petiole  $6.5\text{--}11.5$  mm, sparsely hairy; leaf blade oblong-lanceolate,  $10.5\text{--}24\text{--}(27) \times 3.5\text{--}8$  cm, leathery, abaxially sparsely hairy, adaxially glabrous, secondary veins 10–14 on each side of midvein, base cuneate to broadly cuneate, apex shortly acuminate to acuminate. Inflorescence rachides unbranched, internodes short. Pedicel  $1.2\text{--}1.7$  cm; bracteoles  $1.5\text{--}2 \times 1\text{--}1.5$  mm. Sepals ovate,  $3\text{--}3.5 \times 3\text{--}4.5$  mm. Outer petals white turning bright yellow, ovate,  $1.6\text{--}2.3 \times 1\text{--}1.9$  cm, margin  $\pm$  undulate on older flowers; inner petals purplish,  $1.1\text{--}1.9 \times 0.6\text{--}1.3$  cm. Stamens  $0.8\text{--}1$  mm. Carpels 8–10,  $1.8\text{--}2$  mm; ovules 6–8 per carpel. Fruiting pedicel  $1\text{--}1.6$  cm; monocarp stipes  $0.9\text{--}1.3$  cm; monocarps oblong,  $2.4\text{--}3.8 \times 1.4\text{--}2.6$  cm, sparsely hairy, smooth, with longitudinal ridge. Seeds ca.  $9 \times 6$  mm. Fl. Jan–May, fr. Jun–Sep.

Densely forested slopes; 500–1600 m. S Yunnan [N Thailand].

*Mitrephora wangii* is listed as Vulnerable (VU A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 6 Oct 2010).

## 10. PSEUDUVARIA Miquel, Fl. Ned. Ind. 1(2): 32. 1858.

金钩花属 *jin gou hua shu*

Li Bingtao (李秉滔 Li Ping-tao); Yvonne C. F. Su (许传芳), Richard M. K. Saunders

Trees to 40 m tall, dioecious, monoecious, andro-dioecious, or hermaphroditic. Petiole short or absent; leaf blade venation arcuately looped near margin. Inflorescences on young branches [rarely on trunks], rhpidial, solitary or in clusters; peduncle short [or long]; sympodial rachis internodes short [or long]. Flowers unisexual [or bisexual], pendent. Pedicel short or long, with submedian bracteoles. Sepals 3, valvate, free or basally connate, membranous. Petals 6, in 2 whorls, free, with each whorl valvate; outer petals generally shorter than inner petals, generally without basal claw, membranous; inner petals sometimes with adaxial glands, base generally clawed, apically connivent to form a mitriform dome. Male flowers: stamens [7–]46–56[–153], cuneate, extrorse, often with a ring of staminodes; connectives apically truncate. Female flowers: staminodes [0–]7–9[–20]; carpels [1–]7–14[–30], free; ovules [1–]5 or 6[–20] per carpel, in [1 or]2 series. Fruit apocarpous; monocarps shortly stipitate [or sessile], generally globose [or ellipsoid], mostly with longitudinal groove, [smooth or] rugose. Seeds smooth or rugose.

About 56 species: tropical and subtropical Asia; one species in China.

**1. *Pseuduvaria trimera*** (Craib) Y. C. F. Su & R. M. K. Saunders, Syst. Bot. Monogr. 79: 174. 2006.

金钩花 *jin gou hua*

*Mitrephora trimera* Craib, Bull. Misc. Inform. Kew 1913: 65. 1913; *Pseuduvaria indochinensis* Merrill.

Trees to 20 m tall, monoecious. Branches pale gray, densely puberulent when young, glabrescent. Petiole 3–11 mm, very densely puberulent; leaf blade obovate-elliptic to elliptic, 10–23 × 3.5–8.5 cm, thinly leathery, abaxially bluish green and glabrous, adaxially glossy and sparsely puberulent, secondary veins 10–12(–18) on each side of midvein and pubescent on both surfaces, base broadly cuneate to obtuse, apex acuminate. Inflores-

cences on young branches, in clusters of 3–6, each 1- or 2-flowered; peduncle inconspicuous; sympodial rachides short. Flowers unisexual. Pedicel 1–3 cm. Sepals ovate, 1–1.5 × 2–2.5 mm. Petals yellow; outer petals ovate, 2–3 × 1.5–3 mm; inner petals clawed-triangular, 5–8 × 3–5.5 mm, basal claw 2.5–5 mm. Male flowers: stamens 46–56. Female flowers: staminodes 7–9; carpels 7–14; ovules 5 or 6 per carpel, in 2 series. Fruiting pedicel 2–3 cm; monocarp stipes 1–1.4 cm; monocarps green, globose, 1.6–2.2 × 1.6–2.1 cm, densely puberulent. Seeds rugose. Fl. Feb–Apr, fr. Apr–Jul.

Evergreen and deciduous broad-leaved forests at base of limestone mountains; 200–700(–1500) m. S Yunnan [Myanmar, Thailand, Vietnam].

## 11. XYLOPIA Linnaeus, Syst. Nat., ed. 10, 2: 1241, 1250, 1378. 1759, nom. cons.

木瓣树属 *mu ban shu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Xylopicrum* P. Browne.

Trees [or shrubs]. Flowers axillary, solitary [or fasciculate]. Flower buds lanceolate [to subulate]. Pedicel usually short, bracteolate at apex [or base]. Sepals 3, valvate, thick, connate at base sometimes into a cup-shaped calyx. Petals 6, in 2 whorls, with each whorl valvate, connivent or scarcely open, elongated, thick, woody when dry, inside basally concave, middle narrowly convex; outer petals larger and longer than inner petals. Stamens many; anther locules oblong, extrorse, transversely septate; connectives 3-angular, apex truncate-dilated. Carpels few to many, free; ovules 2–6 per carpel, sutural; styles elongated; stigmas clavate [capitate, or oblong], extended. Fruit apocarpous; monocarps stipitate, oblong [to elongated], moniliform, often dehiscent. Seeds [1–]3–8[to many] per monocarp, ovoid; aril present but often inconspicuous.

About 160 species: Africa, America, SE Asia; one species in China.

**1. *Xylopia vielana*** Pierre, Fl. Forest. Cochinch. t. 34. 1881.

木瓣树 *mu ban shu*

Trees to 20 m tall. Branches dark brown, densely tomentulose when young, glabrescent, densely lenticellate. Petiole 4–8 mm, tomentose to glabrescent; leaf blade elliptic to ovate, 3–7 × 1.2–3 cm, papery, abaxially tomentulose, adaxially appressed pubescent, secondary veins 6 or 7 on each side of midvein, base obtuse to rounded, apex obtuse to shortly acuminate. Inflorescences axillary, 1-flowered. Flower buds lanceolate, with 3 longitudinal ribs. Flower ca. 2 × 0.5–0.8 cm, recurved. Pedicel 2–3 mm, tomentulose, bracteolate at apex. Calyx shallowly 3-

lobed; sepals broadly ovate, ca. 4 × 4 mm, outside densely tomentulose, inside glabrous. Outer petals lanceolate, ca. 15 × 3 mm, concave, thick, woody when dry, tomentulose; inner petals linear-lanceolate, ca. 14 × 2 mm, tomentulose, with adaxially elevated central rib. Stamens oblong, ca. 2.5 mm; anther locules transversely septate; connectives narrowly 3-angular, pubescent. Carpels ca. 4 mm, densely villous; styles slender; stigmas clavate, villous. Monocarp stipes ca. 1.5 cm; monocarps oblong, 2.5–3.5 × 0.8–1 cm. Seeds 3–8 per monocarp, ovoid. Fl. Mar–Jun, fr. Jun–Oct.

Forested slopes; 400–700 m. S Guangxi [Cambodia, N Thailand, Vietnam].

## 12. MEIOGYNE Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 12. 1865.

鹿茸木属 *lu rong mu shu*

Li Bingtao (李秉滔 *Li Ping-tao*); Michael G. Gilbert

Shrubs [or trees], with simple hairs. Leaves with closely spaced oblique secondary veins. Inflorescences axillary, 1–3-flowered. Flowers bisexual. Torus conic. Sepals 3, valvate, united at base. Petals 6, in 2 whorls, with each whorl valvate, flat; outer petals slightly longer than or  $\pm$  as long as inner. Stamens many; anther locules cuneate; connectives apically rhomboidal. Carpels 2–7(–12), sessile, villous; ovules several per carpel, in 2 series; stigmas sessile, subcapitate. Fruit apocarpous; monocarps 1–3[–5], usually sessile, ovoid [oblong or ellipsoid]. Seeds [several to] many per monocarp.

About nine species: S and SE Asia; one species (endemic) in China.

**1. *Meiogyne kwangtungensis*** P. T. Li, Acta Phytotax. Sin. 14(1): 104. 1976.

鹿茸木 *lu rong mu*

Shrubs to 3 m tall. Bark dark gray. Branches densely villous when young, glabrescent. Petiole 2–3 mm, villous; leaf blade oblong to elliptic, 6–18  $\times$  2.5–5.5 cm, membranous, abaxially glaucous and villous, adaxially glossy and glabrous except for pubescent midvein, midvein adaxially impressed, secondary veins ca. 10 on each side of midvein and prominent on both surfaces, base rounded to sometimes shallowly cordate, apex acuminate. Flowers axillary, reportedly light red. Fruiting pedicel much longer than monocarps. Monocarps 1–3, sessile, ovoid,

1.8–3  $\times$  1–1.5 cm, obscurely moniliform, very shallowly transversely constricted between seed, densely tomentose, base rounded, apex apiculate. Seeds 10 per monocarp, in 2 series. Fl. Jul, fr. Jul–Aug.

• Open woodland in valleys; ca. 600 m. Hainan.

Flowers are needed to confirm the generic placement of this taxon. The Annonaceae Checklist (Rainer & Chatrou, eds., AnnonBase in Species 2010 & ITIS Catalogue of Life; <http://herbarium.botanik.univie.ac.at/annonaceae/listTax.php>; accessed on 1 Oct 2010) suggests that it might be better placed within *Pseuduvaria* or *Mitrephora*. *Meiogyne kwangtungensis* is only known from the type collection, which is in fruit although the protologue does report the flower color to be light red.

## 13. CHIENIODENDRON Tsiang & P. T. Li, Acta Phytotax. Sin. 9: 374. 1964.

蕉木属 *jiao mu shu*

Li Bingtao (李秉滔 *Li Ping-tao*); Michael G. Gilbert

Trees, with simple hairs. Inflorescences axillary or superaxillary, 1- or 2-flowered. Flowers bisexual. Pedicel short, bracteolate at base. Sepals 3, valvate, connate at base. Petals 6, in 2 whorls, with each whorl valvate, subequal but inner petals narrower than outer petals, thick and fleshy to leathery when dry, inside basally concave to cucullate. Stamens many; anther locules oblong-obovoid; connectives broad and thickened, apex truncate to subtruncate. Carpels 2–12; ovules 6–10 per carpel, in 2 series; styles subsessile; stigmas large, erect, base constricted, apex entire. Fruit apocarpous; monocarps stipitate, slightly constricted between seeds, rust-colored tomentulose. Seeds many per monocarp, in 2 series.

• One species: China.

The IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 6 Oct 2010) treats the only member of this genus, *Chieniodendron hainanense* (under the name *Oncodostigma hainanense*), as Endangered (EN A2c).

Heusden (Blumea 38: 492–494. 1994) includes *Chieniodendron* within *Meiogyne*.

**1. *Chieniodendron hainanense*** (Merrill) Tsiang & P. T. Li, Acta Phytotax. Sin. 9: 375. 1964.

蕉木 *jiao mu*

*Fissistigma hainanense* Merrill, J. Arnold Arbor. 6: 131. 1925; *Desmos hainanensis* (Merrill) Merrill & Chun; *F. mac-lurei* Merrill (1923), not Merrill (1922); *Meiogyne hainanensis* (Merrill) Bân; *Oncodostigma hainanense* (Merrill) Tsiang & P. T. Li.

Trees to 16 m tall, evergreen, d.b.h. to 50 cm. Branchlets, bracteoles, pedicels, outer petals on both surfaces, inner petals outside, and fruit rust-colored pubescent. Petiole 4–5 mm, pubescent; leaf blade oblong to oblong-lanceolate, (4–)6–10(–16)  $\times$  (1.5–)2–3.5(–5) cm, thinly papery, drying brown or brownish green, glabrous except for veins, midvein adaxially impressed,

secondary veins 6–10 on each side of midvein, base rounded, apex shortly acuminate. Bracts ovate, 2–4 mm. Flowers ca. 1.5 cm in diam. Pedicel 6–7 mm; bracteoles ovate, 2–4 mm. Bud globose. Sepals ovate-triangular, 4–5 mm. Petals yellowish green; outer petals oblong-ovate, 1.4–1.7  $\times$  1–1.1 cm; inner petals slightly thicker and shorter, ca. 1.4  $\times$  0.8–0.9 cm, cucullate, inside basally concave and glabrous. Stamens ca. 2 mm. Carpels oblong, densely villous; stigmas clavate, erect, apex entire and puberulent. Monocarps to 8, shortly stipitate, ellipsoid, cylindric, or obovoid, 2–5  $\times$  2–2.5 cm, constricted between seeds, longitudinally ridged on one side. Seeds 6–10 per monocarp, pale yellowish brown, obliquely quadrate. Fl. Apr–Dec, fr. Aug–Mar.

• Dense forest in valleys; 300–600 m. S Guangxi, Hainan.

14. **POLYALTHIA** Blume, Fl. Javae, Annonaceae, 68. 1830.

暗罗属 an luo shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Trees or shrubs. Inflorescences axillary, internodal, or leaf-opposed, sessile or shortly pedunculate, 1- to many flowered. Flowers usually bisexual. Sepals 3, usually small, valvate or rarely subimbricate in bud, free. Petals 6, in 2 whorls, free, valvate or rarely subimbricate in bud, subequal, flat and spreading; inner petals sometimes slightly larger or smaller than outer, concave and arched over stamens. Stamens usually many; anther locules cuneate; connectives apically orbicular or rhomboidal, concealing anther locules, apex flat-topped or slightly convex. Carpels rather few to many, free; ovules 1 or 2(or 3) per carpel, basal or sutural; styles absent, very short, or long; stigmas mostly dilated. Fruit apocarpous; monocarps few to many, short to long stipitate, mostly globose or ovoid, fleshy. Seeds 1 or 2(or 3) per monocarp, with a longitudinal circumferential groove.

About 120 species: Old World tropics from Africa to the W Pacific, with the center of distribution in SE Asia; 17 species (six endemic, one introduced) in China.

Molecular data (Mols et al., Amer. J. Bot. 91: 590–600. 2004) have shown that *Polyalthia* as traditionally delineated is polyphyletic and will eventually have to be divided among several genera.

**Key to flowering material**

- 1a. Inner petals 0.2–1 cm.
  - 2a. Sepals 8–9 mm ..... 8. *P. cerasoides*
  - 2b. Sepals 2–2.5 mm.
    - 3a. Leaf blade leathery, glabrous; carpels at least partly hairy ..... 9. *P. littoralis*
    - 3b. Leaf blade membranous to papery, adaxially minutely hairy along midrib; carpels glabrous or pubescent.
      - 4a. Inner petals ca. 3.5 mm; carpels ca. 7, glabrous ..... 10. *P. florulenta*
      - 4b. Inner petals ca. 10 mm; carpels many, pubescent.
        - 5a. Leaf blade 5–11 × 2–4 cm, secondary veins inconspicuous; stigmas glabrous ..... 12. *P. suberosa*
        - 5b. Leaf blade 13.5–24 × 4–5 cm, secondary veins raised; stigmas villous ..... 15. *P. lancilimba*
- 1b. Inner petals (1–)1.3–9 cm.
  - 6a. Petals 6–9 cm.
    - 7a. Sepals ca. 12 mm ..... 2. *P. litseifolia*
    - 7b. Sepals 3–5 mm ..... 17. *P. liukuensis*
  - 6b. Petals (1–)1.3–5.5 cm.
    - 8a. Petals 0.6–3 cm wide.
      - 9a. Leaf blade secondary veins 24–28 on each side of midvein ..... 7. *P. pingpiensis*
      - 9b. Leaf blade secondary veins 7–18 on each side of midvein.
        - 10a. Petiole puberulent; leaf blade secondary veins 7–10 on each side of midvein; inflorescences several flowered; petals 2–3.5 × 1–1.5 cm ..... 11. *P. laui*
        - 10b. Petiole glabrous; leaf blade secondary veins 14–18 on each side of midvein; inflorescences 1-flowered; petals 3–5.5 × 1.5–3 cm ..... 16. *P. rumphii*
    - 8b. Petals 0.2–0.5 cm wide.
      - 11a. Pedicel 1–1.8 cm; petals white, 1–1.3 cm ..... 14. *P. obliqua*
      - 11b. Pedicel 2–4 cm; petals green to yellow, 1.3–3.8(–5) cm.
        - 12a. Leaf blade margin undulate, secondary veins 18–24 on each side of midvein ..... 13. *P. longifolia*
        - 12b. Leaf blade margin not undulate, secondary veins 13–20 on each side of midvein.
          - 13a. Petals densely minutely hairy, to 3.8(–5) cm ..... 4. *P. fragrans*
          - 13b. Petals glabrous or only very sparsely hairy on inside, 1.3–3.5 cm.
            - 14a. Leaf blade with pellucid dots; ovaries pubescent and with 1 basal ovule ..... 5. *P. simiarum*
            - 14b. Leaf blade without pellucid dots; ovaries glabrous and with 2 ovules.
              - 15a. Branches and leaf midvein and secondary veins pubescent; leaf blade 18–28 × 5–8.5 cm, smooth; petals ca. 3 cm ..... 6. *P. viridis*
              - 15b. Branches and leaf midvein and secondary veins glabrous; leaf blade 9–17 × 2.5–5 cm; petals ca. 1.3 cm.
                - 16a. Leaf blade membranous, densely verrucate, secondary veins 15–18 on each side of midvein, apex acuminate ..... 1. *P. verrucipes*
                - 16b. Leaf blade thinly papery, not verrucate, secondary veins 8–10 on each side of midvein, apex caudate ..... 3. *P. chinensis*

**Key to fruiting material** (not seen for *P. lancilimba*)

- 1a. Monocarps 0.5–0.8 cm, spherical. .... 8. *P. cerasoides*
- 2a. Monocarp stipes 1.5–2 cm ..... 10. *P. florulenta*
- 2b. Monocarp stipes 0.3–1 cm. .... 12. *P. suberosa*
- 3a. Monocarps to 7, stipes 3–4.5 mm ..... 14. *P. obliqua*
- 3b. Monocarps to 18, stipes 8–10 mm ..... 16. *P. rumphii*
- 1b. Monocarps 1–5 cm, globose, ovoid, or cylindric.
- 4a. Monocarps globose, densely minutely verrucate ..... 9. *P. littoralis*
- 4b. Monocarps ovoid or cylindric, smooth or more coarsely verrucose.
- 5a. Monocarps 1–1.5 cm.
- 6a. Leaf blade secondary veins 24–28 on each side of midvein, parallel ..... 7. *P. pingpiensis*
- 6b. Leaf blade secondary veins 7–13 on each side of midvein, arcuately ascending.
- 7a. Monocarp stipes 0.2–0.5 cm ..... 9. *P. littoralis*
- 7b. Monocarp stipes 1–7 cm ..... 16. *P. rumphii*
- 5b. Monocarps 1.7–5 cm.
- 8a. Young stems glabrous.
- 9a. Pedicel 0.5–0.7 cm; petals ca. 1.3 cm; monocarp stipes 0.5–0.7 cm.
- 10a. Leaf blade membranous, densely verrucate, secondary veins 15–18 on each side of midvein, apex acuminate ..... 1. *P. verrucipes*
- 10b. Leaf blade thinly papery, not verrucate, secondary veins 8–10 on each side of midvein, apex caudate ..... 3. *P. chinensis*
- 9b. Pedicel 2–3.5 cm; petals 2.2–9 cm; monocarp stipes 1–7 cm.
- 11a. Leaf blade secondary veins 10–16 on each side of midvein ..... 2. *P. litseifolia*
- 11b. Leaf blade secondary veins 8 or 9 on each side of midvein ..... 17. *P. liukuensis*
- 8b. Young stems hoary or minutely hairy.
- 12a. Monocarp stipes 1–2 cm ..... 13. *P. longifolia*
- 12b. Monocarp stipes 2.5–5 cm.
- 13a. Young branches hoary; monocarps hoary ..... 4. *P. fragrans*
- 13b. Young branches pubescent or puberulent; monocarps glabrous.
- 14a. Leaf blade with pellucid dots, membranous to papery ..... 5. *P. simiarum*
- 14b. Leaf blade without pellucid dots, thinly leathery to leathery.
- 15a. Leaf blade 18–28 cm, secondary veins pubescent ..... 6. *P. viridis*
- 15b. Leaf blade 8–20 cm, secondary veins glabrous ..... 11. *P. laui*

**1. *Polyalthia verrucipes*** C. Y. Wu ex P. T. Li, Acta Phytotax. Sin. 14(1): 110. 1976.

疣叶暗罗 you ye an luo

Trees to 12 m tall. Branches grayish black, glabrous. Petiole 3–7 mm, with transverse striations; leaf blade oblong to oblong-lanceolate, 10–17 × 2.5–5 cm, membranous, both surfaces glabrous and densely verrucate, midvein abaxially elevated and adaxially flat, secondary veins 15–18 on each side of midvein, delicate, and prominent on both surfaces, base broadly cuneate to obtuse, apex acuminate. Inflorescences axillary, 1- or 2-flowered. Pedicel 5–7 mm; bracteoles at middle and base, ovate to semiorbicular. Sepals orbicular to broadly ovate, apex rounded. Petals yellowish, linear-lanceolate, ca. 13 × 2–3 mm, membranous, glabrous; outer petals larger than inner petals. Stamens numerous; connectives slightly convex. Carpels 10–15, oblong, glabrous; ovary with 2 basal ovules; stigma ovoid. Fruiting pedicel 5–7 × ca. 3 mm; monocarp stipes 5–8 mm, verrucate; monocarps ovoid, 2–2.5 × 1–1.5 cm, glabrous. Seed 1 per monocarp, yellowish, ovoid, 18–20 × 8–11 mm. Fr. Apr–Jul.

- Densely forested slopes; 1000–1900 m. S Yunnan.

*Polyalthia verrucipes* is listed as Endangered (EN A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 7 Oct 2010).

X. L. Hou and P. T. Li (Acta Phytotax. Sin. 45: 369. 2007) included *Polyalthia chinensis* within *P. verrucipes*, but this is no longer accepted.

**2. *Polyalthia litseifolia*** C. Y. Wu ex P. T. Li, Acta Phytotax. Sin. 14(1): 110. 1976.

木姜叶暗罗 mu jiang ye an luo

Trees to 40 m tall. Bark grayish brown. Branches brown, glabrous. Petiole 6–10 mm, adaxially furrowed, glabrous, [with axillary bud at base]; leaf blade elliptic to broadly elliptic, 9–20 × 4.5–8 cm, membranous to subleathery, both surfaces glabrous and densely papillose, secondary veins 10–16 on each side of midvein, reticulate veins elevated on both surfaces, base rounded to broadly cuneate, apex shortly acuminate to obtuse. Inflorescences axillary, 1-flowered. Pedicel 2–3.5 cm, glabrous. Sepals triangular-lanceolate, ca. 12 mm, outside puberulent, inside glabrous. Petals broadly linear, 6–9 × 0.7–1.1 cm, subequal, glabrous, margin slightly revolute, with a midrib and 2–4 parallel secondary veins. Stamens many, ca. 1.5 mm; connectives apically truncate. Carpels 5 or 6, glabrous; ovules 3 per carpel; stigmas clavate, puberulent. Monocarp stipes 1–3 cm; monocarps oblong to ovoid, 3–3.5 × 2–2.5 cm, constricted between seeds, glabrous, verrucose. Seeds 3 per monocarp. Fl. Apr–Jul, fr. May–Sep.

- Sparsely forested slopes, moist valleys; ca. 600 m. S Yunnan.

*Polyalthia litseifolia* is listed as Endangered (EN A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 7 Oct 2010).

**3. *Polyalthia chinensis*** S. K. Wu & P. T. Li, Acta Phytotax. Sin. 14(1): 108. 1976.

西藏暗罗 xi zang an luo

Trees to 10 m tall. Bark grayish white. Branches gray, with many lenticellate and irregular stripes. Petiole ca. 5 mm; leaf blade oblong-elliptic to obovate-lanceolate, 9–13 × 2.5–3.8 cm, thinly papery, glabrous, adaxially glossy, secondary veins 8–10 on each side of midvein, reticulate veins abaxially slightly elevated, base cuneate to broadly cuneate, apex caudate. Inflorescences axillary, 1- or 2-flowered. Pedicel ca. 7 mm; bracteoles at middle and base, semiorbicular to ovate. Sepals broadly ovate, apex rounded. Petals green, linear, ca. 13 × 2–3 mm, subequal, membranous, flat, glabrous. Stamens many; connectives apically rounded to subtruncate. Carpels many, oblong, glabrous; stigma slightly oblique. Carpels each with 2 ovules. Fruit not seen. Fl. Aug.

• Montane forests; ca. 1000 m. SE Xizang (Mêdog).

**4. *Polyalthia fragrans*** (Dalzell) Benth. & J. D. Hooker in J. D. Hooker, Fl. Brit. India 1: 63. 1872.

伞花暗罗 san hua an luo

*Guatteria fragrans* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 206. 1851.

Trees to 18 m tall. Branches hoary when young. Petiole 1–1.8 cm; leaf blade ovate-oblong to oblong-lanceolate, 10–24 × 5–12.5 cm, membranous, abaxially minutely puberulent on major veins but glabrescent, adaxially glabrous or puberulent, secondary veins 14–16 on each side of midvein, oblique, close-set, parallel, and abaxially very prominent, reticulate veins inconspicuous, base rounded, apex rounded to long acuminate. Inflorescences in axils of fallen leaves or on woody tubercles on branches, cymose, pedunculate, few to many flowered, hoary-tomentose. Flowers fragrant. Pedicel to 2.5 cm, slender; bracteoles inserted below middle of pedicel, orbicular. Sepals orbicular, ca. 3 mm in diam., recurved at anthesis, outside densely felted puberulent. Petals greenish yellow to pale yellow, linear, 3.8(–5) × ca. 0.5 cm, subequal, densely minutely hairy. Stamens many; connectives apically truncate. Carpels many, hairy. Fruiting pedicel to 3.5 cm; monocarp stipes to 5 cm, densely pubescent; monocarps broadly ovoid, 2.5–4 cm, walls thin and brittle, surface hoary. Seed 1 per monocarp. Fl. Apr–May, fr. Jun–Aug.

Forested slopes; ca. 700 m. S Yunnan [India].

**5. *Polyalthia simiarum*** (Buchanan-Hamilton ex J. D. Hooker & Thomson) Benth. ex J. D. Hooker & Thomson in J. D. Hooker, Fl. Brit. India 1: 63. 1872.

腺叶暗罗 xian ye an luo

*Guatteria simiarum* Buchanan-Hamilton ex J. D. Hooker & Thomson, Fl. Ind. 1: 142. 1855; *Polyalthia cheliensis* Hu; *P. simiarum* subsp. *cheliensis* (Hu) Bân; *Unona simiarum* (A. Hamilton ex J. D. Hooker & Thomson) Baillon ex Pierre.

Trees to 25 m tall. Bark grayish white. Branches puberulent when young, glabrous and sparsely lenticellate with age. Petiole 5–10 mm, robust; leaf blade ovate-oblong, oblong, lanceolate, or oblanceolate, 9–28 × 3.5–12.5 cm, membranous to papery, hyalopunctate, glabrous or puberulent only on midvein, secondary veins 13–20 on each side of midvein, oblique, close-set, parallel, and prominent on both surfaces, base rounded to broadly cuneate and sometimes oblique, apex acuminate, shortly acuminate, or obtuse. Inflorescences axillary or on older or short branches, 1- to several flowered; bracts ovate, tomentulose. Pedicel ochraceous, 2.5–4 cm, tomentulose, bracteolate near base to middle. Sepals ovate-triangular, ca. 5 × 5 mm, outside pubescent, inside glabrous. Petals yellowish green; outer petals ± longer than inner petals; inner petals linear-lanceolate to linear, 1.5–3.5 × 0.3–0.4 cm, outside puberulent, inside ± glabrous. Stamens oblong; connectives apically broadly truncate to convex. Carpels oblong, pubescent; ovule 1 per carpel, basal; stigmas capitate, puberulent. Fruiting pedicel 2–3 cm; monocarp stipes 3–3.5 cm, glabrous; monocarps ovoid to ovoid-ellipsoid, 2.5–3 × 1.2–1.7 cm, glabrous. Seed 1 per monocarp. Fl. Apr–Sep, fr. Jul–Dec.  $2n = 14$ .

Forested slopes; 500–1200 m. S and SW Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, C and N Thailand, Vietnam].

The record of *Goniothalamus macrophyllus* (Blume) J. D. Hooker & Thomson from the Flora area (X. L. Hou, <http://www.abclunwen.com/lunwen-free-387606/>; accessed on 25 Nov 2010) was based on a misidentification of *Polyalthia simiarum*.

**6. *Polyalthia viridis*** Craib, Bull. Misc. Inform. Kew 1914: 4. 1914.

毛脉暗罗 mao mai an luo

Trees to 15 m tall. Branches tawny pubescent when young, gray lenticellate with age. Petiole ca. 1 cm, robust, transversely striate, tawny pubescent; leaf blade oblong to elliptic-oblong, 18–28 × 5–8.5 cm, thinly leathery, glabrous except for pubescent midvein and secondary veins, secondary veins 15–18 on each side of midvein, prominent on both surfaces and pubescent, base truncate, shallowly cordate, or sometimes rounded, apex acute. Inflorescences axillary, several flowered. Pedicel ca. 2.5 cm, pubescent. Sepals broadly ovate, 3.5–4 mm, outside pubescent, inside glabrous. Petals green, linear-oblong, ca. 3 cm × 4 mm, glabrous. Ovules 2 per carpel. Fruiting pedicel 2–7 cm, robust; monocarp stipes 3–5 cm, glabrous; monocarps oblong-ellipsoid, 2.5–4 × ca. 1.8 cm, glabrous. Seed 1 per monocarp. Fl. Apr–Jul, fr. Aug–Feb.

Densely forested slopes; 600–1100 m. S and SW Yunnan [Thailand].

**7. *Polyalthia pingpiensis*** P. T. Li, Acta Phytotax. Sin. 14(1): 110. 1976.

多脉暗罗 duo mai an luo

Trees to 10 m tall. Bark and branches grayish black, longitudinally striate. Branchlets glabrous. Petiole 1–1.5 cm, densely pubescent; leaf blade oblong to oblong-lanceolate, 7–18 × 2.5–5.5 cm, leathery, abaxially sparsely pubescent but denser along veins, adaxially glabrous except for pubescent midvein, midvein adaxially impressed, secondary veins 24–28 on each side

of midvein, closely parallel, and prominent on both surfaces, base attenuate to obtuse, apex shortly acuminate. Inflorescences axillary or terminal, 1- or 2-flowered. Flowers ca. 3 cm in diam. Pedicel ca. 2.5 cm, puberulent or glabrous. Sepals broadly ovate, ca.  $1.3 \times 1.5$  cm, outside puberulent, inside glabrous. Petals elliptic to ovate,  $2.5\text{--}3.5 \times$  ca. 1.6 cm, outside puberulent, inside glabrous; inner petals oblong,  $2.2\text{--}2.7 \times$  ca. 0.9 cm. Stamens oblong-cuneate, ca. 4 mm; connectives apically rounded, pubescent. Carpels many, oblong, ca. 2.5 mm, villous; ovule 1 per carpel, basal; stigmas capitate. Fruiting pedicel ca. 4 cm; monocarp stipes 2–4 cm, glabrous; monocarps purple, ellipsoid, ca.  $1.5 \times 1$  mm, apex mucronate. Fl. May, fr. Oct.

- Densely forested slopes; 1000–1500 m. S Yunnan.

*Polyalthia pingpiensis* is listed as Endangered (EN A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 7 Oct 2010). The epithet has been given incorrectly as “*pingpinensis*” in some standard indices.

**8. *Polyalthia cerasoides* (Roxburgh) Benth & J. D. Hooker ex Beddome**, Fl. Sylv. S. India, t. 1. 1869.

细基丸 xi ji wan

*Uvaria cerasoides* Roxburgh, Pl. Coromandel 1: 30. 1795; *Polyalthia crassipetala* Merrill.

Trees to 20 m tall. Bark grayish black. Branchlets densely pubescent, glabrescent, lenticellate with age. Petiole 2–3 mm, sparsely hispid; leaf blade oblong, oblong-lanceolate, or sometimes elliptic,  $6\text{--}19 \times 2.5\text{--}6$  cm, abaxially yellowish and pubescent, adaxially often bluish green when dry and glabrous except for minutely hairy midvein, secondary veins 7 or 8 on each side of midvein, base broadly cuneate to rounded, apex obtuse. Inflorescences axillary, 1-flowered. Flowers 1–2 cm in diam. Pedicel 1–2 cm, puberulent, with 1 or 2 leafy bracteoles below middle. Sepals oblong-ovate, 8–9 mm, outside pilose, apex acuminate. Petals green but black when dry, subequal or inner petals shorter than outer petals, oblong-ovate, 8–9 mm, thickly leathery, puberulent. Stamens cuneate; connectives apically truncate. Carpels oblong, pubescent; ovule 1 per carpel; stigmas ovoid, apex entire. Monocarp stipes 1.5–2 cm, weak; monocarps red but black when dry, ovoid to subglobose, ca. 6 mm in diam., glabrous. Fl. Mar–May, fr. Apr–Nov.  $2n = 18$ .

Sparsely forested slopes; 100–1100 m. S Guangdong, S Guangxi, Hainan, S Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

A fine strong bast fiber obtained from the inner bark of *Polyalthia cerasoides* is used to make rope and sacks. The wood is used for farming tools and structural timbers. The flowers are very fragrant and are sometimes collected as a perfume.

**9. *Polyalthia littoralis* (Blume) Boerlage** in Hasskarl, Cat. Hort. Bot. Bogor. 34. 1844.

陵水暗罗 ling shui an luo

*Guatteria littoralis* Blume, Fl. Javae, Annonaceae, 99. 1830; *Polyalthia zhui* X. L. Hou & S. J. Li.

Shrubs or small trees, to 5 m tall. Branchlets dark purple, striate, appressed grayish yellow pubescent, soon glabrous. Petiole yellowish, 3–5 mm, puberulent; leaf blade oblong to

oblong-lanceolate,  $9\text{--}19 \times 2\text{--}6$  cm, leathery, glabrous, abaxially glossy pale green, adaxially dark green, often bluish green when dry, secondary veins 8–10 on each side of midvein, at  $60^\circ\text{--}80^\circ$  to midrib, arcuately ascending, and anastomosing 3–5 mm from margin, base cuneate to rounded, apex acuminate to bluntly acute. Inflorescences leaf-opposed, 1- or 2-flowered; peduncle ca. 1 mm. Flowers 1–2 cm in diam. Pedicel to 3 mm, pubescent; bracteole 1, broadly ovate,  $1\text{--}2 \times$  ca. 2 mm, apex acuminate. Sepals triangular, ca. 2 mm, outside pubescent, apex acute. Petals white, oblong-elliptic, 6–8 mm, spreading, subequal or inner petals slightly shorter than outer petals, slightly thick, outside pubescent, apex acute to obtuse. Stamens many; connectives apically truncate, puberulent. Carpels 7–11(–30), puberulent; ovule 1 per carpel, basal; stigmas obovate, shallowly 2-cleft. Monocarp stipes 2–5 mm, puberulent; monocarps 4–7(–11), red but purplish red when dried, ovoid-ellipsoid,  $1\text{--}1.5 \times 0.8\text{--}1$  cm, glabrous, densely minutely dotted. Seed 1 per monocarp, red, ellipsoid,  $10\text{--}12 \times 6\text{--}8$  mm. Fl. Apr–Jul, fr. Jul–Feb.  $2n = 36$ .

Forested slopes, margins of wet forests, along small streams; 100–800 m. Guangdong, Guangxi, Hainan, Yunnan [Indonesia, Thailand, Vietnam].

Molecular data (Mols et al., Amer. J. Bot. 91: 598. 2004) suggest that *Polyalthia littoralis* and related species are more closely related to the genus *Marsypopetalum* Scheffer rather than *Polyalthia* s.s. “*Polyalthia caloneura*,” proposed but not validly published by X. L. Hou (<http://www.abclunwen.com/lunwen-free-387606/>; accessed on 25 Nov 2010), belongs here. *Polyalthia zhui* was based on material with immature flowers.

**10. *Polyalthia florulenta* C. Y. Wu ex P. T. Li**, Acta Phytotax. Sin. 14(1): 107. 1976.

小花暗罗 xiao hua an luo

Shrubs ca. 2 m tall. Branchlets pubescent when young, glabrescent. Petiole 2–4 mm, pubescent; leaf blade oblong-lanceolate to oblanceolate,  $5\text{--}14.5 \times 2.3\text{--}4$  cm, membranous, abaxially puberulent, adaxially glabrous except for minutely hairy midvein, secondary veins 10–13 on each side of midvein, obliquely ascending, and anastomosing near margin, base broadly cuneate, apex obtuse to acuminate. Inflorescences leaf-opposed, 1-flowered. Flowers ca. 0.4 cm in diam. Pedicel 1–10 mm, pubescent; bracteoles 2 at middle of pedicel, ovate-lanceolate, ca.  $3.5 \times 1$  mm, abaxially pubescent, adaxially glabrous. Sepals ovate, ca.  $2 \times 2$  mm, outside pubescent, inside glabrous. Petals yellowish green; outer petals ovate-lanceolate, ca.  $2.5 \times 1.5$  mm, concave, outside pubescent, inside glabrous; inner petals ovate, ca.  $3.5 \times 2$  mm, flat. Stamens cuneate, ca. 0.5 mm; connectives apically truncate, puberulent. Carpels ca. 7, oblong, ca. 0.8 mm, glabrous; ovule 1 per carpel, basal. Fruiting pedicel 1–1.5 cm; monocarp stipes 3–5 mm, pubescent; monocarps to 7, red, globose, ca. 8 mm in diam., glabrous. Fl. Dec–Feb, fr. Jun–Aug.

- Forested slopes; 1100–1400 m. S and W Yunnan.

**11. *Polyalthia laui* Merrill**, Lingnan Sci. J. 14: 5. 1935.

海南暗罗 hai nan an luo

Trees to 25 m tall, d.b.h. to 40 cm. Bark gray. Branches pubescent when young, glabrescent. Petiole 5–8 mm, trans-

versely rugosely striate, puberulent; leaf blade oblong to oblong-elliptic, 8–20 × 3.5–8 cm, thinly leathery to leathery, glabrous, adaxially shiny, secondary veins 14–18 on each side of midvein, parallel, ascending to margin, and adaxially conspicuous, base broadly cuneate to rounded, apex acuminate. Inflorescences axillary or on old branches, several flowered. Pedicel 1.5–3 cm, puberulent; bracteoles at base of pedicel, broadly ovate. Sepals broadly ovate, ca. 5 × 5 mm, outside puberulent, inside glabrous, apex obtuse to acute. Petals yellowish, oblong-ovate to ovate-lanceolate, 2–3.5 × 1–1.5 cm, outside puberulent or glabrous, inside glabrous; inner petals slightly longer than outer petals. Stamens cuneate; connectives apically obtuse. Carpels many, oblong, densely pubescent; ovule 1 per carpel, basal; stigmas capitate. Fruiting pedicel 3.5–4 cm; monocarp stipes 2.5–5 cm; monocarps red, ovoid-ellipsoid, 2.5–5 × 1–2 cm, glabrous, apex obtuse. Seed 1 per monocarp. Fl. Apr–Jul, fr. Oct–Dec.

Evergreen broad-leaved forests on slopes; 300–700 m. Hainan [Vietnam].

The wood of *Polyalthia laui* is used for making household implements and as structural timber.

**12. *Polyalthia suberosa*** (Roxburgh) Thwaites, Enum. Pl. Zeyl. 398. 1864.

暗罗 an luo

*Uvaria suberosa* Roxburgh, Pl. Coromandel 1: 31. 1795; *Guatteria suberosa* (Roxburgh) Dunal.

Shrubs or small trees, to 5 m tall. Bark corky, ridged. Branchlets dark red, rust-colored pubescent when young, glabrescent, with pink lenticels and corky ridges when older. Petiole 2–4 mm, puberulent; leaf blade oblong, elliptic-oblong, or narrowly obovate-oblong, 5–11 × 2–4 cm, membranous to papery, abaxially pale brown when dry and glabrescent, adaxially gray and glabrous except for sparse pubescence along midvein, secondary veins 8–10 on each side of midvein, spreading, and inconspicuous on both surfaces, reticulate veins lax and inconspicuous, base narrowed and slightly oblique, apex subobtuse to rounded and sometimes abruptly shortly acuminate. Inflorescences extra-axillary, leaf-opposed, or slightly below leaf, 1 (or 2)-flowered. Pedicel 0.7–2.5 cm, puberulent; bracteole near base of pedicel, minute, apex acute. Sepals ovate-triangular, 2–2.5 mm, outside pubescent, inside glabrous. Petals yellowish green; outer petals oblong-lanceolate, shorter than inner petals, leathery, flat and spreading, outside slightly pubescent, inside glabrous, apex acute; inner petals oblong, erect and curved, ca. 10 mm, apex obtuse. Stamens many, ca. 1 mm; connectives apically convex. Carpels many, ca. 2 mm, pubescent; ovules 1 or 2 per carpel; styles widening into a thickly triangular blade-like glabrous stigma. Monocarp stipes 8–10 mm, slender; monocarps to 18, red, almost spherical, ca. 5 mm in diam., sparsely appressed pubescent or glabrescent. Seeds 1 or 2 per monocarp, with a longitudinal circumferential band. Fl. almost year-round, fr. Jun–Dec.  $2n = 18$ .

Open forests at lower elevations. S Guangdong, S Guangxi, Hainan [India, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

**13. *Polyalthia longifolia*** (Sonnerat) Thwaites, Enum. Pl. Zeyl. 398. 1864.

长叶暗罗 chang ye an luo

*Uvaria longifolia* Sonnerat, Voy. Indes Orient. 2: 260. 1782; *Guatteria longifolia* (Sonnerat) Wallich; *Unona longifolia* (Sonnerat) Dunal.

Trees to 20 m tall; trunk straight. Branches finely striate, minutely puberulent when young, soon glabrous. Petiole 5–10 mm; leaf blade ovate-oblong to ovate-lanceolate, 11–31 × 2.5–8 cm, stiffly membranous to thinly leathery, glabrous, abaxially pale, adaxially dark glossy green, secondary veins 18–24 on each side of midvein, reticulate veins raised on both surfaces, base cuneate, obtuse, or rounded, margin undulate, apex acuminate. Inflorescences axillary, fasciculate and shortly pedunculate, racemose, or umbelliform and sessile, mostly many flowered; peduncle to 0.7–1.5 cm; rachis to 1 cm. Pedicel 2–4 cm; bracteole usually 1, at middle of petiole, to 1 mm, tomentulose. Sepals ovate-triangular, 1.5–3 × 1.5–1.8 mm, outside tomentulose, inside glabrous. Petals greenish yellow, narrowly triangular-lanceolate, 1.3–1.5 × 0.2–0.4 cm, subequal, spreading, inside puberulent except basally, base broad, apex acute. Stamens 8–10 cm; connectives apically convex. Carpels 20–25, ca. 1.5 mm, apex tomentulose; ovule 1 per carpel; stigmas sessile, rectangular to oblong, pubescent, with a groove on inner side and continuing down inner side of ovary. Monocarp stipes 1–2 cm; monocarps 4–8, purple, ovoid, 2–2.5 × ca. 1.5 cm, glabrous. Seed pale brown, ovoid, ca. 2 × 1.4 cm, usually with a longitudinal groove. Fl. May–Jun, fr. Jul–Sep.  $2n = 18$ .

Cultivated; 300–400 m. Hainan, Taiwan, Yunnan [native to India and Sri Lanka].

*Polyalthia longifolia* is grown for its wood and as an ornamental throughout SE Asia.

**14. *Polyalthia obliqua*** J. D. Hooker & Thomson, Fl. Ind. 1: 138. 1855.

沙煲暗罗 sha bao an luo

*Polyalthia consanguinea* Merrill.

Trees to 12 m tall. Bark dark gray. Branchlets reddish, minutely rust-colored pubescent, soon glabrous, with many lenticels when young. Petiole 3–5 mm, swollen, puberulent; leaf blade oblong-lanceolate to oblanceolate, 10–20 × 2.5–7 cm, thinly leathery to papery, abaxially dull, drying silvery green, and pubescent along midvein, adaxially glabrous and shiny, secondary veins 10–14 on each side of midvein, curving, forming a wide angle with midvein, anastomosing doubly, and adaxially flat, base narrowed and sometimes inequilateral, margin slightly revolute, apex bluntly acuminate. Inflorescences axillary, sometimes formed after leaf fall, 1–3-flowered. Pedicel 1–1.8 cm, pubescent; bracteoles 2 or 3, minute, 2 basal and other medial on pedicel. Sepals ovate-triangular, 2–3 mm, outside pubescent, inside glabrous, apex slightly obtuse. Petals white, oblong, 10–13 × 3–4.5 mm, subequal, outside pubescent, inside glabrous and rough, margins revolute, apex slightly obtuse. Stamens ca. 1 mm; connectives apically flat-topped to

convex, pubescent. Carpels ovate-oblong, ca. 1.5 mm, pubescent; ovules 2 per carpel; stigmas ovoid, pubescent. Monocarp stipes 0.7–2 cm; monocarps reddish brown, globose, 1–2 cm in diam., thinly walled, glabrous, densely minutely verrucate. Seeds 2 per monocarp, verrucose. Fl. Jan–Apr, fr. Jun–Dec.

Woodlands at middle elevations. Hainan [Malaysia].

**15. *Polyalthia lancilimba*** C. Y. Wu ex P. T. Li, *Acta Phytotax. Sin.* 14(1): 109. 1976.

剑叶暗罗 jian ye an luo

Trees. Bark gray. Branchlets puberulent, glabrescent. Petiole 2–3 mm, pubescent; leaf blade oblong-lanceolate to oblanceolate, 13.5–24 × 4–5 cm, papery, abaxially pubescent along midvein, adaxially glabrous, secondary veins 10–13 on each side of midvein, adaxially flat, base broadly cuneate, apex acuminate to shortly acuminate. Inflorescences axillary, 1- or 2-flowered; peduncle short. Pedicel 5–10 mm, pubescent, bracteolate at base. Sepals broadly ovate, ca. 2 × 3 mm, outside puberulent, inside glabrous. Petals oblong, 6–10 × 2.5–4 mm, all similar and almost equal in length, leathery, outside pubescent, inside glabrous, apex obtuse. Stamens ovate-cuneate; connectives apically broadly truncate, puberulent. Carpels many, ovate-oblong, villous; ovules 2 per carpel, sutural; stigmas sessile, capitate, villous. Fruit not seen. Fl. Apr–May, fr. Jun–Aug.

• Forested slopes; ca. 200 m. SE Yunnan (Hekou).

*Polyalthia lancilimba* is listed as Critically Endangered (CR B1ab(i,ii,v)) by the *IUCN Red List of Threatened Species* (Version 2010.3; <http://www.iucnredlist.org>; accessed on 7 Oct 2010).

**16. *Polyalthia rumphii*** (Blume ex Henschel) Merrill, *Enum. Philipp. Fl. Pl.* 2: 162. 1923.

香花暗罗 xiang hua an luo

*Guatteria rumphii* Blume ex Henschel, *Vita Rumphii*, 153. 1833; *G. jenkinsii* J. D. Hooker & Thomson; *Polyalthia jenkinsii* (J. D. Hooker & Thomson) J. D. Hooker & Thomson.

Trees to 15 m tall. Branches minutely rust-colored pubescent when young, soon glabrous. Petiole 5–12 mm, glabrous; leaf blade oblong-lanceolate, 10–17 × 3–7 cm, papery to leathery, glabrous; adaxially shiny dark green, secondary veins 7–10 on each side of midvein and prominent on both surfaces, base cuneate to rounded and sometimes oblique, apex acuminate. Inflorescences axillary, 1-flowered. Flowers 4–7 cm in diam. Pedicel 1–2 cm, appressed pubescent. Sepals subovate to triangular, 6–15 × 3–8 mm, outside puberulent, apex acute. Petals greenish to yellowish, elliptic, oblong-elliptic, or oblong, 3–5.5 × 1.5–3 cm, thin, puberulent or glabrous, apex obtuse; inner petals slightly shorter than outer petals. Stamens oblong; connectives apically broadly rounded, concealing anther cells. Carpels many, oblong, pubescent; ovule 1 per carpel, basal; stigmas clavate to capitate. Fruiting pedicel ca. 2 cm × 2 mm; monocarp stipes 5–10 × ca. 1 mm, glabrous; monocarps many, ellipsoid, ca. 10 × 5 mm, base rounded, apex acute. Fl. May–Oct, fr. Jul–Apr.  $2n = 18$ .

Forested slopes at lower to middle elevations. Hainan [Indonesia, Malaysia, Philippines, Thailand].

**17. *Polyalthia liukiensis*** Hatusima, *J. Geobot.* 26: 86. 1979.

琉球暗罗 liu qiu an luo

Trees to 12 m tall. Branches dark brown, longitudinally reticulately striate when dried, glabrous. Petiole dark; leaf blade oblong-elliptic, 14–17 × 7–9 cm, thinly leathery, glabrous, midvein abaxially raised and adaxially flat, secondary veins 8 or 9, at ca. 45° to midrib, and then arcuately ascending, reticulate veins elevated on both surfaces, base rounded, apex acuminate. Inflorescences axillary, 1–6-flowered; peduncle 1–1.5 cm. Pedicel 2–3 cm, glabrous or sparsely shortly hairy. Sepals rounded-triangular, 3–5 mm. Petals green to yellowish green, narrowly lanceolate, 6–7 cm, subequal. Fruiting peduncle ca. 2 × 0.5 cm; pedicel 2.5–3 cm; monocarps black when mature, ellipsoid, 1.7–2.5 × 1.5–2 cm, longitudinally 2-grooved. Fl. Aug.  $2n = 18$ .

Thickets on coral limestone at low elevations. Taiwan (Lan Yu [Japan (Ryukyu Islands)]).

## 15. TRIVALVARIA (Miquel) Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 2: 19. 1865.

海岛木属 hai dao mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Guatteria* sect. *Trivalvaria* Miquel, *Fl. Ned. Ind., Eerste Bijv.* 381. 1861.

Shrubs or small trees, indument of simple hairs, sometimes absent. Inflorescences extra-axillary or sometimes leaf-opposed, sometimes fasciculate on woody axes; flowers solitary or paired. Flowers polygamous or bisexual. Flower buds very broadly ovoid to cylindrical. Sepals 3, small, imbricate, free or united at base. Petals 6, in 2 whorls, unequal, each whorl minutely imbricate or valvate, outer petals spreading, inner petals larger, spreading or connivent and concave. Male flowers: torus conical, broadly conical-ovoid, or cylindrical; stamens many; connective apex shieldlike to tongue-shaped, minutely pubescent or glabrous. “Female” flowers: stamens few; carpels many, densely hairy; ovule 1, basal. Styles absent; stigmas ± globose. Bisexual flowers: torus cylindrical; stamens and carpels many. Fruit apocarpous; monocarps 2 to > 20, shortly stipitate, ellipsoid to oblong or ovoid, thin walled, glabrous or pubescent. Seeds solitary, ellipsoid to oblong, smooth, shiny, with circumferential, longitudinal groove.

Four species: Bangladesh, China, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam; one species in China.

*Trivalvaria* has not been recognized for China in previous Flora accounts, but see Heusden (*Nordic J. Bot.* 17: 169–180. 1997).

**1. *Trivalvaria costata*** (J. D. Hooker & Thomson) I. M. Turner, Kew Bull. 64: 577. 2009.

海島木 hai dao mu

*Guatteria costata* J. D. Hooker & Thomson, Fl. Ind. 1: 143. 1855; *Ellipeia costata* (J. D. Hooker & Thomson) King; *Polyalthia costata* (J. D. Hooker & Thomson) J. D. Hooker & Thomson; *P. nemoralis* Aug. Candolle; *P. oligogyna* Merrill & Chun.

Shrubs or small trees, to 5 m tall. Branches densely to very sparsely pubescent when young, glabrescent. Petiole 2–10 mm, densely pubescent to glabrous; leaf blade obovate to elliptic to (ovate-)oblong, 6–25 × 2–9 cm, membranous to thinly leathery, abaxially sparsely to densely pubescent, adaxially glabrous or rarely pubescent, base cuneate to ± rounded, apex acuminate to caudate, sometimes rounded, midvein adaxially impressed, lateral veins adaxially faint to indistinct. Inflorescences extra-axillary or sometimes ± leaf-opposed, rarely from old branches, often on woody axis with scars of previous flowers, 1- or 2-flowered; bracts 1 or 2, triangular to ovate, 1.5–3(–5) mm. Flowers polygamous (male and bisexual). Pedicel 2–5(–8) mm, pubescent. Buds 2.5–5(–8) mm. Sepals triangular to very broadly ovate, 2–3.5 × 1.5–4 mm, outside densely pubescent, apex acuminate to rounded. Petals white to dirty pale yellow, minute

ly imbricate, (ob)lanceolate, narrowly ovate to broadly triangular, 2–8(–12) × 1–4.5 mm, spreading outside pubescent, inside glabrous; inner petals obovate to lanceolate, 4–12 × 1–4 mm, apex rounded to bluntly acute. Male flowers: torus conical; stamens many, 1.3–2.6 mm; connective apex shieldlike, sometimes tongue-shaped on outer stamens, glabrous or densely puberulent. Bisexual flowers: torus cylindrical; stamens many; carpels 2–10, densely hairy; stigma pubescent. Fruiting pedicel 3–5(–8) mm; monocarp stipes 1–6 mm; monocarps to 5, sometimes glaucous, ripening red, ellipsoid to oblong, 10–28 × 5–11 mm, sparsely pubescent, verruculose, with circumferential longitudinal groove.

Hainan [India (Andaman Islands), Laos, Malaysia, Myanmar, Thailand, Vietnam].

The Chinese material of *Trivalvaria costata* was included within *Polyalthia nemoralis* (as the synonym *P. oligogyna*) in FRPS (30(2): 87. 1979). "*Polyalthia dubia*" (Kurz, Rep. Veg. Andaman Isl. 29. 1870) belongs here but is a nomen nudum and was therefore not validly published (*Vienna Code*, Art. 32.1(d)); as a result, "*P. dubia* var. *glabriuscula*" (Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 43(2): 53. 1874) was also not validly published (Art. 43.1). *Popowia kurzii* King (J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 61(2): 96. 1892) was also applied to this species, but that name was nomenclaturally superfluous (and is therefore illegitimate: Art. 52.1), because the earlier name *Guatteria macrophylla* Blume was cited as a synonym in the protologue.

## 16. DISEPALUM J. D. Hooker, Trans. Linn. Soc. London 23: 156. 1860.

异萼花属 yi e hua shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Enicosantheum* Bân.

Trees or shrubs, indument of simple or stellate hairs. Petiole often short to absent. Inflorescences terminal or sometimes leaf-opposed, 1–3-flowered. Pedicel slender, pendent, without bracteoles. Sepals [2 or]3, relatively large, valvate, free, eventually ± reflexed. Petals [4–]6, in [1 or]2 whorls, ± equal, free [or united into cup, sometimes adnate to torus], sometimes imbricate at tips. Torus usually much wider than high, enlarged in fruit. Stamens many; connective depressed-globose, wider than anther locules. Carpels many; ovules (1 or)2(or 3), lateral. Styles oblong, often hairy at apex. Fruit apocarpous; monocarps usually many, each on long stipelike carpophore articulate at apex, usually ± ellipsoid, fleshy. Seeds usually 2, shiny chestnut-brown, ellipsoid or flattened-ellipsoid.

Nine species: China, Indonesia, Laos, Malaysia, Vietnam; two species in China.

The fruit of *Disepalum* are very distinct because of the different origin of the carpophores bearing the monocarps. In most members of the Annonaceae the monocarps are borne on stipes formed by extension of the monocarps themselves. In *Disepalum* the monocarps are borne on carpophores derived from the torus that differ in color and texture from the monocarps and are abruptly separated from them by an articulation at the apex. The Chinese species had previously been placed in *Polyalthia* or placed in their own genus *Enicosantheum*. *Disepalum* s.s. has extremely distinctive flowers, but Johnson (Brittonia 41: 356–378. 1989) argues that the very unusual fruit make a good case for including *Enicosantheum* within *Disepalum*.

1a. Leaf blade with translucent dots, membranous; petals oblong or oblanceolate, 1.3–2.6 × 0.6–1.2 cm; carpels

18–35; carpophores 0.7–1.3 cm ..... 1. *D. petelotii*

1b. Leaf blade without translucent dots, papery to thinly leathery; flowers 5–10 cm in diam.; petals broadly

obovate, 2.2–3.4 × 1.2–3 cm; carpels 60–200; carpophores 3–4.7 cm ..... 2. *D. plagioneurum*

**1. *Disepalum petelotii*** (Merrill) D. M. Johnson, Brittonia 41: 364. 1989.

窄叶异萼花 zhai ye yi e hua

*Polyalthia petelotii* Merrill, Univ. Calif. Publ. Bot. 13: 131. 1926; *Enicosantheum petelotii* (Merrill) Bân; *E. plagioneurum* (Diels) Bân var. *oblanceolatum* (W. T. Wang) Bân; *Uvaria oblanceolata* W. T. Wang.

Shrubs or small trees, 2–7 m tall. Branches dark gray, longitudinally wrinkled, puberulent when young, glabrescent. Petiole 5–7 mm, appressed pubescent; leaf blade narrowly elliptic, oblong, oblong-lanceolate, or oblanceolate, 8–20 × 2–4.5 cm, membranous and translucent punctate when young, later papery, abaxially golden to rust-colored sericeous but glabrescent or with scattered appressed hairs with age, adaxially shiny green and glabrous, secondary veins 7–13 on each side of mid-

vein, arcuately ascending, and slightly prominent on both surfaces, base cuneate to cuneate and decurrent onto petiole, apex acuminate and sometimes with a 1–2 cm acumen. Inflorescences terminal or sometimes leaf-opposed, 1-flowered. Flowers ca. 3 cm in diam. Pedicel 1–1.7 cm, ferruginous pubescent. Sepals ovate-triangular to subcordate, 1–1.2 × 0.8–1.2 cm, outside appressed pubescent, inside glabrous. Petals greenish to yellow with a purple base, oblong to rarely oblanceolate, 2–2.5 × 0.6–1.2 cm, subequal, outside sparsely puberulent or glabrous, inside glabrous, apex obtuse to acute. Stamens oblong, 2.2–2.7 mm; connectives apically broadly truncate, puberulent. Carpels 18–35, villous; ovules 1 or 2 per carpel, basal. Fruiting pedicel 2–5 cm; carpophore ± as long as monocarp, slender; monocarp to 20, dark purple when ripe, ellipsoid to cylindric-ellipsoid, 1.2–1.5 × 0.8–1 cm, ferruginous pubescent when young, glabrescent. Seeds 1 or 2, flat-ellipsoid, 10–13 × 6–8 mm. Fl. Mar–Nov, fr. Jul–Dec.

Forested slopes, often along moist valleys; 100–2000 m. Guangxi, S Guizhou, Hainan, SE Yunnan [N Vietnam].

**2. *Disepalum plagieneurum*** (Diels) D. M. Johnson, *Brittonia* 41: 366. 1989.

斜脉异萼花 *xie mai yi e hua*

*Polyalthia plagieneura* Diels, *Notizbl. Bot. Gart. Mus. Berlin-Dahlem* 10: 886. 1930; *Enicosanthellum plagieneurum* (Diels) Bân.

Trees to 15 m tall. Branches brown to dark gray, rust-colored sericeous, glabrescent. Petiole 5–10 mm, appressed sericeous, glabrescent; leaf blade narrowly elliptic, oblong, lanceolate, or oblanceolate, 8–22 × 3–7.5 cm, papery to thinly leathery, abaxially densely rust-colored sericeous but soon sparsely appressed pubescent to glabrescent, adaxially shiny and glabrous, secondary veins 8–12 on each side of midvein, arcuately ascending, and prominent on both surfaces, base broadly cuneate to decurrent, apex acute to shortly acuminate and sometimes with a 3–9 mm acumen. Inflorescences terminal or leaf-opposed, 1-flowered. Flowers 5–10 cm in diam. Pedicel 3–5 cm, rust-colored pubescent. Sepals broadly ovate, 1.5–2 × 1.3–1.7 cm, pubescent to sparsely pubescent, apex obtuse to apiculate. Petals yellowish green, broadly obovate, 2.2–4 × 1.2–3 cm, subequal, thickly papery when dry, appressed tomentulose, apex obtuse to rounded. Stamens oblong, base attenuate; connectives apically truncate, puberulent. Carpels linear, 1.5–2 mm, rust-colored appressed pubescent; ovules 1 or 2 per carpel, basal. Fruiting pedicel 4.5–10 cm × 2–5 mm; carpophores 2–7 cm, pinkish red, pubescent or glabrescent; monocarp to at least 20, ripening black but grayish black when dry, ellipsoid to ovoid, 1–1.6 × 0.8–1.1 cm, glabrescent, apex dilated. Seeds 1 or 2 per monocarp, ellipsoid, 11–12 × ca. 8 mm. Fl. Mar–Aug, fr. Sep–Dec.

Forested slopes, often in valleys; 500–1600 m. Guangdong, Guangxi, S Guizhou, Hainan [Vietnam].

## 17. *POPOWIA* Endlicher, Gen. Pl. 831. 1839.

嘉陵花属 *jia ling hua shu*

Li Bingtao (李秉滔 *Li Ping-tao*); Michael G. Gilbert

Shrubs or small trees. Leaf blade granular or subgranular in texture, glabrous, pubescent, or tomentose. Inflorescences leaf-opposed or extra-axillary and 1-flowered or fasciculate and several flowered. Flowers small, bisexual. Sepals 3, slightly smaller than petals, valvate. Petals 6, in 2 whorls, thick, sometimes outer and inner petals united at base forming a sympetalous corolla; outer petals small, valvate, spreading; inner petals larger than outer, sometimes connivent and erect, inside concave, base shortly clawed, margin adhering but later free, apically often incurved and valvate but occasionally imbricate. Stamens many; anther locules cuneate, extrorse; connectives apically broadly flat-topped to slightly concave. Carpels few to many; ovules 1 or 2 per carpel; styles very short; stigmas subcapitate to cuneate, grooved on top and down inner side. Fruit apocarpous; monocarp subsessile to stipitate, globose [or ovoid]. Seed often 1 per monocarp, rugose or pitted and with a circumferential ridge.

About 50 species: tropical Africa, tropical Asia, Oceania; one species in China.

**1. *Popowia pisocarpa*** (Blume) Endlicher in Walpers, *Repert. Bot. Syst.* 1: 252. 1842.

嘉陵花 *jia ling hua*

*Guatteria pisocarpa* Blume, *Bijdr.* 21. 1825.

Shrubs or small trees, 3–7 m tall. Branches spreading, slender, pliant; branchlets dark colored, striate, rufous pubescent when young, glabrescent, with many leaf scars when old. Petiole 2–5 mm; leaf blade ovate, elliptic, lanceolate, or sometimes slightly obovate, 5.5–14 × 2.5–7 cm, membranous, minutely granular, abaxially appressed rufous pubescent on midvein and secondary veins, adaxially glabrous except for slightly pubescent midvein, secondary veins 6–10 pairs, curving then

becoming straight, ascending steeply, and running some distance close to margin before terminating, base acute to subrounded and oblique, apex acute to shortly acuminate. Inflorescences 1-flowered or 2- or 3-fasciculate. Pedicel white or yellowish, 2–6 mm, slender, pubescent. Sepals broadly ovate, ca. 1 × 1 mm, outside pubescent. Petals yellowish green; outer petals ovate-triangular, ca. 2.5 × 2.5 mm, pubescent; inner petals ca. 2 × 2 mm. Stamen connectives apically truncate, puberulent. Carpels 5 or 6, ca. 1.5 mm, puberulent. Monocarps globose, 6–8 mm in diam. Fl. Jan–Jul, fr. Sep–Nov.  $2n = 18$ .

Forested slopes; 200–300 m. Guangdong, Hainan [Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

The flowers of *Popowia pisocarpa* are fragrant and are used as a perfume.

**18. ALPHONSEA** J. D. Hooker & Thomson, Fl. Ind. 1: 152. 1855.藤春属 *teng chun shu*Li Bingtao (李秉滔 *Li Ping-tao*); Michael G. Gilbert

Trees or shrubs, glabrous or with simple hairs. Petiole short; leaf blade usually leathery to thinly leathery, shiny. Inflorescences internodal, leaf-opposed, rarely extra-axillary or axillary, 1-flowered or flowers to 12 forming clusters. Flowers bisexual. Torus cylindrical to hemispheric, hairy. Sepals 3, much smaller than petals, valvate in bud. Petals 6, in 2 whorls, basally saccate, apically recurved and valvate in bud; outer petals spreading,  $\pm$  as long as inner petals but slightly wider. Stamens many, in several series; connectives produced but not concealing dorsal anther locules, apex apiculate. Carpels 1–8(–15), free; ovules 4–24 per carpel, in 2 series; styles cylindric, short; stigmas inconspicuously capitate, with a slit down inner side. Fruit apocarpous; monocarp stipes with thick walls or almost absent; monocarps few, globose or cylindric, succulent or woody, glabrous, tomentose, or verrucose. Seeds several per monocarp, not separating from fruit wall.

About 23 species: S and SE Asia; six species (four endemic) in China.

- 1a. Young stems and abaxial leaf surfaces densely villous to tomentose ..... 1. *A. mollis*
- 1b. Stems and abaxial leaf surfaces glabrous or obscurely puberulent only along midvein.
  - 2a. Leaf blade apex caudate with a 1–1.7 cm acumen, secondary veins 15–19 on each side of midvein; flowers solitary; monocarps cylindric ..... 6. *A. tsangyuanensis*
  - 2b. Leaf blade apex acute to acuminate but without an acumen, secondary veins 9–13 on each side of midvein; flowers fascicled; monocarps ovoid, subglobose, ellipsoid, or obovoid.
    - 3a. Peduncle with 4–12 bracts, pedicel with up to 8 persistent bracteoles; monocarp verrucose.
      - 4a. Peduncle with 8–12 bracts; sepals longer than wide, apex acuminate or acute ..... 2. *A. squamosa*
      - 4b. Peduncle with 4 or 5 bracts; sepals shorter than wide, apex rounded ..... 3. *A. boniana*
    - 3b. Peduncle and fruiting pedicel with not more than 2 bracts and bracteoles; monocarp smooth.
      - 5a. Leaf blade adaxially not glossy, glaucous when dry; outer petals glabrous inside; carpel 1, with ca. 22 ovules ..... 4. *A. monogyna*
      - 5b. Leaf blade adaxially glossy, yellowish green when dry; outer petals pubescent inside; carpels 3–5, with 10–12 ovules per carpel ..... 5. *A. hainanensis*

**1. *Alphonsea mollis*** Dunn, J. Linn. Soc., Bot. 35: 485. 1903.毛叶藤春 *mao ye teng chun*

Trees to 20 m tall, evergreen, d.b.h. to 40 cm. Bark grayish brown, bast reddish. Branches densely tomentose when young, glabrescent. Petiole 2–3 mm, pubescent; leaf blade elliptic to ovate-oblong, 6–12  $\times$  2.5–5.6 cm, papery, abaxially villous, adaxially glabrous except for puberulent area along midvein, secondary veins ca. 10 on each side of midvein and slender, reticulate veins conspicuous, base obtuse to rounded, apex shortly acuminate. Inflorescences 1- or 2-flowered. Pedicel 1–2 cm, pubescent, bracteolate. Sepals triangular, ca. 1  $\times$  1 mm. Petals yellowish white; outer petals ca. 11  $\times$  7 mm, outside tomentose, inside glabrescent, apex recurved; inner petals slightly shorter than outer petals. Stamens many; anthers ovoid; connectives apically acute. Carpels 3, tomentose. Monocarps 1 or 2, yellow when ripe, ovoid to ellipsoid, 2–4  $\times$  1.5–2.5 cm, fulvous tomentose. Seeds several per monocarp, grayish brown, orbicular and flat, 1–1.5 cm in diam. Fl. Mar–May, fr. Jun–Aug.

• Evergreen broad-leaved forests on slopes; 600–1000 m. Guangdong, SW Guangxi, Hainan, S Yunnan.

The fruit of *Alphonsea mollis* are edible when ripe. The wood is used for the construction of carts, agricultural implements, etc.

**2. *Alphonsea squamosa*** Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 161. 1906.多包藤春 *duo bao teng chun*

Trees to 5 m tall. Bark grayish white. Branches pubescent when young, glabrous and lenticellate with age. Petiole 3–4

mm, transversely striate, puberulent or glabrescent; leaf blade elliptic, ovate, or sometimes oblong-elliptic, 4.5–11.5  $\times$  2–4.5 cm, papery, puberulent or glabrous, midvein adaxially impressed, secondary veins 10–13 on each side of midvein and adaxially flat, base rounded, apex shortly acuminate to acute. Inflorescences superaxillary, 1- or 2-flowered; peduncle ca. 6 mm; bracts 11 or 12. Pedicel ca. 1 cm, with 7 or 8 persistent bracteoles. Sepals triangular, ca. 3  $\times$  2 mm, outside pubescent, inside glabrous, apex acuminate or acute. Outer petals ovate, ca. 7  $\times$  5 mm; inner petals slightly smaller than outer petals. Stamens ovoid; connectives apically acute. Carpels 1–5, ovoid-oblong, pubescent; ovules ca. 10 per carpel, in 2 series; stigmas subglobose, glabrous, apex 2-cleft. Fruiting pedicel ca. 1.3 cm, with 7 or 8 bracteoles; monocarps 1–5, ovoid to subglobose, 2–2.5  $\times$  1.2–2 cm, densely pubescent. Fl. Mar–Jun, fr. Jun–Sep.

Forested slopes, usually in ravines; 1500–2300 m. Guangxi, Yunnan [Vietnam].

*Alphonsea squamosa* was treated as a synonym of the following species, *A. boniana*, by Kessler (Bot. Jahrb. Syst. 118: 86–87. 1995).

**3. *Alphonsea boniana*** Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 162. 1906.金平藤春 *jin ping teng chun*

Shrubs to 3 m tall. Branches pubescent when young, glabrescent. Petiole ca. 3 mm, transversely striate, puberulent or glabrous; leaf blade elliptic to oblong-elliptic, 5–11  $\times$  1.4–3 cm, thinly leathery, abaxially greenish and glabrous except occasionally for puberulent midvein, adaxially shiny green and glabrous, secondary veins 10–13 on each side of midvein, slender,

abaxially slightly prominent, and adaxially flat, base broadly cuneate, apex acuminate to shortly acuminate. Inflorescences leaf-opposed or superaxillary, 1- or 2-flowered; peduncle 2–3 mm, glabrous, with 4 or 5 bracts. Pedicel 4–7 mm, puberulent, with several bracteoles from base to middle. Sepals broadly ovate-reniform, ca.  $1 \times 2$  mm, outside puberulent, inside glabrous, apex rounded. Outer petals ovate-lanceolate, ca.  $7 \times 4$  mm, incurved at base, outside densely pubescent, inside glabrous; inner petals lanceolate, ca.  $6 \times 3.5$  mm, incurved at base. Stamens 3, whorled; anther locules ovoid; connectives apically acute. Carpel 1, oblong, ca. 4 mm, densely villous; ovules 6–12, in 1 or 2 series; stigmas subglobose, glabrous, apex 2-cleft. Fruit not seen. Fl. Apr, fr. May–Jun.

Sparsely forested slopes; 300–700 m. SE Yunnan [Thailand, Vietnam].

Chinese material identified as *Alphonsea tonquinensis* Aug. Candolle (C. Y. Wu & W. T. Wang, Acta Phytotax. Sin. 6: 210. 1957) belongs here.

**4. *Alphonsea monogyna* Merrill & Chun, Sunyatsenia 2: 26. 1934.**

藤春 teng chun

Trees to 12 m tall. Peduncles, pedicels, sepals, and petals outside pubescent. Petiole 5–7 mm; leaf blade elliptic to oblong,  $7\text{--}14 \times 3\text{--}6$  cm, thinly leathery to papery, glaucous when dry, glabrous, secondary veins 9–11 on each side of midvein, slender, and slightly prominent, reticulate veins prominent on both surfaces, base broadly cuneate to slightly obtuse, apex acute to acuminate. Inflorescences leaf-opposed; bracts ovate, puberulent. Pedicel 5–10 mm, with 1 or 2 bracteoles at base. Sepals broadly ovate, ca. 2 mm. Outer petals oblong-ovate to ovate, ca. 1 cm, apex acute; inner petals smaller than outer petals. Stamens ca. 1 mm; connectives apically acute. Carpel 1, cylindric, puberulent; ovules ca. 22, in 2 series. Fruiting carpel subglobose to ellipsoid,  $2\text{--}4 \times 1\text{--}3$  cm, densely hispidulous when young, inconspicuously verruculose with age. Fl. Jan–Sep, fr. Sep–Dec.

- Forested slopes; 400–1200 m. Guangxi, Hainan, S Yunnan.

The flowers of *Alphonsea monogyna* are fragrant and are used for perfumes. Its wood is hard and used in construction as supporting timber.

*Alphonsea monogyna* is listed as Vulnerable (VU A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 8 Oct 2010).

**5. *Alphonsea hainanensis* Merrill & Chun, Sunyatsenia 5: 62. 1940.**

海南藤春 hai nan teng chun

Trees to 20 m tall, evergreen, d.b.h. to 30 cm. Bark grayish brown, smooth, 5–6 mm thick; inner bark reddish brown, fra-

grant. Branchlets appressed ferruginous puberulent when young, glabrescent. Petiole 3–5 mm, puberulent or glabrous; leaf blade broadly ovate to elliptic,  $4\text{--}9 \times 2\text{--}3.5$  cm, thickly papery, glabrous, adaxially shiny and green, secondary veins 7–10 on each side of midvein, slender, and prominent on both surfaces, base broadly cuneate to rounded, apex acute to shortly acuminate. Inflorescences leaf-opposed or subopposite, 2- or 3-flowered; peduncle subsessile; bracts broadly ovate. Pedicel 5–13 mm, pubescent, bracteolate at base. Sepals reniform, ca. 1 mm, outside pubescent, inside glabrous. Outer petals ovate to oblong-ovate, ca. 9 mm, pubescent, apex obtuse; inner petals smaller than outer petals, outside puberulent, inside glabrous or glabrescent. Stamens in 3 whorls; anther locules ovoid, ca. 1 mm; connectives apically acute. Carpels 3–5, densely pubescent; ovules 10–12 per carpel, in 2 series. Fruiting carpels yellowish green, subglobose to obovate, ca.  $4 \times 3\text{--}4$  cm, densely tomentose. Seeds flat, semiobicular. Fl. Oct–Mar, fr. Mar–Aug.

- Evergreen broad-leaved forests on slopes; 400–700 m. SW Guangxi, Hainan, Yunnan.

The fruit of *Alphonsea hainanensis* are edible when ripe. Its wood is hard and used for the construction of carts and agricultural implements, etc.

*Alphonsea hainanensis* is listed as Endangered (EN A2c) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 8 Oct 2010).

**6. *Alphonsea tsangyuanensis* P. T. Li, Acta Phytotax. Sin. 14(1): 112. 1976 [*“tsangyuanensis”*].**

多脉藤春 duo mai teng chun

Trees to 12 m tall, glabrous except for flowers. Petiole 3–5 mm; leaf blade oblong,  $6\text{--}16 \times 2.5\text{--}4.5$  cm, papery, midvein abaxially elevated and adaxially impressed, secondary veins 15–19 on each side of midvein, abaxially slightly prominent, and adaxially flat, base broadly cuneate to obtuse, apex caudate with a 1–1.7 cm tip. Inflorescences leaf-opposed, 1-flowered. Pedicel ca. 3 mm, puberulent. Flower buds conic, ca.  $10 \times 8$  mm. Sepals triangular, outside tomentulose, inside glabrous. Outer petals ovate-triangular, ca.  $10 \times 6$  mm, outside tomentulose, inside glabrous; inner petals ca.  $9 \times 5$  mm. Stamens many, in 3 whorls, ca. 1.5 mm; connectives apically apiculate. Carpels 4 or 5, oblong, slightly flat, hirsute; ovules 5 per carpel, in 2 series; styles short; stigmas apically 2-cleft. Fruiting carpels oblong, ca.  $4 \times 2.5$  cm, densely tomentose. Fl. Apr–Jun, fr. Aug–Oct.

- Forested slopes; 700–1500 m. S Yunnan.

*Alphonsea tsangyuanensis* is listed as Endangered (EN B2ab (i,ii,v)) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 8 Oct 2010). The type collection of this species (*Q. W. Wang 73312*) was originally identified as *A. lutea* J. D. Hooker & Thomson (C. Y. Wu & W. T. Wang, Acta Phytotax. Sin. 6: 210. 1957).

**19. CANANGA (Candolle) J. D. Hooker & Thomson, Fl. Ind. 1: 129. 1855, nom. cons., not Aublet (1775).**

依兰属 yi lan shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Unona* subsect. *Cananga* Candolle, Syst. Nat. 1: 485. 1817.

Trees or shrubs. Petiole short; leaf blade large. Inflorescences axillary or extra-axillary, forming cymes, racemes, or with several flowers clustered on a peduncle. Flowers large. Sepals 3, valvate. Petals 6, in 2 whorls, subequal or inner petals slightly smaller, spreading, flat, valvate in bud. Stamens many; anther locules linear-lanceolate, lateral or subintrorse; connectives ca. 1/3 size of stamens, apex apiculate. Carpels many, oblong; ovules many per carpel, in 2 series; styles slender; stigmas sticking together at anthesis, clavate. Fruit apocarpous; monocarps several to many, long stipitate, ovoid to subglobose. Seeds several per monocarp, in 2 series, pitted, sending spinose processes into albumen.

Two species: tropical Asia and Australia; one species (introduced) in China.

**1. *Cananga odorata*** (Lamarck) J. D. Hooker & Thomson, Fl. Ind. 1: 130. 1855.

依兰 yi lan

Trees or shrubs. Bark pale gray. Branchlets dark colored, striate with age, minutely pubescent when young, glabrescent. Petiole 1–2 cm, narrowly grooved; leaf blade in 2 ranks, ovate, oblong, or broadly elliptic, 9–23 × 4–14 cm, membranous to thinly papery, often drying black, glabrous when mature except for mostly whitish pubescence along midvein and secondary veins, secondary veins 7–15 on each side of midvein, base rounded, obtuse, or truncate and often inequilateral, apex acute to acuminate. Inflorescences axillary or on short woody branches, racemose or cymose, 1- or several flowered; peduncle 2–5 mm; bracts minute, deciduous. Flowers pendulous. Pedicel 1–5 cm, pubescent, bracteolate. Sepals ovate, ca. 0.7 mm, pubescent, connate at base, apex acute and reflexed. Petals green, turning yellow and inside basally with a purplish brown blotch, linear to linear-lanceolate, 5–8 × 0.5–1.8 cm, tomentose and with several veins minutely pubescent, basal claw small. Stamens oblong-oblongeolate, 0.7–1 mm; connectives apically acute, pubescent. Carpels 10–12, ca. 4 mm, puberulent when young, glabrescent; stigmas clavate, lamellate, fused, with a U-shaped groove on inner side running down to base of ovary to form a convex pileate disk. Monocarp stipes 1.2–1.8 cm; monocarps nearly black, ovoid, globose, or oblong, 1.5–2.3 × ca. 1 cm, pulpy, glabrous. Seeds 2–12 per monocarp, pale brown, in 2 series, surface pitted. Fl. Apr–Aug, fr. Oct–Mar.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Tai-

wan, Yunnan [native to NE Australia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, and Thailand].

The flowers of *Cananga odorata* are the source of an essential oil used in perfumery, soaps, and cosmetics. The flowers are also laid between cloth to impart an agreeable scent.

- 1a. Tree 6–33 m tall ..... 1a. var. *odorata*  
1b. Shrubs 1–2 m tall ..... 1b. var. *fruticosa*

**1a. *Cananga odorata* var. *odorata***

依兰(原变种) yi lan (yuan bian zhong)

*Uvaria odorata* Lamarck, Encycl. 1: 595. 1785; *Canangium odoratum* (Lamarck) King.

Trees 6–33 m tall. Fl. Apr–Aug, fr. Nov–Mar.  $2n = 16$ .

Cultivated; 100–200 m. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan [native to NE Australia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, and Thailand].

**1b. *Cananga odorata* var. *fruticosa*** (Craib) J. Sinclair, Sarawak Mus. J. 5: 599. 1951.

小依兰 xiao yi lan

*Canangium fruticosum* Craib, Bull. Misc. Inform. Kew 1922: 166. 1922; *C. odoratum* var. *fruticosum* (Craib) Corner.

Shrubs 1–2 m tall. Fl. Apr–Jun, fr. Oct–Mar.

Cultivated; 100–200 m. Guangdong, Yunnan [native to Indonesia, Malaysia, and Thailand].

**20. ARTABOTRYS R. Brown, Bot. Reg. 5: t. 423. 1820.**

鹰爪花属 ying zhua hua shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Climbing shrubs or woody lianas. Inflorescences 1- or few-flowered clusters; peduncle recurved, woody, persistent, forming a hook. Flowers bisexual, often fragrant. Torus flat or concave. Sepals 3, valvate, connate at base. Petals 6, in 2 whorls, pale yellowish, subequal, with each whorl valvate, base concave, apex connivent. Stamens many, outermost series sometimes forming staminodes; connectives apically dilated, apex truncate. Carpels 4 to many; ovules 2 per carpel, basal; stigmas ovoid, oblong, or clavate. Fruit apocarpous; monocarps fasciculate, sessile or shortly stipitate, ellipsoid-obovoid or globose, fleshy and berrylike. Seeds 1 or 2 per monocarp, without an aril.

About 100 species: Old World tropics and subtropics; eight species (four endemic, one introduced) in China.

Members of *Artabotrys* climb by means of the very distinctive, persistent, recurved, woody peduncles and pedicels, which hook onto the supporting vegetation.

- 1a. Monocarp apex long beaked; leaf blade base slightly oblique ..... 1. *A. rhynchocarpus*  
1b. Monocarp apex not beaked; leaf blade base symmetric.  
2a. Flowers many per peduncle; stamen connectives apically truncate ..... 2. *A. multiflorus*  
2b. Flowers 1–3 per peduncle; stamen connectives apically triangular, semiorbicular, or subtruncate.  
3a. Outer petals 1–1.8 cm.

- 4a. Leaf blade glabrous on both surfaces or only midrib abaxially puberulent; pedicel longer than peduncle ..... 3. *A. hongkongensis*
- 4b. Leaf blade abaxially densely tomentose or pubescent; pedicel shorter than peduncle.
- 5a. Leaf blade adaxially shiny, secondary veins 10–12 on each side of midvein; outer petals ovate to broadly triangular ..... 4. *A. fragrans*
- 5b. Leaf blade adaxially slightly glaucous, secondary veins 8 on each side of midvein; outer petals narrowly oblong ..... 5. *A. pilosus*
- 3b. Outer petals 2–4.5 cm.
- 6a. Leaf blade adaxially minutely punctate; outer petals oblong-ovate ..... 6. *A. punctulatus*
- 6b. Leaf blade adaxially not punctate; outer petals narrowly lanceolate or oblong-lanceolate.
- 7a. Leaf blade secondary veins 7–9 on each side of midvein; outer petals ca.  $2 \times 0.2$  cm ..... 7. *A. hainanensis*
- 7b. Leaf blade secondary veins 8–16 on each side of midvein; outer petals  $3\text{--}4.5 \times 0.9\text{--}1.6$  cm ..... 8. *A. hexapetalus*

**1. *Artabotrys rhynchocarpus*** C. Y. Wu ex S. H. Yuan, Acta Bot. Yunnan. 4: 261. 1982.

喙果鹰爪花 *hui guo ying zhua hua*

Shrubs to 10 m tall, climbing. Branchlets appressed pilose when young, glabrescent. Petiole 3–5 mm, appressed pilose; leaf blade oblong to oblong-lanceolate,  $8\text{--}13 \times 3\text{--}4$  cm, papery, abaxially puberulent, adaxially glabrous, secondary veins 12–14 on each side of midvein and adaxially prominent, base cuneate, apex acuminate. Inflorescences leaf-opposed, 2–5-flowered; peduncle 0.8–1.5 cm, pilose. Pedicel 1.2–1.5 cm, pubescent. Sepals broadly ovate,  $3\text{--}4 \times 3\text{--}4$  mm, both surfaces pilose. Petals ovate-oblong, ca.  $1.5 \times 0.6$  cm, tawny pubescent. Stamens cuneate, ca. 1.5 mm; connectives apically subtruncate, glabrous. Monocarp stipes 5–7 mm; monocarps oblong,  $4.5\text{--}5 \times 1.5\text{--}1.7$  cm, apex conspicuously beaked. Seeds 2 per monocarp, flat, ca.  $3 \times 1.2$  cm. Fl. Aug–Sep, fr. Oct.

• Dense woodlands; ca. 1200 m. SE Yunnan.

**2. *Artabotrys multiflorus*** C. E. C. Fischer, Bull. Misc. Inform. Kew 1937: 437. 1937.

多花鹰爪花 *duo hua ying zhua hua*

Lianas. Branchlets dark brown, minutely puberulent when young, minutely lenticellate. Petiole 5–8 mm; leaf blade elliptic to elliptic-oblong,  $10\text{--}16.5 \times 4\text{--}6.5$  cm, appressed pubescent when young especially abaxially on midvein, glabrescent, midvein abaxially prominent, secondary veins 9–12 on each side of midvein, base narrow, apex apiculate to bluntly acuminate. Inflorescences with 2 fascicles, one apical and another slightly below it on outer side, many flowered; peduncle 1.5–2 cm, stout, sharply curved, appressed bristly. Pedicel 0.8–1.5 cm, rufous hispid. Sepals ovate-triangular, 3–4 mm, outside rufous pubescent, inside glabrous. Petals green to yellow, oblong to oblong-lanceolate,  $1.8\text{--}2.5 \times 0.6\text{--}0.7$  cm, subequal, base deeply convex; inner petals slightly narrower and more deeply concave than outer petals, connivent over stamens and carpels, outside thinly pubescent but densely gray pubescent on basal concave part, inside glabrous. Stamens oblong-cuneate, ca. 1.5 mm; connectives apically truncate. Carpels 12–21, narrowly oblong to lanceolate-oblong, 1.3–1.5 mm, glabrous; styles oblong to narrowly clavate, 1.3–1.5 mm. Fruit not seen. Fl. May–Aug, fr. Jul–Oct.

Thickets on limestone; 800–1000 m. Guangdong, Guangxi, Guizhou, Yunnan [Myanmar].

**3. *Artabotrys hongkongensis*** Hance, J. Bot. 8: 71. 1870.

香港鹰爪花 *xiang gang ying zhua hua*

Shrubs, to 8 m tall, climbing. Branchlets hispid. Petiole 2–5 mm, puberulent; leaf blade elliptic-oblong to oblong,  $6\text{--}12 \times 2.5\text{--}4$  cm, leathery, glabrous or only midvein abaxially puberulent, adaxially lucid, secondary veins 8–10 on each side of midvein and adaxially prominent, base rounded and slightly oblique. Inflorescences 1-flowered. Pedicel slightly longer than hooked peduncle, puberulent. Sepals ovate-triangular, ca. 5 mm, glabrescent. Outer petals ovate-lanceolate, 1–1.8 cm, thickened, outside densely sericeous pubescent, base concave; inner petals basally concave. Stamens cuneate; connectives apically 3-angled, puberulent. Carpels ovate-oblong, glabrous; ovules 2 per carpel, basal; stigmas shortly clavate. Monocarps black when dry, ellipsoid,  $2\text{--}4 \times 1.5\text{--}3$  cm, apex subrounded. Fl. Mar–May, fr. May–Aug.

Dense woodlands, thickets; 300–1500 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Yunnan [Vietnam].

**4. *Artabotrys fragrans*** Jovet-Ast, Notul. Syst. (Paris) 9: 77. 1940.

香鹰爪花 *xiang ying zhua hua*

Lianas to 20 m. Branchlets pubescent, glabrescent. Petiole 5–8 mm, pubescent; leaf blade oblong to lanceolate-oblong,  $13\text{--}17 \times 5\text{--}6$  cm, densely pubescent when young and sparsely puberulent with age, adaxially lucid and glabrous, secondary veins 10–12 on each side of midvein and adaxially prominent, base cuneate to obtuse, apex shortly acuminate to obtuse. Inflorescences 1–3-flowered; peduncle ca. 2 cm, glabrous. Pedicel 1–1.2 cm, pubescent. Sepals triangular, golden pubescent. Outer petals broadly ovate-triangular, ca.  $1.4 \times 0.9$  cm, densely villous except for base, base concave; inner petals triangular, 1–1.2 cm, pubescent except for base, base concave. Stamen connectives apically semiorbicular. Carpels 4–7, ovoid, glabrous. Monocarps ellipsoid, ca.  $4 \times 2$  cm, glabrous; epicarp smooth. Fl. Jul–Aug, fr. Sep–Oct.

Mixed woods; ca. 1000 m. Guangxi, Guizhou, S Yunnan [Vietnam].

The name *Artabotrys fragrans* was first published in 1938 (Fl. Indo-Chine Suppl. 1: 83) but not validly so.

**5. *Artabotrys pilosus*** Merrill & Chun, Sunyatsenia 2: 224. 1935.

毛叶鹰爪花 *mao ye ying zhua hua*

Shrubs to 5 m tall, climbing. Branches densely tomentose

when young. Petiole ca. 2 mm, densely tomentose; leaf blade oblong to oblong-elliptic, 5–17 × 2–7.5 cm, papery, abaxially densely tomentose, adaxially glabrous and slightly glaucous, secondary veins ca. 8 on each side of midvein and adaxially flat to slightly prominent, base rounded, apex acuminate to obtuse. Inflorescences leaf-opposed or extra-axillary, usually 1-flowered; peduncle longer than pedicel, flat, densely villous when young, glabrescent. Pedicel 6–12 mm, densely pubescent. Sepals ovate, ca. 4 mm, outside pubescent. Petals greenish to yellowish, narrowly oblong, 1.5–1.7 cm, pubescent. Stamens cuneate; connectives apically subtruncate. Carpels ca. 8, glabrous. Monocarps dark brown, oblong-ellipsoid, 1.5–2.2 × ca. 1.5 cm, glabrous. Fl. Apr–Jul, fr. May–Dec.

- Mixed woods; 200–500 m. Guangdong, Hainan.

The flowers of *Artabotrys pilosus* are fragrant and are used as perfume; its bast fiber is used to make ropes.

**6. *Artabotrys punctulatus*** C. Y. Wu ex S. H. Yuan, Acta Bot. Yunnan. 4: 260. 1982.

点叶鹰爪花 dian ye ying zhua hua

Shrubs to 4 m tall, climbing. Branchlets puberulent when young. Petiole 5–7 mm, puberulent; leaf blade oblong-elliptic, 7–13.5 × 3–5.5 cm, papery, glabrous except for abaxially puberulent midvein, adaxially minutely punctate, secondary veins 12–14 on each side of midvein and adaxially prominent, base cuneate to broadly cuneate and oblique, apex acuminate to obtuse. Peduncle puberulent. Flowers 3–4 cm in diam. Pedicel 1.5–2 cm. Sepals broadly ovate-triangular, 5–7 mm, puberulent, basally slightly attenuate. Petals brownish green; outer petals oblong-ovate, ca. 2.5 cm, base concave; inner petals ca. 2 cm, concave and connivent, horizontally spreading from apical 1/3, basally attenuate. Stamens many, cuneate, ca. 1.5 mm; connectives apically subtruncate, glabrous. Carpels ca. 20, oblong, glabrous; stigmas clavate, longer than ovaries, pubescent. Monocarps fusiform, slightly flattened, 3.5–4 × 1.5–1.7 cm. Fl. Apr–Jun, fr. Sep–Nov.

- Open woods; ca. 1500 m. S Yunnan.

**7. *Artabotrys hainanensis*** R. E. Fries, Ark. Bot., n.s., 3: 41. 1955.

海南鹰爪花 hai nan ying zhua hua

Based on *Artabotrys stenopetalus* Merrill & Chun, Sunyatsenia 2: 226. 1935, not Engler (1899).

Shrubs to 4 m tall, climbing. Branchlets glabrous. Petiole 4–8 mm, glabrous; leaf blade oblong to oblong-elliptic, 7–15 × 3–6 cm, papery, glabrous except for abaxially hairy main veins, secondary veins 7–9 on each side of midvein and adaxially prominent, base rounded to broadly cuneate, apex acuminate to acute. Inflorescences leaf-opposed, usually 1-flowered. Pedicel 1.2–1.5 cm. Sepals ovate, 4–5 mm, sparsely pubescent. Petals yellowish white, narrowly lanceolate, ca. 2 × 0.2 cm, subequal, base slightly broad and concave. Stamens oblong, ca. 14 × 2 mm; connectives apically rounded to subtruncate. Carpels 15, slightly longer than stamens; stigmas shortly clavate. Monocarps ellipsoid, ca. 2.5 × 1.2 cm. Fl. May–Jul, fr. Jul–Oct.

- Densely wooded slopes; 200–500 m. Guangdong, Guangxi, Hainan.

**8. *Artabotrys hexapetalus*** (Linnaeus f.) Bhandari, Bailey 12: 149. 1965.

鹰爪花 ying zhua hua

*Annona hexapetala* Linnaeus f., Suppl. Pl. 270. 1782; *A. uncinata* Lamarck; *Artabotrys odoratissimus* R. Brown, nom. illeg. superfl.; *A. uncatus* (Loureiro) Baillon; *A. uncinatus* (Lamarck) Merrill; *Unona uncinata* (Lamarck) Dunal; *Uvaria esculenta* Roxburgh ex Rottler; *U. odoratissima* Roxburgh; *U. uncata* Loureiro.

Shrubs to 10 m tall, climbing. Branchlets glabrous or glabrescent. Petiole 4–8 mm; leaf blade oblong to broadly lanceolate, 6–16(–25) × 2.5–6(–8) cm, papery, abaxially glabrous or only midvein puberulent, adaxially glabrous, secondary veins 8–16 on each side of midvein and adaxially prominent, base cuneate to acute, apex acuminate to acute. Inflorescences 1- or 2-flowered. Flowers 2.5–3 cm in diam., fragrant. Sepals green, ovate, 5–8 mm, sparsely puberulent. Petals greenish to yellowish, oblong-lanceolate, 3–4.5 × 0.9–1.6 cm, outside basally densely pubescent, contracted nearly to base but basally expanded. Stamens oblong; connectives apically 3-angular. Carpels oblong, glabrous. Monocarps ovoid, 2.5–4 × ca. 2.5 cm, glabrous, apex conspicuously apiculate. Seeds pale brown, 1.5–2 cm, smooth. Fl. May–Aug, fr. May–Dec.  $2n = 16$ .

Widely cultivated, rarely naturalized; 100–300 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Taiwan, Yunnan, Zhejiang [native to S India and Sri Lanka].

The flowers of *Artabotrys hexapetalus* are fragrant and are used as perfume and in tea; its fruit are used as medicine for scrofula.

## 21. FRIESODIELSIA Steenis, Bull. Jard. Bot. Buitenzorg, sér. 3, 17: 458. 1948.

尖花藤属 jian hua teng shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Polyalthia* sect. *Oxymitra* Blume, Fl. Javae, Annonaceae, 71. 1830; *Oxymitra* (Blume) J. D. Hooker & Thomson (1855), not Bischoff ex Lindenberg (1829).

Climbers [rarely trees], with simple hairs. Inflorescences leaf-opposed, extra-axillary, or superaxillary, 1-flowered, bracteate. Flowers (not known for only Chinese species) bisexual. Sepals 3, valvate, ± connate at base. Petals 6, in 2 whorls, free, valvate; outer petals flat or 3-ridged, long and narrow, leathery, basally broadened and concave; inner petals much shorter than outer, ovate, lanceolate, or oblong, narrowed at base and often with a gap between petals, cohering to cover stamens and carpels. Stamens many; connectives apically enlarged and concealing anther locules, apex truncate. Carpels many, oblong; ovules 1–5 per carpel, lateral;

styles clavate. Fruit apocarpous; monocarps stipitate, subglobose [or globose to ellipsoid-cylindric], moniliform when more than 1-seeded; epicarp thin to thick. Seed usually 1 per monocarp, subglobose.

About 50–60 species: Old World tropics; one species (endemic) in China.

There has been considerable confusion between *Friesodielsia* and the genus *Richella* A. Gray. Recent accounts (e.g. Kessler in Kubitzki, Fam. Gen. Fl. Pl. 2: 119. 1993) have restricted *Richella* to just 2 or 3 species, which molecular studies (Nakkuntod et al., Taxon 58: 127–132. 2009) show to be most closely related to *Goniothalamus*. Most species previously placed within *Richella* are now placed in *Friesodielsia*.

**1. *Friesodielsia hainanensis*** Tsiang & P. T. Li, Acta Phytotax. Sin. 9: 377. 1964.

尖花藤 jian hua teng

*Richella hainanensis* (Tsiang & P. T. Li) Tsiang & P. T. Li.

Climbers to 5 m tall, woody, glabrous except for slightly puberulent leaf blade midvein. Petiole 5–8 mm; leaf blade oblong to oblong-elliptic, 10–21.5 × 3.7–7.5 cm, papery, abaxially glaucous, secondary veins 13–15 on each side of midvein, base shallowly cordate, apex acute to shortly acuminate. Flow-

ers not seen. Monocarp stipes 5.3–7.5 cm, slender; monocarps subglobose, ca. 10 × 8 mm, apex apiculate. Seed 1 per monocarp, brown, subglobose, ca. 8 × 6 mm, testa thin. Fl. Aug–Sep, fr. Oct.

• Forested slopes; 300–500 m. Hainan (Baoting).

The generic placement of *Friesodielsia hainanensis* must remain in doubt without knowledge of the flowers. It is listed as Vulnerable (VU D2) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 8 Oct 2010, as *Richella hainanensis*).

## 22. FISSISTIGMA Griffith, Not. Pl. Asiat. 4: 706. 1854.

瓜馥木属 gua fu mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Climbers, with simple hairs, usually pubescent to tomentose and sometimes copiously so. Leaf blade with many stout parallel secondary veins. Inflorescences mostly leaf-opposed or terminal, less often axillary or infra-axillary, 1- to many flowered and forming cymes, glomerules, or branched panicles. Pedicel often with several bracteoles from base to middle. Flower buds ovoid or oblong-conic. Sepals 3, small, valvate, connate at very base. Petals 6, in 2 whorls, valvate, leathery, margin thickened; outer petals slightly larger than inner petals, erect or spreading, inside flat to convex; inner petals 3-edged, base concave. Stamens many; connectives slightly enlarged, apically oblique, obtuse, or slightly apiculate. Carpels many, free, often pubescent, slightly curved, grooved on inner side; ovules 1–16 per carpel, in 1 or 2 sutural series; styles sometimes narrowly clavate but usually not enlarging; stigmas very short and not clearly differentiated from style, apex 2-cleft or entire. Fruit apocarpous; monocarps few to many, stipitate, spherical, ovoid, or oblong, thick walled, usually pubescent to tomentose. Seeds 1–10 per monocarp, in 1 or 2 series, smooth, shiny.

About 75 species: Old World tropics and subtropics; 23 species (eight endemic) in China.

### 1a. Inflorescence 1- or 2-flowered.

2a. Flowers leaf-opposed, ca. 1.2 cm in diam.; outer petals rounded, ca. 6 mm; inner petals ca. 4 mm ..... 1. *F. cupreonitens*

2b. Flowers axillary or subaxillary, 3–4 cm in diam.; outer petals ovate-triangular or oblong, 14–24 mm; inner petals 10–14 mm.

3a. Leaf blade oblong; pedicel ca. 2 cm; stigmas apically entire; ripe carpels 4–5 × ca. 4 cm ..... 2. *F. uonicum*

3b. Leaf blade lanceolate to elliptic-lanceolate; pedicel ca. 0.5 cm; stigmas apically 2-cleft; ripe carpels ca. 1.8 × 1.5 cm ..... 3. *F. machurei*

### 1b. Inflorescence usually more than 2-flowered, often in cymes, glomerules, or panicles.

4a. Leaf blade abaxially glabrous or obscurely sparsely pubescent, glabrescent.

5a. Leaf blade abaxially grayish white or grayish green and glaucous when dry.

6a. Leaf blade 1.2–6 cm wide; inflorescences thyrses; petals 5–6 mm; ovaries 1-ovuled; stigmas apically 2-cleft ..... 4. *F. glaucescens*

6b. Leaf blade 6–8 cm wide; inflorescences cymes; petals ca. 15 mm; ovaries ca. 30-ovuled; stigmas apically entire ..... 5. *F. pallens*

5b. Leaf blade greenish or abaxially grayish green and not glaucous.

7a. Leaf blade base truncate to slightly cordate, secondary veins 18–20 on each side of midvein; stigmas apically entire; ripe monocarps 3.5–4 cm wide; ovules ca. 10 per carpel ..... 6. *F. chloroneurum*

7b. Leaf blade base rounded, obtuse, or broadly cuneate, secondary veins 13–15 on each side of midvein; stigmas apically 2-cleft; ripe monocarps 2–3 cm wide; ovules 4 or ca. 22 per carpel.

8a. Young branchlets ferruginous pubescent; cymes usually leaf-opposed or alternate; ovules 4 per carpel; ripe monocarps glabrescent ..... 7. *F. wallichii*

8b. Branchlets glabrous; panicles terminal or axillary; ovules ca. 22 per carpel; ripe monocarps densely fulvous tomentulose ..... 8. *F. tonkinense*

## 4b. Leaf blade abaxially densely tomentose, densely pubescent, or hispid.

## 9a. Flowers in panicles or cymes.

## 10a. Inflorescence rachides 1–28 cm.

11a. Leaf blade apex acute; flower buds ovoid; petals ovate; stamen connectives ovoid, apex obtuse ..... 9. *F. latifolium*

11b. Leaf blade apex rounded or retuse; flower buds conic or lanceolate; petals oblong-lanceolate or ovate-elliptic; stamen connectives conic or broadly ovoid, apex acuminate or truncate.

12a. Peduncle to 28 cm; pedicel 2–3 mm; petals ovate-elliptic to ovate-oblong; stamen connectives apically acuminate; stigma apex 2-cleft ..... 10. *F. tungfangense*12b. Peduncle ca. 1 cm; pedicel ca. 15 mm; petals oblong-lanceolate to narrowly lanceolate; stamen connectives apically truncate; stigma apex entire ..... 11. *F. tientangense*

## 10b. Inflorescence rachides 0.1–0.5 cm.

13a. Leaf blade secondary veins adaxially flattened; stigma apex 2-cleft.

14a. Sepals connate at base, broadly triangular, ca.  $3 \times 3.5$  mm; stamen connectives broadly triangular ..... 12. *F. polyanthoides*14b. Sepals free at base, ovate-triangular, ca.  $2 \times 2$  mm; stamen connectives obliquely triangular ..... 13. *F. poilanei*

13b. Leaf blade secondary veins adaxially concave; stigma apex entire.

15a. Leaf blade base cuneate to broadly cuneate; inner petals pubescent outside; ripe monocarps ca. 1.2 cm in diam. .... 14. *F. acuminatissimum*15b. Leaf blade base shallowly cordate; inner petals glabrous outside; ripe monocarps 2–2.5 cm in diam. .... 15. *F. cavaleriei*

## 9b. Flowers in glomerules.

16a. Leaf blade secondary veins 25–35 on each side of midvein; ripe monocarps ca. 4 cm in diam. .... 16. *F. balansae*

16b. Leaf blade secondary veins 13–20 on each side of midvein; ripe monocarps 1.5–3 cm in diam.

17a. Leaf blade secondary veins adaxially flattened.

18a. Branches and abaxial leaf blade surfaces densely tomentose; outer petals with a prominent abaxial midrib; stamen connectives subrounded or truncate ..... 17. *F. xylopetalum*

18b. Branches and abaxial leaf blade surfaces pubescent to glabrescent; outer petals without a prominent midrib; stamen connectives triangular or slightly obliquely triangular.

19a. Petals 2–2.1 cm; ovules 10 per carpel; stigmas apically 2-cleft ..... 18. *F. oldhamii*19b. Petals 0.9–1.2 cm; ovules 4–6 per carpel; stigmas apically entire ..... 19. *F. polyanthum*

17b. Leaf blade secondary veins adaxially concave.

20a. Bracteoles many, longer than or as long as sepals; stigmas apically 2-cleft ..... 20. *F. bracteolatum*

20b. Bracteoles few or absent, if present shorter than sepals; stigmas apically entire.

21a. Leaf blade oblong-lanceolate to narrowly oblong, apex slightly acute; stamen connectives long lanceolate ..... 21. *F. kwangsiense*

21b. Leaf blade broadly ovate, obovate, or obovate-oblong, apex rounded or retuse; stamen connectives broadly or obliquely triangular.

22a. Leaf blade base rounded, truncate, or shallowly cordate; inflorescences leaf-opposed; sepals ovate-lanceolate, ca. 1 cm; outer petals ovate-oblong, ca. 1.5 cm; ovules 4 per carpel; ripe monocarps globose ..... 22. *F. retusum*22b. Leaf blade base broadly cuneate or rounded; inflorescences extra-axillary; sepals broadly triangular, ca. 5 mm; outer petals ovate, ca. 1 cm; ovules 10 per carpel; ripe monocarps oblong ..... 23. *F. shangtzeense*1. *Fissistigma cupreonitens* Merrill & Chun, Sunyatsenia 2: 8. 1934.

金果瓜馥木 jin guo gua fu mu

Climbers to 13 m tall. Branchlets, petioles, and flowers densely appressed reddish brown pubescent, glabrescent. Petiole 0.8–1.2 cm; leaf blade oblong to oblong-elliptic, 5–10  $\times$  1.5–3 cm, leathery, abaxially densely appressed reddish brown pubescent, adaxially glabrous except for appressed pubescence on midvein, secondary veins 8–13 on each side of midvein, slender, and adaxially flat, base rounded, apex acute to shortly acuminate. Inflorescences leaf-opposed, 1-flowered; bracts tri-

angular. Flowers ca. 1.2 cm in diam. Pedicel ca. 1 cm. Sepals broadly triangular, ca. 6 mm, basally connate. Outer petals rounded, ca. 6 mm, incurved; inner petals ca. 4 mm, inside basally depressed. Stamens oblong, ca. 1 mm; connectives 3-angular. Carpels oblong, ca. 2 mm, sericeous pubescent; ovules ca. 14 per carpel, in 2 series; stigma apex entire. Fruiting pedicel ca. 2 mm, robust; monocarp stipes ca. 1.5 cm; monocarps globose, ovoid-ellipsoid, or ellipsoid, ca.  $3 \times 2$  cm, densely reddish brown tomentose, apex rounded or mucronulate. Seeds ca. 14 per monocarp, brown, in 2 series, ovoid, subflattened, ca.  $1.4 \times 0.9$  cm. Fl. Apr–Nov, fr. Jun–Dec.

• Densely forested slopes; 300–1000 m. SE Guangxi.

*Fissistigma cupreonitens* is listed as Endangered (EN B2ab(ii,iv)) by the IUCN Red List of Threatened Species (Version 2010.3; <http://www.iucnredlist.org>; accessed on 8 Oct 2010).

**2. *Fissistigma uonicum*** (Dunn) Merrill, Philipp. J. Sci. 15: 137. 1919.

香港瓜馥木 xiang gang gua fu mu

*Melodorum uonicum* Dunn, J. Bot. 48: 323. 1910; *Fissistigma clementis* Merrill.

Climbers to 5 m tall. Branches glabrous. Petiole 5–10 mm, blackish and minutely transversely wrinkled when dried; leaf blade oblong, 4–20 × 1–5 cm, papery, abaxially yellowish, very sparsely puberulent, and reddish yellow when dry, adaxially glabrous, secondary veins 8–12[–18] on each side of midvein and adaxially flat to slightly prominent, tertiary veins inconspicuously raised, base rounded to cuneate, apex acute. Inflorescences axillary or subaxillary, sometimes ± grouped into terminal thyrses, 1- or 2-flowered; peduncle 1–3 mm; bracts minute, scalelike. Flowers fragrant. Pedicel ca. 2 cm, minutely appressed pubescent, minutely bracteolate below middle. Sepals ovate-triangular, ca. 2 mm, outside pubescent, inside glabrous. Petals yellow; outer petals ovate-triangular, ca. 2.4 × 1.4 cm, thickened, outside fulvous pubescent, inside glabrous, apex obtuse; inner petals lanceolate, 1.2–1.4 × ca. 0.6 cm, inside basally concave and apically convex. Stamens oblong; connectives 3-angular. Carpels oblong, pubescent; ovules 9–16 per carpel, in 2 series; styles cylindric, short, glabrous; stigmas apically entire. Monocarp stipes short, thick; monocarps globose to shortly cylindric, 4–5 × ca. 4 cm, pubescent to glabrescent. Seeds 9–16 per monocarp, in 2 series. Fl. Mar–Jun, fr. Jun–Dec.

Forest margins, scrub; 100–800 m. Fujian, Guangdong, Guizhou, Hainan, Hunan [Indonesia].

The fruit of *Fissistigma uonicum* are edible; its leaves are used as yeast powder to start fermentation when making liquor in Guangxi and Hainan.

**3. *Fissistigma maclurei*** Merrill, Philipp. J. Sci. 21: 342. 1922.

毛瓜馥木 mao gua fu mu

*Meiogyne maclurei* (Merrill) Sinclair; *Melodorum maclurei* (Merrill) Jovet-Ast ["Ast"].

Climbers to 6 m tall, most parts fulvous to blackish brown tomentose. Petiole 5–8 mm, blackish brown tomentose; leaf blade lanceolate to elliptic-lanceolate, 7–12 × 2–3.5 cm, thinly leathery, abaxially fulvous to blackish brown tomentose, adaxially glabrous, secondary veins 13–17 on each side of midvein and adaxially flat, reticulate veins prominent, base obtuse, apex acute to acuminate. Inflorescences axillary, 1-flowered. Pedicel ca. 5 mm, robust. Sepals ovate-oblong, ca. 5 mm, blackish brown villous. Petals thickened; outer petals oblong, ca. 1.4 cm, villous; inner petals shorter than outer petals, pubescent. Stamens oblong, nearly as long as carpels; connectives 3-angular, apex acute. Carpels fulvous pubescent; ovules 10 per carpel, in 2 series; stigmas apically 2-cleft. Fruiting pedicel 2–2.5 cm, densely blackish brown tomentose; monocarps globose to subglobose, ca. 1.8 × 1.5 cm, densely blackish brown tomentose. Seeds 7–9 per monocarp, deep yellow, reniform, ca. 10 × 6 mm. Fl. Feb–Aug, fr. Apr–Oct.

Forested slopes, often in valleys or beside water; 200–1100 m. Guangxi, Hainan, S Yunnan [Vietnam].

**4. *Fissistigma glaucescens*** (Hance) Merrill, Philipp. J. Sci. 15: 132. 1919.

白叶瓜馥木 bai ye gua fu mu

*Melodorum glaucescens* Hance, J. Bot. 19: 112. 1881; *Fissistigma obtusifolium* Merrill.

Climbers to 6 m tall, most parts glabrous except for inflorescences. Petiole 4–12 mm, blackish and minutely transversely wrinkled when dried, pubescent when young, glabrescent; leaf blade oblong, oblong-elliptic, or sometimes obovate-oblong, 3–20 × 1.2–6 cm, thinly leathery, abaxially grayish green and glaucous when dry, secondary veins 10–15 on each side of midvein and adaxially very slightly prominent or flat, tertiary veins inconspicuously raised, base rounded, apex rounded to slightly retuse. Inflorescences terminal, thyrsoid, to 6 cm, sometimes continuing vegetatively and cymes apparently axillary, cymules 2- or 3-flowered, brownish tomentose; peduncle very short. Pedicel to 1.2 cm. Sepals broadly triangular, ca. 2 mm. Outer petals broadly ovate, ca. 6 mm, fulvous pubescent; inner petals ovate-oblong, ca. 5 mm, grayish white pubescent. Stamens oblong; connectives 3-angular. Carpels ca. 15, ellipsoid, fulvous pubescent; ovule 1 per carpel; styles elongate, glabrous; stigmas apically 2-cleft. Monocarp stipes ca. 3 mm; monocarps ca. 8 mm in diam., glabrous. Seed 1 per monocarp. Fl. Jan–Sep, fr. Mar–Dec.

Sparsely forested slopes, scrub, often in ravines; 100–1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Vietnam].

A fine strong bast fiber obtained from the inner bark of *Fissistigma glaucescens* is used to make rope, sacks, and paper; its roots are used as medicine for rheumatism and injury; and its leaves are used as yeast powder to start fermentation when making liquor in Guangdong and Hainan.

**5. *Fissistigma pallens*** (Finet & Gagnepain) Merrill, Philipp. J. Sci. 15: 134. 1919.

苍叶瓜馥木 cang ye gua fu mu

*Melodorum pallens* Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 137. 1906; *Fissistigma petelotii* Merrill.

Climbers to 12 m tall. Branches robust, grayish black, glabrous. Petiole ca. 2 cm, rugose, glabrous; leaf blade oblong, 15–20 × 6–8 cm, papery, abaxially grayish white and sparsely puberulent, adaxially glabrous, secondary veins 13–16 on each side of midvein, reticulate veins apparent, base obtuse to rounded, apex obtuse to acute. Inflorescences leaf-opposed or terminal, 1–3-flowered; peduncle ca. 1.5 cm; bracts triangular. Pedicel ca. 2 cm, puberulent, with triangular bract at base. Sepals triangular, outside puberulent. Petals ovate, ca. 1.5 × 1 cm, puberulent; inner petals slightly smaller than outer petals. Stamens oblong, ca. 2.5 mm; connectives broadly triangular, apex obtuse. Carpels many, cylindric, ca. 5 mm, villous; ovules ca. 30 per carpel, in 2 series; styles oblique, glabrous; stigmas 3-angular, apex entire. Fruit not seen. Fl. Mar–May, fr. Jun–Aug.

Forested slopes; 600–800 m. W Guangxi [Vietnam].

**6. *Fissistigma chloroneurum*** (Handel-Mazzetti) Tsiang, J. Bot. Soc. China 2: 693. 1935.

阔叶瓜馥木 *kuo ye gua fu mu*

*Melodorum chloroneurum* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 61: 83. 1924.

Climbers to 12 m tall. Branches puberulent when young, glabrescent. Petiole 0.8–2 cm, abaxially grooved, glabrous; leaf blade oblong, 14–30 × 5.5–12 cm, papery, abaxially puberulent when young but glabrescent and greenish with age, adaxially dark green and glabrous, secondary veins 15–20 on each side of midvein and adaxially flat, reticulate veins conspicuous, base truncate to shallowly cordate, apex shortly acuminate. Inflorescences leaf-opposed or subopposed, cymose, 2–8-flowered; peduncle 1–2 mm; bracts ovate, pubescent. Pedicel 0.5–2.3 cm, fulvous pubescent, bracteolate at middle. Flower buds broadly ovoid. Sepals triangular, ca. 4 × 4 mm, outside pubescent. Petals yellowish white; outer petals ovate-oblong, ca. 12 × 5(–10) mm, outside fulvous pubescent, inside glabrous; inner petals ovate-triangular, ca. 8(–11) × 4(–7) mm, outside pubescent, inside glabrous. Stamens oblong, ca. 1.2 mm; connectives apically rounded. Carpels ca. 15, ovate-oblong, 2–3 mm, densely pubescent; ovules 10 per carpel, in 2 series; styles short; stigmas ellipsoid, apex entire. Fruiting monocarps globose, subglobose, ellipsoid, or obovoid, 3.5–6 × 3.5–4 cm, glabrous. Seeds 10–20 per monocarp, in 2 series. Fl. Mar–Nov, fr. Jul–Dec.

Open woodland slopes, moist disturbed scrub; 100–900 m. Guangxi, Guizhou, SW Hunan, Yunnan [Vietnam].

**7. *Fissistigma wallichii*** (J. D. Hooker & Thomson) Merrill, Philipp. J. Sci. 15: 137. 1919.

贵州瓜馥木 *gui zhou gua fu mu*

*Melodorum wallichii* J. D. Hooker & Thomson, Fl. Ind. 1: 118. 1855; *Fissistigma oligocarpum* W. T. Wang.

Climbers to 7 m tall. Branchlets ferruginous pubescent when young, glabrescent. Petiole 1–2.5 cm, blackish and minutely transversely wrinkled when dried, pubescent when young, glabrescent; leaf blade oblong-lanceolate, oblong-elliptic, or sometimes obovate-oblong, 7–24 × 2.4–6 cm, thinly leathery, abaxially ferruginous pubescent when young but glabrescent and grayish green with age, adaxially glabrous, secondary veins 10–14 on each side of midvein and adaxially flat, tertiary veins partly parallel and also often irregularly branched, reticulate veins inconspicuous, base rounded, obtuse, or sometimes broadly cuneate, apex obtuse to shortly acuminate. Inflorescences leaf-opposed or alternate, sometimes terminal, cymose, umbel-like, 3–7-flowered, ferruginous pubescent; peduncle short; bracts ovate, pubescent. Pedicel 0.3–2 cm, 1- or 2-bracteolate. Sepals ovate-triangular, ca. 3 × 2.3 mm, outside pubescent, inside glabrous. Petals leathery; outer petals ovate-oblong, 1.5–1.7 × ca. 0.7 cm, outside densely ferruginous pubescent, inside slightly puberulent; inner petals lanceolate, ca. 1.3 × 0.4 cm, inside basally glabrous and concave, apically puberulent. Stamens oblong; connectives ovoid. Carpels 2–6, densely pubescent; ovules 4 per carpel; styles cylindric, incurved; stigmas apically slightly 2-cleft. Monocarps subglobose, ca. 2.8 cm in diam., glabrescent. Fl. Mar–Nov, fr. Jul–Dec.

Densely forested slopes, open forests in valleys; 400–1600 m. W Guangxi, S Guizhou, S Yunnan [NE India].

**8. *Fissistigma tonkinense*** (Finet & Gagnepain) Merrill, Philipp. J. Sci. 15: 136. 1919.

东京瓜馥木 *dong jing gua fu mu*

*Melodorum tonkinense* Finet & Gagnepain, Bull. Soc. Bot. France 53(Mém. 4): 135. 1906; *Fissistigma globosum* C. Y. Wu ex P. T. Li.

Climbers to 8 m tall. Branches grayish black to grayish brown, glabrous. Petiole 0.5–1.5 cm, grayish black, verrucate, abaxially grooved; leaf blade oblong to oblong-ovate, 16–20 × 4–6 cm, papery, abaxially sparsely pubescent when young but glabrescent, adaxially glabrous, secondary veins 10–14 on each side of midvein, obliquely ascending to margin, and adaxially flat, reticulate veins prominent, base rounded, apex shortly acuminate. Inflorescences terminal or axillary, paniculate, puberulent; peduncle 1–3.5 cm, with bracts at base; bracts triangular, margins ciliate. Pedicel 0.5–1.5 cm, bracteolate at base and middle. Sepals broadly triangular, ca. 4 × 5 mm, outside puberulent. Outer petals ovate, ca. 10 × 7.5 mm, margins thickened, puberulent, apex obtuse; inner petals oblong-ovate, ca. 10 × 5 mm, thickened at middle, outside and inside puberulent from middle to apex, inside concave from base to middle. Stamens oblong, ca. 3 mm; connectives ovoid, apex subrounded. Carpels subcylindric, villous; ovules ca. 22 per carpel, in 2 series; styles short; stigmas obliquely ovoid, glabrous, apex 2-cleft. Fruiting pedicel ca. 1.2 cm, fulvous tomentulose; monocarp stipes 1.5–2 cm; monocarps globose, 2–3 cm in diam., densely fulvous tomentulose. Seeds ca. 7 per monocarp, reddish brown, shiny, oblong, flat, ca. 1.5 × 0.9 cm. Fl. Nov–Jan, fr. Mar–May.

Forested slopes; 200–800 m. SE Yunnan [Vietnam].

**9. *Fissistigma latifolium*** (Dunal) Merrill, Philipp. J. Sci. 15: 132. 1919.

大叶瓜馥木 *da ye gua fu mu*

*Unona latifolia* Dunal, Monogr. Anonac. 115. 1817; *Melodorum latifolium* (Dunal) J. D. Hooker & Thomson.

Climbers to 5 m tall. Branches tawny pubescent when young, glabrescent. Petiole 1–1.5 cm, robust, abaxially grooved, tawny pubescent; leaf blade oblong, oblong-elliptic, or obovate, 13–35 × 5–15 cm, papery, abaxially tawny pubescent and more densely so on veins, adaxially puberulent, secondary veins 18–22 on each side of midvein, at ca. 45° to midvein, anastomosing before margin, and adaxially impressed, reticulate veins dense and nearly at 90° to secondary veins, base rounded, apex acute. Inflorescences leaf-opposed, panicles borne on apical branches, to 20 cm, densely tawny pubescent; peduncle 1.5–1.8 cm; bracts broadly ovate, 3–4 × 3–4 mm, abaxially densely tawny pubescent. Pedicel ca. 2 cm, bracteolate at middle. Flower buds ovoid, recurved. Sepals broadly ovate, 5–6 × 5–6 mm, outside densely tawny pubescent. Outer petals outside reddish and basally orange, inside orangish red, ovate, 1.6–2.2 × 1.1–1.5 cm, thickened, outside brown pubescent, inside glabrous; inner petals ovate, 1.2–1.5 × 0.6–0.8 cm, glabrous. Stamens oblong,

ca. 2.5 mm; connectives ovoid, apex obtuse. Carpels oblong, densely villous; ovules 8 per carpel; stigmas pubescent. Monocarp stipes ca. 3 cm, pubescent; monocarp globose, ca. 2 cm in diam., densely brown pubescent. Seeds 4–8 per monocarp. Fl. Mar–Nov, fr. Jun–Jan.

Forested slopes; 500–1200 m. S Yunnan [India, Indonesia, Malaysia, Philippines, Thailand, Vietnam].

**10. *Fissistigma tungfangense*** Tsiang & P. T. Li, *Acta Phytotax.* Sin. 9: 377. 1964.

东方瓜馥木 *dong fang gua fu mu*

Climbers to 6 m tall, most parts densely red tomentose, glabrescent. Petiole 1–1.5 cm; leaf blade spatulate to elliptic-oblong, 5–11 × 1.9–4.1 cm, leathery, abaxially yellowish brown pilose, adaxially glabrous, secondary veins 16–22 on each side of midvein and adaxially impressed, reticulate veins inconspicuous, base rounded to broadly cuneate, margin revolute, apex rounded to retuse. Inflorescences terminal or leaf-opposed, paniculate; peduncle to 28 cm; bracts broadly triangular, red tomentose. Pedicel 2–3 mm, 1- or 2-bracteolate. Flower buds conic, ca. 1.1 cm. Sepals broadly triangular, ca. 4 × 3 mm, glabrous. Outer petals ovate-elliptic, ca. 11 × 5 mm, inside glabrous; inner petals ovate-oblong, ca. 8 × 4 mm. Stamens oblong, ca. 1 mm; connectives conic. Carpels oblong, 1.5–2 mm, sericeous pubescent; ovules 10 per carpel, in 2 series; stigmas glabrous, apex 2-cleft. Fruit not seen. Fl. Oct, fr. Nov–Dec.

• Sparsely forested slopes; 400–600 m. W Hainan.

*Fissistigma tungfangense* is listed as Critically Endangered (CR B1ab(i,ii)) by the *IUCN Red List of Threatened Species* (Version 2010.3; <http://www.iucnredlist.org>; accessed on 8 Oct 2010).

**11. *Fissistigma tientangense*** Tsiang & P. T. Li, *Acta Phytotax.* Sin. 10: 326. 1965.

天堂瓜馥木 *tian tang gua fu mu*

Climbers to 9 m tall. Branchlets densely yellowish pubescent when young, glabrous and lenticellate with age. Petiole 3–5 mm; leaf blade oblong to elliptic-oblong, 8.5–17.5 × 3.2–6 cm, leathery, abaxially yellowish pubescent, adaxially glabrous except for sparsely pubescent midvein, secondary veins 16–18 on each side of midvein, obliquely ascending, anastomosing before margin, and adaxially impressed, base rounded, apex rounded to retuse. Inflorescences leaf-opposed, paniculate, 1–4-flowered, yellowish pubescent; peduncle ca. 1 cm. Pedicel ca. 1.5 cm, bracteolate above middle. Flower buds lanceolate in outline, ca. 2.8 × 0.8 cm. Sepals triangular, ca. 4 × 4 mm, outside pubescent, inside glabrous. Outer petals oblong-lanceolate, ca. 2.5 × 0.8 cm, outside glabrous, inside sparsely pubescent; inner petals narrowly lanceolate, ca. 2.3 × 0.6 cm, glabrous. Stamens oblong; connectives apically truncate. Carpels ovate-oblong, ca. 2.5 mm, densely sericeous pubescent; ovules 6–8 per carpel, in 2 series; stigma apex entire. Monocarp stipes ca. 3 cm, robust; monocarp globose, ca. 1.6 cm in diam., densely yellowish pubescent. Fl. Mar–Nov, fr. Jul–Dec.

• Forested valley slopes; 300–600 m. SW Guangdong, SE Guangxi, Hainan, Yunnan.

**12. *Fissistigma polyanthoides*** (Aug. Candolle) Merrill, *Philipp. J. Sci.* 15: 135. 1919.

小萼瓜馥木 *xiao e gua fu mu*

*Melodorum polyanthoides* Aug. Candolle, *Bull. Herb. Boissier*, sér. 2, 4: 1070. 1904; *Fissistigma minuticalyx* (R. W. MacGregor & W. W. Smith) Chatterjee; *M. minuticalyx* R. W. MacGregor & W. W. Smith.

Climbers to 10 m tall. Branches fulvous pubescent when young, glabrous and lenticellate with age. Petiole 1–1.3 cm, fulvous tomentose; leaf blade oblong, oblong-lanceolate, or sometimes obovate-oblong, 10–23 × 4–10 cm, leathery, abaxially fulvous tomentose, adaxially pubescent or glabrous, secondary veins 14–20 on each side of midvein, obliquely ascending to margin, and adaxially flat, base rounded, apex acute to shortly acuminate. Inflorescences leaf-opposed, subopposed, or sometimes terminal, pseudo-cymose, densely red fulvous tomentulose; peduncle ca. 3 mm; bracts ovate, ca. 1.5 mm, abaxially reddish fulvous tomentulose. Pedicel 1–1.5 cm, 1- or 2-bracteolate above middle. Flower buds conic. Sepals broadly triangular, ca. 3 × 3.5 mm, basally connate, outside tomentose, inside pubescent. Outer petals ovate-triangular, ca. 1.2 × 0.9 cm, outside red fulvous tomentose, inside apically puberulent; inner petals ovate-lanceolate, ca. 10 × 6 mm, outside pubescent, inside glabrous. Stamens oblong-cuneate, ca. 1.5 mm; connectives broadly 3-angular. Carpels ca. 10, sericeous pubescent; stigma apex 2-cleft. Fruiting pedicel ca. 2 cm; monocarp stipes to 4 cm; monocarp globose, ca. 2 cm in diam., densely red fulvous tomentose. Seeds reddish brown, oblong, ca. 1.5 × 0.6 cm. Fl. May–Nov, fr. Aug–Mar.

Densely forested slopes; 500–1600 m. Guizhou, C and S Yunnan [Laos, Myanmar, N Thailand, Vietnam].

**13. *Fissistigma poilanei*** (Jovet-Ast) Tsiang & P. T. Li, *Acta Phytotax.* Sin. 10: 316. 1965.

火绳藤 *huo sheng teng*

*Melodorum poilanei* Jovet-Ast, *Notul. Syst. (Paris)* 9: 82. 1940.

Climbers to 7 m tall. Branches sparsely puberulent when young, glabrous and lenticellate with age. Petiole 1–1.5 cm, pubescent; leaf blade oblong-lanceolate, 6.5–16 × 2–4.5 cm, leathery to thickly papery, abaxially densely grayish brown pubescent, adaxially glabrous except for sparsely puberulent midvein, secondary veins 14–20 on each side of midvein, obliquely ascending, and adaxially flat, base cuneate to broadly cuneate, apex acuminate. Inflorescences leaf-opposed or subopposed, cymose, 2–8-flowered; peduncle 1–3 mm. Pedicel 7–8 mm, ochraceous pubescent, 1- or 2-bracteolate at base to middle. Flower buds broadly ovoid, 4–5 × 4–5 mm. Sepals ovate-triangular, ca. 2 × 2 mm, outside puberulent, inside glabrous. Outer petals ovate-triangular, ca. 9 × 6 mm, outside ochraceous pubescent, inside apically puberulent; inner petals ovate-oblong, ca. 7 × 4 mm, outside pubescent, inside glabrous. Stamens oblong, ca. 1.5 mm; connectives obliquely 3-angular. Carpels oblong, ca. 3 mm, densely hispid; ovules ca. 8 per carpel, in 2 series; stigma apex 2-cleft. Fruiting monocarp globose, ca. 2 cm in diam. Fl. Mar–Dec, fr. Jun–Apr.

Sparsely forested slopes, usually in valleys; 700–1000 m. S and SE Yunnan [Vietnam].

The basionym, *Melodorum poilanei*, was first published in 1938 (Fl. Indo-Chine Suppl. 1: 109) but not validly so.

**14. *Fissistigma acuminatissimum*** Merrill, J. Arnold Arbor. 19: 29. 1938.

尖叶瓜馥木 *jian ye gua fu mu*

Climbers to 8 m tall. Branchlets pubescent when young, glabrescent. Petiole 5–12 mm, densely appressed ferruginous pubescent; leaf blade lanceolate to oblong-lanceolate, 7–17 × 2–4 cm, papery to thinly leathery, abaxially ferruginous pubescent but denser on veins, adaxially glabrous except for pubescent midvein and secondary veins, secondary veins 14–21 on each side of midvein, obliquely ascending to margin, and adaxially impressed, base cuneate to broadly cuneate, apex acuminate. Inflorescences terminal or leaf-opposed, cymose, 1–4-flowered; peduncle 3–4 mm, pubescent; bracts ovate-lanceolate. Pedicel 1–1.5 cm, ferruginous pubescent, bracteolate between base and middle. Sepals ovate-triangular, 6–8 × 3–3.5 mm, outside ferruginous pubescent, inside glabrous. Petals greenish white; outer petals oblong-lanceolate, ca. 20 × 8 mm, outside ferruginous pubescent, inside puberulent; inner petals orbicular, to 16 mm, outside pubescent, inside glabrous, apex rounded. Stamens oblong, ca. 2 mm; connectives 3-angular, apex obtuse. Carpels oblong, pubescent; ovules 6 per carpel, in 2 series; styles oblong, pubescent; stigma apex entire. Monocarp stipes ca. 1 cm; monocarps globose, ca. 1.2 cm in diam., densely golden tomentose. Fl. Mar–Nov, fr. Jun–Dec.

Forested slopes; 900–2000 m. Guangxi, SW Guizhou, S Yunnan [Vietnam].

A fine strong bast fiber obtained from the inner bark of *Fissistigma acuminatissimum* is used to make rope in Yunnan.

**15. *Fissistigma cavaleriei*** (H. Léveillé) Rehder, J. Arnold Arbor. 10: 192. 1929.

独山瓜馥木 *du shan gua fu mu*

*Uvaria cavaleriei* H. Léveillé, Fl. Kouy-Tchéou, 29. 1914–1915.

Climbers to 8 m tall, most parts reddish pubescent. Petiole 6–8 mm; leaf blade oblong-lanceolate to oblong-elliptic, 6.5–16 × 1.8–3.8 cm, thinly leathery to thickly papery, abaxially glabrous, adaxially sparsely pubescent, secondary veins 14–21 on each side of midvein and adaxially impressed, base shallowly cordate, apex acute. Inflorescences leaf-opposed or alternate, cymose, 1–5-flowered. Pedicel 1.5–2 cm, 2-bracteolate at base. Sepals ovate-oblong, ca. 6 mm, reddish tomentose. Petals yellowish; outer petals ovate-oblong, ca. 18 × 7 mm, outside densely reddish tomentose, inside glabrous; inner petals ovate-lanceolate, ca. 13 × 4 mm, glabrous, inside basally concave. Stamens oblong; connectives broadly 3-angular. Carpels densely villous; ovules ca. 7 per carpel, in 2 series; styles oblong, pubescent; stigma apex entire. Fruiting pedicel ca. 1.2 cm, reddish pubescent; monocarp stipes ca. 2.7 cm; monocarps globose, 2–2.5 cm in diam., densely villous. Fl. Mar–Nov, fr. Jun–Dec.

• Densely forested slopes; 500–1500 m. W Guangxi, S Guizhou, SE Yunnan.

**16. *Fissistigma balansae*** (Aug. Candolle) Merrill, Philipp. J. Sci. 15: 130. 1919.

多脉瓜馥木 *duo mai gua fu mu*

*Melodorum balansae* Aug. Candolle, Bull. Herb. Boissier, sér. 2, 4: 1070. 1904; *Fissistigma guinanense* Y. Wan.

Climbers to 6 m tall. Branchlets densely fulvous pubescent when young, glabrescent. Petiole 0.8–2 cm, robust, abaxially grooved, densely brown pubescent; leaf blade oblong, oblong-elliptic, or obovate-oblong, 14–23 × 5–10 cm, thinly leathery, abaxially brown pubescent, adaxially sparsely appressed puberulent or puberulent only on midvein and secondary veins, secondary veins 25–35 on each side of midvein and adaxially flat to impressed when dry, reticulate veins prominent and at ca. 90° to secondary veins, base rounded to broadly cuneate, margin revolute, apex acute, obtuse, or retuse. Inflorescences leaf-opposed, terminal, or extra-axillary, in glomerules, many flowered, fulvous tomentulose; peduncle to 1 cm; bracts ovate, 3.5–5 × 2–3 mm, adaxially tomentulose. Flowers fragrant. Stigma apex entire. Fruiting pedicel ca. 2.5 cm, pubescent; monocarp stipes 1.5–2 cm, densely fulvous tomentulose; monocarps subglobose, ca. 4.4 × 4 cm, sparsely fulvous hispid and with slightly raised tubercles. Seeds brown, oblong, ca. 2.4 × 1.7 cm, with a winged margin. Fl. Mar–May, fr. May–Sep.

Forested slopes; 500–1200 m. SW Guangxi, SE Yunnan [Vietnam].

**17. *Fissistigma xylopetalum*** Tsiang & P. T. Li, Acta Phytotax. Sin. 10: 318. 1965.

木瓣瓜馥木 *mu ban gua fu mu*

Climbers to 8 m tall, most parts densely reddish brown to brown tomentose. Petiole ca. 1 cm; leaf blade ovate-oblong to ovate-elliptic, 7.5–17 × 3.5–6.5 cm, thickly papery, abaxially densely reddish brown to brown tomentose, adaxially glabrous except for pubescent midvein, secondary veins 14–18 on each side of midvein, ascending obliquely to margin, and adaxially flat, base rounded to broadly cuneate, apex acute to obtuse. Inflorescences axillary or leaf-opposed, in glomerules, 3–7-flowered; peduncle ca. 3 mm; bracts 1 or 2, lanceolate, 1.5–2 × ca. 0.3 cm, adaxially pubescent. Pedicel 2–2.5 cm. Sepals triangular, ca. 9 × 6 mm, inside glabrous. Petals yellow to grayish purple, thickened, woody when dry; outer petals ovate-lanceolate, ca. 19 × 7 mm, outside sparsely pubescent and prominently costate, inside glabrous. Stamens oblong, ca. 2 mm; connectives apically subrounded to truncate. Carpels oblong, ca. 4 mm, densely sericeous pubescent; ovules 6 per carpel, in 2 series; stigmas glabrous, apex 2-cleft. Fruiting pedicel ca. 2.5 cm; monocarp stipes ca. 3 mm; monocarps globose, 1.5–2 cm in diam. Seeds 6 per monocarp, in 2 series, reddish brown, ovoid to sometimes globose, flat, ca. 10 × 6–8 mm. Fl. Oct–Dec, fr. May–Jul.

Open woodlands, often on moist riverbanks; 300–500 m. S Guangxi, Hainan, S Yunnan [Vietnam].

**18. *Fissistigma oldhamii*** (Hemsley) Merrill, Philipp. J. Sci. 15: 134. 1919.

瓜馥木 *gua fu mu*

*Melodorum oldhamii* Hemsley, J. Linn. Soc., Bot. 23: 27. 1886; *Fissistigma oldhamii* var. *longistipitatum* Tsiang.

Climbers to 8 m tall. Branchlets fulvous pubescent. Petiole ca. 1 cm, pubescent; leaf blade obovate-elliptic to oblong, 6–13 × 2–5 cm, leathery, abaxially pubescent to glabrescent, adaxially glabrous, secondary veins 10–20 on each side of midvein and adaxially flat, base broadly cuneate to rounded, apex bluntly acute, rounded, or retuse. Inflorescences in glomerules, 1–8-flowered; peduncle ca. 2.5 cm. Flowers ca. 1.5 × 1–1.7 cm. Sepals broadly triangular, 3–5(–7) × 5–6 mm, brown tomentose, apex acute. Petals pale yellow to golden; outer petals ovate-elliptic, 21–24 × 11–12 mm, thicker, outside pubescent, inside glabrous; inner petals ovate-lanceolate, ca. 20 × 6 mm, outside puberulent, inside concave and puberulent, margin ciliate. Stamens oblong, ca. 2 cm; connectives slightly curved. Carpels 24–26, golden hairy; ovules 10 per carpel; styles white; stigma apex 2-cleft. Monocarp stipes 2.5–4 cm; monocarps globose, 1.5–1.8 cm in diam., densely fulvous tomentose. Seeds 4 per monocarp, orbicular. Fl. Apr–Sep, fr. Jul–Feb.

• On shrubs, often along ravines; 500–1500 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Taiwan, SE Yunnan, S Zhejiang.

A fine strong bast fiber is obtained from the inner bark of *Fissistigma oldhamii* and is used to make rope, sacks, and paper; its flowers yield a perfumed oil; the seed oil is used in cosmetics and industry; and its roots are used as medicine for traumatic injury and arthritis.

**19. *Fissistigma polyanthum*** (J. D. Hooker & Thomson) Merrill, Philipp. J. Sci. 15: 135. 1919.

多花瓜馥木 duo hua gua fu mu

*Melodorum polyanthum* J. D. Hooker & Thomson, Fl. Ind. 1: 121. 1855.

Climbers to 8 m tall. Roots black, very aromatic. Branches dark gray to brown pubescent, glabrescent. Petiole 0.8–1.5 cm, blackish and transversely wrinkled when dried, pubescent; leaf blade oblong, obovate-oblong, or sometimes elliptic, 6–17.5 × 2–7.5 cm, thinly leathery, abaxially puberulent, adaxially glabrous, secondary veins 13–18 on each side of midvein and adaxially flat, base rounded to broadly cuneate, apex acute, rounded, or sometimes retuse. Inflorescences axillary, leaf-opposed, or extra-axillary, glomerulate, usually 3–7-flowered, yellowish pubescent; peduncle to 4 mm. Flowers small; pedicel to 1.5 cm, bracteolate between base and below middle. Flowers buds broadly 3-angular, apex acute. Sepals broadly triangular, outside pubescent. Outer petals ovate-elliptic, ca. 12 mm, outside densely fulvous pubescent, inside glabrous; inner petals oblong, ca. 9 mm, apex acuminate. Stamens oblong; connectives 3-angular, apex obtuse. Carpels oblong, villous; ovules 4–6 per carpel, in 2 series; stigma apex entire. Monocarp stipes to 2.5 cm, slender; monocarps globose, ca. 1.5 cm in diam., yellowish pubescent. Seeds reddish brown, ellipsoid, flat. Fl. Jan–Oct, fr. Mar–Dec.

Forested slopes, often in ravines; 100–1200 m. Guangdong, Guangxi, S Guizhou, Hainan, SE Xizang, S Yunnan [Bhutan, India, Myanmar, Vietnam].

The roots of *Fissistigma polyanthum* are used as medicine for rheumatism, traumatic injury, and scabies; its leaves are used for treating asthma and scabies; and the bast fibers are used to make rope. The taxon was first mentioned, but not validly published, as "*Uvaria polyantha*" by Wallich (Numer. List, no. 6467. 1832).

**20. *Fissistigma bracteolatum*** Chatterjee, Kew Bull. [3]: 58. 1948.

多苞瓜馥木 duo bao gua fu mu

Climbers to 10 m tall. Bark grayish black. Branches brown tomentose when young, glabrous and lenticellate with age. Petiole 1–1.5 cm, densely hispid to tomentose; leaf blade ovate-oblong, elliptic-oblong, or obovate-oblong, 9–18 × 3.2–8 cm, leathery, abaxially brown hispid, adaxially glabrous except for hispid midvein, secondary veins 16–20 on each side of midvein, obliquely ascending to margin, and adaxially impressed, main tertiary veins prominent and parallel, reticulate veins inconspicuous, base rounded to broadly cuneate, apex acute and apiculate. Inflorescences mostly leaf-opposed, in subumbellate glomerules, often 10-flowered or more; peduncle 3–10 mm; bracts oblong-ovate, 5–6 × 3–4 mm, abaxially brown tomentulose, adaxially glabrous. Pedicel 1–2 cm, fulvous tomentulose, 1- or 2-bracteolate below middle. Flower buds conic. Sepals ovate, 5–7 × 3–4 mm, outside tomentulose, inside glabrous. Outer petals ovate-triangular to ovate-lanceolate, 13–17 × 7–8 cm, outside fulvous tomentulose, inside glabrous; inner petals ovate-lanceolate, 10–11 × 4–5 mm, outside pubescent, inside glabrous. Stamens oblong; connectives ovoid-triangular. Carpels 4–6, ovate-oblong, ca. 3 mm, densely hispid; ovules 8–10 per carpel, in 2 series; styles elongate, inclining; stigma apex 2-cleft. Monocarp stipes ca. 3 cm; monocarps globose, ca. 1.5 cm in diam., tomentulose. Fl. Mar–Jun, fr. Aug–Nov.

Forested valley slopes, moist scrub; 800–1800 m. SE Yunnan [Myanmar].

**21. *Fissistigma kwangsiense*** Tsiang & P. T. Li, Acta Phytotax. Sin. 10: 323. 1965.

广西瓜馥木 guang xi gua fu mu

Climbers to 6 m tall. Branches densely ferruginous pubescent when young, glabrous and lenticellate with age. Petiole ca. 5 mm, ferruginous tomentose; leaf blade oblong-lanceolate to narrowly oblong, 7–18 × 1.7–3.8 cm, papery, abaxially ferruginous tomentose, adaxially sparsely pubescent but denser along midvein, secondary veins 13–19 on each side of midvein, obliquely ascending, and adaxially impressed, base rounded, apex slightly acute. Inflorescences usually leaf-opposed, sometimes pseudoterminal, in glomerules, several flowered, densely ferruginous tomentose; peduncle very short to almost absent. Pedicel 2-bracteolate. Flower buds ovoid, ca. 1 cm. Sepals ovate-oblong, ca. 6 mm. Outer petals ovate-elliptic, ca. 8 × 4 mm; inner petals oblong-elliptic, smaller than outer petals, margins connivent. Stamen connectives apically long acuminate. Carpels ovate-oblong, villous; ovules ca. 10 per carpel, in 2 series; styles filamentous; stigma apex entire. Fruit not seen. Fl. Feb–Sep, fr. Jun–Nov.

• Densely forested slopes, usually in valleys; 200–500 m. SW Guangxi, SE Yunnan.

**22. *Fissistigma retusum*** (H. Lévillé) Rehder, J. Arnold Arbor. 10: 191. 1929.

凹叶瓜馥木 ao ye gua fu mu

*Melodorum retusum* H. Lévillé, Repert. Spec. Nov. Regni Veg. 9: 458. 1911; *Fissistigma capitatum* Merrill ex H. L. Li.

Climbers to 10 m tall. Branches brown tomentose. Petiole 0.8–1.5 cm, abaxially grooved, densely tomentulose; leaf blade broadly ovate, obovate, or obovate-oblong, 9–26 × 4.5–13 cm, leathery to thinly leathery, abaxially brown tomentose, adaxially tomentulose only on midvein and secondary veins, secondary veins 15–22 on each side of midvein and adaxially ± impressed, tertiary veins prominently parallel, reticulate veins very dense, base rounded, truncate, or sometimes shallowly cordate, apex rounded to retuse and minutely apiculate. Inflorescences ± leaf-opposed, in umbel-like glomerules, 4–8-flowered or more; peduncle 5–10 mm; bracts caducous. Pedicel to 2 cm, bracteolate at middle. Sepals ovate-lanceolate, ca. 1 cm, as long as petals in bud, outside tomentulose, inside glabrous. Outer petals ovate-elliptic, ca. 15 mm, outside tomentulose, inside glabrous; inner petals ovate-lanceolate, shorter than outer petals, glabrous, slightly incurved at base. Stamens oblong; connectives broadly 3-angular. Carpels ca. 1.5 mm, densely sericeous pubescent; ovules ca. 4 per carpel, in 2 series; styles oblong, incurved, pubescent; stigma apex entire. Fruiting pedicel 1.5–2.2 cm, golden tomentulose; monocarp stipes very short; monocarps globose, ca. 3 cm in diam., golden tomentulose. Fl. May–Nov, fr. Jun–Dec.

• Densely forested slopes; 700–2000 m. S Guangdong, Guangxi, Guizhou, Hainan, SE Xizang, Yunnan.

**23. *Fissistigma shangtzeense*** Tsiang & P. T. Li, Acta Phytotax. Sin. 10: 324. 1965.

上思瓜馥木 shang si gua fu mu

Climbers to 8 m tall, most parts fulvous pubescent. Branches lenticellate and glabrous with age. Petiole ca. 1.5 cm; leaf blade obovate, obovate-oblong, or sometimes elliptic, 3–13(–25) × 2–5.5(–8) cm, papery, abaxially fulvous pubescent, adaxially glabrous except for fulvous pubescence on midvein, secondary veins 13–20 on each side of midvein and adaxially impressed, base broadly cuneate to sometimes rounded, apex rounded to retuse. Inflorescences extra-axillary, in glomerules, 2–5-flowered; peduncle to 6 mm; bracts ovate, ca. 1 × 1 mm. Pedicel bracteolate between base and middle. Sepals broadly triangular, ca. 5 × 3 mm. Outer petals ovate, ca. 10 × 6 mm, outside puberulent; inner petals oblong, ca. 6 × 2 mm, outside puberulent, inside glabrous. Stamens oblong; connectives obliquely 3-angular. Carpels oblong-lanceolate, densely sericeous-villous; ovules ca. 10 per carpel, in 2 series; stigmas apically entire. Fruiting pedicel ca. 2 cm; monocarps oblong, ca. 4 × 2 cm, densely brown tomentose. Seeds shiny black, oblong, ca. 5 mm in diam. Fl. Jul–Oct, fr. Oct–May.

• Forested slopes; 600–800 m. S Guangxi.

## 23. *ANNONA* Linnaeus, Sp. Pl. 1: 536. 1753.

番荔枝属 fan li zhi shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Guanabanus* Miller.

Trees or shrubs, with an indument of simple or stellate hairs. Inflorescences terminal, leaf-opposed, extra-axillary, or sometimes cauliflorous, never axillary, 1-flowered or in few-flowered clusters. Pedicel usually short. Sepals 3, small, valvate. Petals 6, in 2 whorls or inner whorl rudimentary or absent, free or connate at base; outer petals valvate, fleshy but leathery when dry, connivent or somewhat spreading, inside basally concave, margin thick; inner petals imbricate or valvate. Stamens many; filament short; connectives apically convex or apiculate. Carpels many, often connate; ovule 1 per carpel, basal; styles clavate; stigmas muriculate. Fruit syncarpous, surface covered with knobs, bulges, spines, or less often smooth. Seeds many per syncarp, embedded in edible pulp.

About 100 species: mostly in tropical America, a few in tropical Africa; seven species (all introduced) in China.

*Annona* includes several trees that have become widely grown for their fruit.

### 1a. Inner petals present.

2a. Carpels glabrous; ripe syncarp smooth ..... 1. *A. glabra*

2b. Carpels pubescent; ripe syncarp with soft prickles.

3a. Leaf blade elliptic, 14–24 cm, secondary veins punctate at base; inner petals glabrous ..... 2. *A. montana*

3b. Leaf blade obovate-oblong to ovate-elliptic, 5–18 cm, secondary veins not punctate at base; inner petals pubescent ..... 3. *A. muricata*

### 1b. Inner petals absent or reduced to minute scales.

4a. Leaf blade abaxially tomentose.

5a. Axillary vegetative buds glabrous; leaf blade adaxially pubescent; leaves associated with flowering branches not auriculate ..... 4. *A. cherimolia*

5b. Axillary vegetative buds pubescent; leaf blade adaxially glabrous; leaves associated with flowering branches auriculate ..... 5. *A. diversifolia*

4b. Leaf blade abaxially pubescent or puberulent when young, glabrescent.

6a. Outer petals outside surface and carpels hairy; ripe syncarp not pruinose, areoles flattened and separated by ± raised ridges; fruit pulp yellowish ..... 6. *A. reticulata*

6b. Outer petals and carpels glabrous; ripe syncarp slightly pruinose, areoles convex and separated by deep grooves; fruit pulp whitish ..... 7. *A. squamosa*

**1. *Annona glabra* Linnaeus, Sp. Pl. 1: 537. 1753.**圆滑番荔枝 *yuan hua fan li zhi*

Trees to 12 m tall, evergreen. Branches glabrous, lenticellate. Axillary leaf buds ovoid, fulvous pubescent, apex obtuse. Petiole 0.8–2.5 cm; leaf blade ovate, elliptic-ovate, elliptic, or oblong, 6–20 × 3–8 cm, papery to thinly leathery, glabrous at maturity, secondary veins 7–12 on each side of midvein and forming a ca. 60° angle with midvein, secondary and reticulate veins prominent on both surfaces when dry, base obtuse to rounded and slightly decurrent onto petiole, apex acute to obtuse. Inflorescences internodal or terminal on a short branchlet, 1-flowered. Flower buds ovoid to subglobose. Pedicel 1.5–2 cm, glabrous. Sepals broadly ovate, 3–4 × 3–4 mm, free, glabrous. Outer petals greenish yellow to pale yellow and inside basally with a red spot, broadly ovate, 1.5–3 × 1.3–2.5 cm, outside glabrous, inside minutely puberulent, apex obtuse; inner petals outside yellow, inside carmine, 1.2–2.5 × 0.7–1.5 cm, minutely puberulent. Stamens oblong, 3–4 mm; connectives apically slightly convex. Carpels connate at anthesis, glabrous. Syncarp yellow to orange, ovoid, 5–12 × 5–8 cm, smooth, apex rounded. Seeds pale reddish brown, 1.3–1.5 cm. Fl. May–Jun, fr. Jul–Aug.

Cultivated; 100–200 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan, Zhejiang [native to tropical America].

The insipid fruit, pond apple, are mostly used for jellies or eaten raw. This tree is tolerant of saline soils and is considered a very troublesome invasive species in coastal areas of Australia.

**2. *Annona montana* Macfadyen, Fl. Jamaica 1: 7. 1837.**山地番荔枝 *shan di fan li zhi*

Trees to 10 m tall, evergreen. Bark purplish brown. Branchlets green and smooth when young. Petiole 1.2–2 cm, adaxially grooved; leaf blade elliptic, papery, abaxially smooth and pale green, adaxially light to dark green, secondary veins 11–16 on each side of midvein, basally punctate, and adaxially slightly concave, base cuneate, apex shortly acuminate. Inflorescences terminal or axillary on apical branchlets, 1- or 2-flowered. Pedicel 2.5–4 cm, robust. Sepals ovate, ca. 6 mm. Outer petals yellowish brown, broadly ovate, apex acute; inner petals orange, shorter than outer petals, apex obtuse. Stamens many; filaments white, flat; anther locules brown; connectives apically dilated. Carpels oblong, 6–7 mm, free at anthesis; ovaries pubescent. Syncarp brownish yellow, ovoid, subglobose, or cordate-ovoid, slightly oblique, 9.5–14 × 9.5–12.5 cm, with dense soft prickles and dark brown hairs; pulp yellowish, aromatic. Fl. May–Jun, fr. Jul–Sep.

Cultivated; 100–200 m. Guangdong, Taiwan [native to W tropical America].

The fruit, mountain soursop, are of a good flavor.

**3. *Annona muricata* Linnaeus, Sp. Pl. 1: 536. 1753.**刺果番荔枝 *ci guo fan li zhi*

Trees to 10 m tall, evergreen. Bark rugose. Petiole short; leaf blade obovate-oblong to ovate-elliptic, 5–18 × 2–7 cm, papery, abaxially greenish and glabrous, adaxially green and shiny, secondary veins 6–13 on each side of midvein and

slightly prominent on both surfaces, base broadly cuneate to rounded, apex acute to obtuse. Inflorescences axillary, 1- or 2-flowered. Flowers ca. 3.8 cm in diam. Pedicel 0.5–2.5 cm, pubescent. Sepals ovate-elliptic to ovate-triangular, 3–5 mm, petals green, later yellowish, inside basally without a red spot; outer petals thick, broadly triangular, 2.5–5 × 2–4 cm, inside finely pubescent, apex acute to obtuse; inner petals ovate-elliptic, 2–4 × 1.5–3.5 cm, slightly thin, imbricate, pubescent, base clawed, apex obtuse. Stamens 4–5 mm; filaments fleshy; connectives apically dilated. Carpels ca. 5 mm, pubescent. Syncarp green, ovoid and often oblique or curved, 10–35 × 7–15 cm, covered with soft prickles, base impressed, apex rounded; pulp white. Seeds brownish yellow, reniform, ca. 2 × 1 cm. Fl. Apr–Jul, fr. Jul–Dec.  $2n = 14, 16$ .

Widely cultivated; 100–400 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [native to tropical America].

The fruit, soursop, is the largest among *Annona* species. It is eaten raw, used in sherbets, and used in drinks. The pulp is also consumed with wine or cognac.

**4. *Annona cherimolia* Miller, Gard. Dict., ed. 8, *Annona* no. 5. 1768.**毛叶番荔枝 *mao ye fan li zhi*

Trees 3–7 m tall, deciduous. Branchlets tomentose, glabrescent. Axillary leaf buds ovoid, apex obtuse. Petiole 6–12 mm; leaf blade ovate, ovate-lanceolate, elliptic, obovate, or rarely orbicular, 5–25 × 2.5–10 cm, thinly papery, abaxially tomentose, adaxially pubescent, secondary veins 11–14 on each side of midvein and forming an angle from 60° to almost 90° with midvein, base rounded to obtuse and slightly decurrent onto petiole, apex obtuse to shortly acuminate. Inflorescences 1–3-flowered. Sepals ovate, 2–4 mm, outside tomentose, inside glabrous. Petals outside greenish yellow to reddish, inside yellowish to whitish and basally purple-spotted, linear-oblong, 1.5–3 cm, tomentose, apex obtuse; inner petals absent or reduced to minute scales. Stamens oblong, 1.2–1.7 mm. Syncarp mostly green, ovoid, cordate, conic, or rarely globose, to 20 × 15 cm, smooth or tuberculate but not furrowed between areoles; pulp white. Seeds blackish brown, turning paler when dry, obovoid, ca. 1 cm, slightly flattened, apex obliquely truncate. Fl. Mar–Jul, fr. Jun–Nov.

Widely cultivated; 100–300 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [native to tropical America].

The fruit, cherimoya, has good dessert qualities and is subacid and delicate. It is eaten raw, used in cooling drinks, and used in sherbets. It contains up to 18.4% sugar, 1.8% protein, and 0.4% fat.

**5. *Annona diversifolia* Safford, Science, n.s., 33: 471. 1911.**异叶番荔枝 *yi ye fan li zhi*

Trees to 8 m tall, deciduous. Branchlets tomentose, glabrescent. Axillary leaf buds ovoid, brown tomentose, apex obtuse. Petiole ca. 1 cm; leaf blade broadly obovate to ovate-lanceolate, 7.5–20 × 3–10 cm, papery, abaxially gray pruinose and brown tomentose, adaxially smooth and glabrous, secondary veins 11–14 on each side of midvein and adaxially flat, base rounded to obtuse, apex rounded. Flowering branches associated with large auriculate leaves. Inflorescences 1–3-flowered.

Flowers ca. 3 cm. Sepals ovate, 2–4 mm, outside tomentose, inside glabrous. Petals reddish; outer petals linear-oblong, 1.5–3 cm, tomentose; inner petals absent. Stamens oblong, ca. 1.5 mm. Syncarp green to reddish, conic, ovoid, or spherical, ca. 20 × 15 cm, tuberculate; pulp white or brownish when ripe. Seeds blackish brown, ovoid to obovoid, ca. 1 cm. Fl. Apr–Aug, fr. Jun–Nov.  $2n = 14$ .

Cultivated; 100–200 m. Guangdong [native to Central America and S Mexico].

This species is cultivated for the fine fruit, ilama, which are eaten raw.

**6. *Annona reticulata* Linnaeus, Sp. Pl. 1: 537. 1753.**

牛心番荔枝 niu xin fan li zhi

Trees to 6 m tall, evergreen. Branchlets grayish sericeous, glabrescent. Axillary leaf buds ovoid, apex obtuse. Petiole 1–1.5 cm; leaf blade oblong-lanceolate, 9–30 × 2–7 cm, papery, pubescent when young but glabrescent, secondary veins 9–18 on each side of midvein, forming an angle of 30°–60° with midvein, and flat, base cuneate to obtuse and slightly decurrent onto petiole, apex acuminate. Inflorescences leaf-opposed or internodal, cymose, several flowered. Flower buds lanceolate, apex obtuse. Sepals ovate, 2–3 mm, outside pubescent, inside glabrous. Petals yellowish green; outer petals oblong-lanceolate, fleshy, outside puberulent, inside glabrous; inner petals absent. Stamens oblong, 1–1.3 mm; connectives apically subtruncate. Carpels oblong, villous; stigmas muriculate. Syncarp turning yellow to reddish, spherical to ovoid, 5–12.5 cm in diam.; areoles ± flat, separated by a reticulation of often raised ridges; pulp yellowish. Seeds blackish brown. Fl. Nov–Feb, fr. Mar–Jun.  $2n = 14$ .

Widely cultivated; 100–200 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [native to tropical America].

The fruit, bullock's-heart or custard-apple, are edible, containing nearly 17% sugar, 1.6% protein, and 0.26% fat.

**7. *Annona squamosa* Linnaeus, Sp. Pl. 1: 537. 1753.**

番荔枝 fan li zhi

Trees, deciduous, to 8 m tall. Bark thin. Branchlets pubescent, glabrescent. Petiole 4–15 mm; leaf blade elliptic-lanceolate, narrowly elliptic, or oblong, 5–17.5 × 2–7.5 cm, thinly papery to membranous, abaxially pale green and puberulent when young but glabrate in age, base obtuse to rounded and slightly decurrent, apex acute to obtuse, lateral veins 8–15 on each side of midvein, adaxially flat. Inflorescences 1-flowered or 2–4-fasciculate. Flowers 2–3 cm, puberulent. Sepals triangular. Outer petals basally green to purple, oblong-lanceolate, 1.5–3 × 0.5–0.8 cm, fleshy, thick, inside concave, keeled on apical half; inner petals absent or reduced to scales, as long as stamens. Stamens oblong, ca. 1 mm; connective broad, apex subtruncate. Carpels oblong, distinct at anthesis; stigmas ovate-lanceolate. Syncarp greenish yellow, slightly pruinose, spherical to ovoid, 5–10 cm in diam., areoles rounded, convex, separated by deep grooves; pulp white. Seeds black-brown, ca. 14 mm. Fl. May–Jul, fr. Jun–Nov.

Widely cultivated; near sea level to 200 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan, Zhejiang [native to tropical America].

The fruit, sugar-apple or sweetsop, is edible. It contains more than 20% sugar, 2.3% protein, and 0.3% fat. The bast fiber is used for paper making; the roots are used medicinally for dysentery; and the seeds yield up to 20% oil.

**24. ROLLINIA A. Saint-Hilaire, Fl. Bras. Merid., ed folio, 1: 23; ed. quarto, 1: 28. 1824.**

萎林果属 lou lin guo shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Trees or shrubs, indument of simple or rarely stellate hairs. Inflorescences few flowered or rarely 1-flowered. Sepals 3, small, valvate, free or rarely connate at base into a cup. Petals 6, in 2 whorls, with each whorl valvate, connate at base; outer petals outside with a spur or wing; inner petals minute. Stamens many; connectives disklike, apex dilated. Carpels many; ovule 1 per carpel, basal. Fruit syncarpous, globose to ovoid. Seeds many per syncarp, usually dark brown to almost black, flat, embedded in edible pulp.

About 42 species: Central America, tropical South America; one species (introduced) in China.

Rainer (Ann. Naturhist. Mus. Wien, B, 108: 191–205. 2007) transferred all species of *Rollinia* to *Annona*, mainly on the basis of preliminary molecular data that nested the two species of *Rollinia* investigated within *Annona*.

**1. *Rollinia mucosa* (Jacquin) Baillon, Adansonia 8: 268. 1868.**

米糕萎林果 mi gao lou lin guo

*Annona mucosa* Jacquin, Observ. Bot. 1: 16. 1764; *Rollinia orthopetala* A. Candolle.

Trees to 10 m tall. Bark grayish brown, with rose-colored tissue below. Petiole 5–10 mm; leaf blade oblong-elliptic, 15–25 × 8–11 cm, leathery, abaxially pubescent, adaxially smooth and glossy, midvein prominent, secondary veins 11–16 on each side of midvein, base slightly cuneate, apex acuminate. Inflorescences 1-flowered. Flowers 2–3.5 cm in diam. Pedicel ca. 2 cm, thick and widening at apex. Sepals broadly triangular, 3–4

mm. Outer petals with conspicuous winglike dorsal appendage; inner petals small and scalelike. Stamens many, ca. 1 mm. Carpels many; styles terminal, short, densely hairy. Syncarp dark green at first, ripening yellow to pale yellow, spherical to oblong, 10–20 × 7–20 cm, with soft protuberances ending in a brown to black fleshy point at apex of each carpel; pulp white or cream, fleshy, with a soft fibrous and mucilaginous texture, juicy and with a pleasant aroma. Seeds dark brown to almost black, ca. 10 × 5 mm. Fl. May–Jun, fr. Jul–Nov.

Cultivated; 100–200 m. Guangdong [native to tropical South America].

This species is grown for the fine fruit, biriba. The abundant fleshy pulp surrounding the seeds is eaten.

## BERBERIDACEAE

小檗科 xiao bo ke

Ying Junsheng (应俊生 Ying Tsun-shen)<sup>1</sup>; David E. Boufford<sup>2</sup>, Anthony R. Brach<sup>3</sup>

Herbs, perennial, or shrubs, rarely small trees, evergreen or deciduous, sometimes rhizomatous or tuberous. Stems with or without spines. Leaves alternate, opposite, or basal, simple, or 1–3 × pinnately or 2–3 × ternately compound; stipules present or absent; venation pinnate or palmate. Inflorescences terminal or axillary, racemes, spikes, umbels, cymes, or panicles, or flowers fascicled or solitary. Flowers pedicellate or sessile, bisexual, radially symmetric; bracteoles or bracts present or absent. Perianth usually 2- or 3-merous, rarely absent. Sepals 6–9, often petaloid, distinct, in 2 or 3 whorls. Petals 6, distinct, flat, hooded, pouched, or spurred; nectary present or absent. Stamens 6, opposite petals; anthers 2-celled, dehiscing by valves or longitudinal slits. Ovary superior, apparently 1-carpellate; ovules numerous, rarely solitary; placentation marginal or appearing basal; style present or absent, sometimes persistent in fruit as a beak. Fruit a berry, capsule, follicle, or utricle. Seeds 1 to numerous, sometimes arillate; endosperm abundant.

Seventeen genera and ca. 650 species: mainly in the north temperate zone and on subtropical mountains; 11 genera and 303 species (272 endemic, one introduced) in China; 17 additional species (15 endemic) are insufficiently known.

Editors' note. The Berberidaceae were to be published in *Flora of China* Volume 7 (2008). However, a problem with the treatment of *Berberis* necessitated postponing publication of the family until the present volume. See the comments under *Berberis*, below.

The family Berberidaceae presents an interesting, distinctive biogeography. The two species of *Achlys* Candolle are disjunctly distributed between E Asia and North America, with one in Japan and Korea and one along the west coast of North America. *Caulophyllum* and *Diphylleia* each contain three species; the former has one species in E Asia and two in North America, the latter has two in E Asia and one in North America. *Sinopodophyllum* and *Plagiorhegma* (if maintained separate from *Podophyllum* Linnaeus and *Jeffersonia* Barton, respectively) are endemic to E Asia, but their closest relatives, *Podophyllum* and *Jeffersonia*, are widely disjunct in E North America. *Epimedium* has a wide, fragmented range from Japan westward to Algeria; the nearest relative, *Vancouveria* C. Morren & Decaisne, is endemic to the Pacific Northwest of North America. *Dysosma* and *Nandina* are endemic to China, and *Ranzania* T. Ito is endemic to Japan.

*Podophyllum cavaleriei* H. Léveillé (Bull. Acad. Int. Géogr. Bot. 14: 142. 1914) is the replaced synonym of *Pilea panzhihuaensis* C. J. Chen et al. (Novon 17: 24. 2007) in the Urticaceae.

Ying Tsunshen. 2001. Berberidaceae. In: Ying Tsunshen, ed., Fl. Reipubl. Popularis Sin. 29: 50–310.

### 1a. Shrubs.

- 2a. Leaves 2 or 3 × pinnately compound; margins of leaflets entire; anthers dehiscing by longitudinal slits; placentation parietal ..... 1. *Nandina*
- 2b. Leaves simple or pinnately compound; margins of leaflets toothed; anthers dehiscing by 2 apically hinged valves; placentation basal.
  - 3a. Leaves simple; branches spiny ..... 2. *Berberis*
  - 3b. Leaves pinnately compound; branches without spines ..... 3. *Mahonia*

### 1b. Perennial herbs.

- 4a. Leaves simple; petals without nectary.
  - 5a. Flowers solitary.
    - 6a. Rhizomes stout; flowers appearing before leaves; fruit a berry, indehiscent ..... 4. *Sinopodophyllum*
    - 6b. Rhizomes slender; flowers appearing with the leaves; fruit a dehiscent capsule ..... 5. *Plagiorhegma*
  - 5b. Flowers 2 or more, in fascicles, umbels, or cymes.
    - 7a. Inflorescences fascicles or umbels; leaves 3–9-parted or -lobed; seeds numerous ..... 6. *Dysosma*
    - 7b. Inflorescences terminal cymes or umbelliform; leaves 2-parted; seeds 2–4 ..... 7. *Diphylleia*
- 4b. Leaves compound (except in few species of *Epimedium*); petals with nectary.
  - 8a. Fruit resembling a berry, actually a naked seed at maturity; inflorescences compound cymes ..... 11. *Caulophyllum*
  - 8b. Fruit capsules or achenes; seeds contained within fruit; inflorescences racemes or panicles.
    - 9a. Plants from rhizomes; margins of leaflets toothed; petals 4, often spurred ..... 8. *Epimedium*
    - 9b. Plants from tubers; margin of leaflets entire; petals 6, nectary-like, spurs absent.
      - 10a. Tubers producing 1 or rarely 2 leaves per year; fruit a dehiscent capsule; seeds with arils ..... 9. *Gymnospermium*
      - 10b. Tubers producing 2–5 leaves per year; fruit an achene, globose, utricular; seeds without arils ..... 10. *Leontice*

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# 1. *NANDINA* Thunberg, Nov. Gen. Pl. 14. 1781.

南天竹属 *nan tian zhu shu*

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

Shrubs, evergreen, without rhizomes. Leaves alternate, 2 or 3 × pinnately compound, estipulate; petioles and petiolules swollen at base; leaflets entire, venation pinnate. Inflorescences terminal or axillary panicles of dozens to hundreds of flowers. Flowers bisexual, 3-merous; bracteoles present. Sepals numerous, spirally arranged. Petals 6, larger than sepals, basally without nectaries. Anthers dehiscing by longitudinal slits; pollen grains prolate, 3-polyporate, exine distinctly reticulate. Ovary ellipsoid; placentation submarginal; style short; stigma entire or crisped. Fruit berries, globose. Seeds 1–3; aril absent.  $2n = 20$ .

One species: E Asia.

*Nandina* is occasionally treated as a separate family, Nandinaceae (Takhtajan, Divers. Classific. Fl. Pl. 1997), or subfamily, Nandinoideae (Loconte in Kubitzki et al., Fam. Gen. Vasc. Pl. 2: 147–151. 1993).

## 1. *Nandina domestica* Thunberg, Nov. Gen. Pl. 14. 1781.

南天竹 *nan tian zhu*

*Nandina domestica* var. *linearifolia* C. Y. Wu ex S. Y. Bao.

Shrubs, evergreen, erect, to 3 m tall, glabrous, few branched. Branchlets reddish when young. Leaves 30–50 cm; leaflets nearly sessile; blades elliptic or elliptic-lanceolate, 2–10 × 0.5–2 cm, weakly leathery, glabrous, base cuneate, apex acuminate. Inflorescences erect, 20–35 cm. Flowers cream or white. Sepals ovate-triangular or ovate-oblong, 1–4 mm. Petals

oblong, ca. 4.2 × 2.5 mm, apex obtuse. Stamens ca. 3.5 mm; anther connective prolonged. Ovary locules 1; ovules 1–3. Carpodium 4–8 mm. Berry red or purplish, 6–8 mm in diam. Seeds grayish or brownish, oblate-spheroidal. Fl. Mar–Jun, fr. May–Nov.  $2n = 20^*$ .

Streamsides in montane forests, roadsides, thickets; below 1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [India, Japan; probably not native in SE North America, West Indies, and South America (Peru)].

# 2. *BERBERIS* Linnaeus, Sp. Pl. 1: 330. 1753.

小檗属 *xiao bo shu*

Ying Junsheng (应俊生 Ying Tsun-shen)

Shrubs, evergreen or deciduous. Branches glabrous or tomentose, spinose or not; spines simple or usually 3–5-fid. Leaves on short shoots, simple, alternate, usually petiolate. Inflorescences solitary or fascicled flowers, racemes, umbels, or panicles. Flowers 3-merous; bracteoles usually 3, caducous, scalelike. Sepals 6, rarely 3 or 9, yellow. Petals 6, yellow, bases nectariferous. Stamens opposite petals; anthers dehiscing by valves; pollen grains subspheroidal, exine reticulate. Ovary symmetrically club-shaped; ovules 1–12, rarely to 15, subbasal; styles very short. Fruit a berry, usually red, dark red, or black, globose, ellipsoid, oblong, ovoid, or obovoid. Seeds 1–10, tan to red-brown or black; aril absent.  $2n = 14$ .

About 500 species: north temperate regions, a few in the S Hemisphere; 215 species (197 endemic, one introduced) in China.

Many species of the genus are grown as ornamental shrubs and used for medicinal purposes.

Editors' note. This treatment of *Berberis* was written solely by the Chinese author, Ying Junsheng. The non-Chinese co-author of the genus was to be Julian Harber (Mytholmroyd, West Yorkshire, U.K.), and the Berberidaceae were to be included in *Flora of China* Volume 7 (2008), but two months before that volume was sent to the printer, Ying rejected Harber's revision, with the result that the Berberidaceae were postponed until the present volume. The treatment provided here is an edited version of the English manuscript provided by Ying and is essentially a translation of his earlier treatment in FRPS (29: 54–214. 2001). It has been edited only to follow the *Flora of China* format, to correct the usage of English, and to correct nomenclatural errors, including errors of bibliographic citation. The taxonomy and data provided in the descriptions and distributions have not been changed. The editors observe that 49 names based on Chinese material have apparently been overlooked or disregarded in this treatment. They are provided as an appendix at the end of the genus. Harber is currently preparing a thorough revision of Chinese *Berberis*, expanded from the joint treatment that was intended to appear in the *Flora of China*; it will include all taxa known to occur in China, will account for all names based on Chinese material, and will be published by Missouri Botanical Garden Press.

1a. Inflorescence an umbel, raceme, or panicle.

2a. Inflorescence an umbel.

3a. Branches densely pubescent ..... 119. *B. weiningensis*

3b. Branches glabrous.

4a. Inflorescences not pedunculate (flowers fascicled at base of peduncle).

5a. Stems, pedicels, and leaves abaxially pruinose, each leaf margin 2–7-aristate-dentate ..... 124. *B. multiserrata*

5b. Stems, pedicels, and leaves abaxially not pruinose, each leaf margin 1–4-spinose-serrate or entire.

6a. Shrubs evergreen; spines 3-fid; each leaf margin 1–4-spinose-serrate, rarely entire, veins raised

on both surfaces; ovules 4 or 5 ..... 125. *B. pulangensis*

- 6b. Shrubs deciduous; spines simple; leaves entire, veins inconspicuous; ovules 1 or 2 ..... 126. *B. thunbergii*
- 4b. Inflorescences pedunculate (flowers not fascicled at base of peduncle).
  - 7a. Sepals in 3 whorls; fruit contracted at middle part, apex usually bent ..... 120. *B. johannis*
  - 7b. Sepals in 2 whorls; fruit not bent at apex.
    - 8a. Leaves narrowly elliptic or obovate-elliptic; fruit contracted at lower part, style persistent; ovules 2 ..... 121. *B. leboensis*
    - 8b. Leaves obovate, obovate-lanceolate, or oblong; fruit not contracted, style not persistent; ovules 4 or 5.
      - 9a. Petals emarginate at apex; leaves obovate or obovate-lanceolate ..... 122. *B. umbratica*
      - 9b. Petals entire at apex; leaves oblong or elliptic ..... 123. *B. gilungensis*
- 2b. Inflorescence a raceme or panicle.
  - 10a. Inflorescence a panicle.
    - 11a. Inflorescence a corymbose panicle.
      - 12a. Leaf blade narrowly obovate or obovate-lanceolate, margin entire; sepals in 3 whorls; petals emarginate at apex; ovules 3 or 4 ..... 198. *B. jiulongensis*
      - 12b. Leaf blade narrowly elliptic, margin 1–4-spinose-serrate on each side; sepals in 2 whorls; petals entire at apex; ovules 1 ..... 199. *B. contracta*
    - 11b. Inflorescence a panicle.
      - 13a. Inflorescence a congested panicle; pedicels 1–2(–3) mm; fruit subglobose ..... 200. *B. aggregata*
      - 13b. Inflorescence a loose panicle; pedicels longer than 2 mm.
        - 14a. Sepals in 3 whorls.
          - 15a. Rachis and peduncle pubescent ..... 201. *B. luhuoensis*
          - 15b. Rachis and peduncle glabrous.
            - 16a. Leaves entire.
              - 17a. Rachis conspicuously flexuose; fruit oblong-ovoid, pruinose, style not persistent ..... 202. *B. sherriffii*
              - 17b. Rachis not flexuose; fruit ovoid, not pruinose, style persistent ..... 203. *B. prattii*
            - 16b. Leaves spinose-serrate.
              - 18a. Leaves abaxially pruinose; inflorescences 2–4 cm; petals entire or slightly emarginate at apex; style not persistent; ovules 3 or 4 ..... 204. *B. beaniana*
              - 18b. Leaves abaxially not pruinose; inflorescences 5–12 cm; petals incised at apex; style persistent; ovules 2 ..... 205. *B. francisci-ferdinandi*
    - 14b. Sepals in 2 whorls.
      - 19a. Branches and rachises pubescent.
        - 20a. Bracts shorter than pedicels; anther connective apiculate; ovules 2 ..... 206. *B. trichiata*
        - 20b. Bracts longer than pedicels; anther connective truncate; ovules usually 3 or 4 ..... 207. *B. gyalica*
      - 19b. Branches and rachises glabrous.
        - 21a. Shrubs deciduous.
          - 22a. Leaves narrowly oblanceolate, thinly papery; petals entire or emarginate at apex ..... 215. *B. beijingensis*
          - 22b. Leaves obovate, papery; petals emarginate at apex.
            - 23a. Leaves up to 6.5 cm; pedicels 5–12 mm; fruit red, pruinose, style not persistent ..... 213. *B. xanthophlaea*
            - 23b. Leaves up to 2.7 cm; pedicels 2–3 mm; fruit dark red to purple-red, not pruinose, style persistent ..... 214. *B. concolor*
        - 21b. Shrubs evergreen or semi-evergreen.
          - 24a. Shrubs evergreen; leaves oblanceolate; fruit black, pruinose ..... 208. *B. kerriana*
          - 24b. Shrubs semi-evergreen; leaves spatulate-cuneate, obovate, or oblong-obovate.
            - 25a. Leaf margin spinose-serrate; style 1–1.5 mm.
              - 26a. Spines usually simple; inflorescences 5–15 cm; petals incised at apex; ovules 2 ..... 209. *B. polyantha*
              - 26b. Spines 3-fid; inflorescences 3–5 cm; petals entire at apex; ovules 4 ..... 210. *B. sikkimensis*
            - 25b. Leaves entire; style 0.5–0.75 mm.
              - 27a. Leaves spatulate-cuneate, apex retuse; bracts shorter than pedicels ..... 211. *B. coryi*
              - 27b. Leaves obovate, apex rounded; bracts subequal to pedicels in length ..... 212. *B. metapolyantha*
    - 10b. Inflorescence a raceme.
      - 28a. Inflorescence a spikelike raceme.
        - 29a. Leaves glabrous.
          - 30a. Leaf margin 2–15-spinose-serrate on each side; fruit black ..... 131. *B. purdomii*
          - 30b. Leaf margin entire; fruit red.
            - 31a. Petals entire at apex ..... 132. *B. vernae*
            - 31b. Petals incised at apex ..... 133. *B. poiretii*
        - 29b. Leaves pubescent.

- 32a. Sepals in 3 whorls.  
 33a. Adaxial surface of leaf rugose, both surfaces pubescent ..... 127. *B. brachypoda*  
 33b. Adaxial surface of leaf not rugose, only abaxially pubescent ..... 128. *B. salicaria*
- 32b. Sepals in 2 whorls.  
 34a. Leaves entire; petals entire at apex; pedicels glabrous ..... 129. *B. gilgiana*  
 34b. Leaf margin aristate-dentate; petals incised at apex; pedicels pubescent ..... 130. *B. stenostachya*
- 28b. Inflorescence a racemose subumbel or raceme.  
 35a. Inflorescence a racemose subumbel.  
 36a. Inflorescences not pedunculate.  
 37a. Sepals in 3 whorls ..... 134. *B. pallens*  
 37b. Sepals in 2 whorls.  
 38a. Leaf margin closely spinose-serrate; petals slightly emarginate at apex; berry ovoid ..... 135. *B. reticulata*  
 38b. Leaves entire or 1–4-spinose-serrate; petals entire or deeply emarginate at apex.  
 39a. Leaves oblong-obovate; spines simple; ovules solitary ..... 136. *B. pruinocarpa*  
 39b. Leaves lanceolate or broadly ovate; spines 3-fid; ovules 2–5.  
 40a. Leaves lanceolate; spines stout, 1–3 cm; petals entire at apex; ovules 2 or 3 ..... 137. *B. hemsleyana*  
 40b. Leaves broadly obovate; spines slender, ca. 1 cm; petals emarginate at apex;  
 ovules 3–5 ..... 138. *B. platyphylla*
- 36b. Inflorescences pedunculate.  
 41a. Sepals in 3 whorls.  
 42a. Inflorescences with leaflike bracts; fruit globose, style persistent ..... 139. *B. sichuanica*  
 42b. Inflorescences without leaflike bracts; fruit oblong, style not persistent.  
 43a. Leaves obovate or broadly obovate; stamens truncate at apex ..... 140. *B. mekongensis*  
 43b. Leaves oblanceolate or narrowly elliptic; stamens apiculate at apex; fruit contracted  
 below middle ..... 141. *B. pseudoamoena*
- 41b. Sepals in 1 or 2 whorls.  
 44a. Sepals in 1 whorl; leaves narrowly oblanceolate, less than 5 mm wide ..... 142. *B. lepidifolia*  
 44b. Sepals in 2 whorls.  
 45a. Stems, rachises, and pedicels conspicuously pruinose ..... 143. *B. calcipratorum*  
 45b. Stems, rachises, and pedicels not pruinose.  
 46a. Leaves leathery.  
 47a. Leaves abaxially not pruinose; fruit obovoid-oblong ..... 146. *B. derongensis*  
 47b. Leaves abaxially pruinose; fruit globose or oblong.  
 48a. Leaves elliptic or oblong-obovate, reticulate veins conspicuous; fruit subglobose;  
 seeds 3 ..... 144. *B. weisiensis*  
 48b. Leaves narrowly obovate, reticulate veins inconspicuous; fruit oblong; seeds 1 ..... 145. *B. amoena*
- 46b. Leaves papery.  
 49a. Leaves entire.  
 50a. Petals incised at apex; stamens truncate at apex ..... 147. *B. papillifera*  
 50b. Petals entire at apex; stamens shortly apiculate at apex.  
 51a. Leaves acute at apex; petals obovate, clawed at base ..... 148. *B. virescens*  
 51b. Leaves obtuse at apex; petals elliptic, not clawed at base ..... 149. *B. integripetala*
- 49b. Leaves spinose-serrate or entire and 1–10-spinose-serrate.  
 52a. Branches and pedicels pubescent ..... 150. *B. tomentulosa*  
 52b. Branches and pedicels glabrous.  
 53a. Leaves oblanceolate, abaxially brown ..... 154. *B. atroviridiana*  
 53b. Leaves abaxially pale green, grayish, or pruinose.  
 54a. Leaves abaxially pruinose; ovules 3 or 4 ..... 151. *B. tischleri*  
 54b. Leaves abaxially not pruinose; ovules 1 or 2.  
 55a. Petals entire at apex; fruit globose ..... 152. *B. silva-taroucana*  
 55b. Petals emarginate at apex; fruit oblong-ellipsoid ..... 153. *B. tsarongensis*
- 35b. Inflorescence a raceme.  
 56a. Racemes not pedunculate.  
 57a. Evergreen or semi-evergreen shrubs.  
 58a. Semi-evergreen shrubs; leaves entire ..... 50. *B. wilsoniae*  
 58b. Evergreen shrubs; leaves spinose-serrate or aristate-dentate.  
 59a. Leaves 1–4-aristate-dentate; stem spines 1.5–6 cm ..... 182. *B. potaninii*  
 59b. Leaves 10–25-spinose-serrate on each side; stem spines 0.6–1.5 cm.  
 60a. Leaves 3–9 × 1–3 cm; fruit oblong-ellipsoid; style persistent, short ..... 183. *B. centiflora*

- 60b. Leaves 0.8–2(–3.5) × 0.5–1.2 cm; fruit subglobose; style not persistent ..... 184. *B. tenuipedicellata*
- 57b. Deciduous shrubs.
- 61a. Sepals in 3 whorls.
- 62a. Leaves rounded or retuse at apex; reticulate veins distinctly raised; anther connective truncate ..... 196. *B. batangensis*
- 62b. Leaves acute or rounded at apex; reticulate veins inconspicuous; anther connective apiculate ..... 197. *B. ignorata*
- 61b. Sepals in 1 or 2 whorls.
- 63a. Sepals in 1 whorl; leaves entire or 1–8-spinose-serrate ..... 185. *B. mouillacana*
- 63b. Sepals in 2 whorls.
- 64a. Leaves entire or rarely few spinose-serrate.
- 65a. Leaves entire.
- 66a. Fruit usually bent, style persistent; petals acute at apex ..... 186. *B. franchetiana*
- 66b. Fruit not bent, style not persistent.
- 67a. Petals incised at apex; leaf margin not revolute, 1.2–3.5 × 0.5–1.4 cm ..... 187. *B. lecomtei*
- 67b. Petals rounded, entire at apex; leaf margin revolute, 1–2 × 0.4–0.8 cm ..... 188. *B. microtricha*
- 65b. Leaves entire, occasionally 1–7-spinose-serrate.
- 68a. Fruit red; style persistent, short ..... 189. *B. dawoensis*
- 68b. Fruit black; style not persistent.
- 69a. Leaves obovate; petals entire at apex ..... 190. *B. heteropoda*
- 69b. Leaves lanceolate; petals slightly emarginate at apex ..... 191. *B. kaschgarica*
- 64b. Leaves spinose-serrate.
- 70a. Petals deeply incised at apex; leaves elliptic, glabrous ..... 192. *B. dielsiana*
- 70b. Petals entire at apex.
- 71a. Ovules 7–11; leaves oblong-orbicular, abaxially grayish white, usually pruinose ..... 42. *B. aemulans*
- 71b. Ovules 1 or 2.
- 72a. Leaf blade elliptic or obovate-elliptic, margin spinose-serrate; bracts ca. 1 mm ..... 193. *B. dictyoneura*
- 72b. Leaf blade obovate, margin remotely spinose-serrate; bracts 4–5 mm.
- 73a. Spines to 2.5 cm; leaves to 5 × 2 cm ..... 194. *B. nutanticarpa*
- 73b. Spines to 5 cm; leaves to 4 × 1.7 cm ..... 195. *B. bracteata*
- 56b. Racemes pedunculate.
- 74a. Leaves entire.
- 75a. Leaves pubescent.
- 76a. Rachises, peduncles, and pedicels pubescent ..... 155. *B. daochengensis*
- 76b. Rachises, peduncles, and pedicels glabrous ..... 156. *B. pubescens*
- 75b. Leaves glabrous.
- 77a. Leaves abaxially pruinose.
- 78a. Leaves oblanceolate; petals slightly emarginate at apex ..... 157. *B. kongboensis*
- 78b. Leaves obovate; petals entire at apex ..... 158. *B. agricola*
- 77b. Leaves not pruinose.
- 79a. Sepals in 3 whorls.
- 80a. Peduncles 1–4 cm; fruit not pruinose, style not persistent ..... 159. *B. forrestii*
- 80b. Peduncles 3–7 cm; fruit pruinose, style persistent ..... 160. *B. racemulosa*
- 79b. Sepals in 2 whorls.
- 81a. Leaves cuneate, obcordate, or oblong-rhombic.
- 82a. Leaves cuneate or obcordate, 0.8–1.4 × 0.6–0.9 cm ..... 161. *B. retusa*
- 82b. Leaves oblong-rhombic, 3.5–8 × 1.5–3.5(–7) cm ..... 162. *B. virgetorum*
- 81b. Leaves elliptic, oblong, obovate, oblong-obovate, or obovate-lanceolate.
- 83a. Style persistent.
- 84a. Leaves oblong-obovate; fruit obovoid, pruinose when mature ..... 163. *B. humidoubrosa*
- 84b. Leaves narrowly obovate; fruit oblong, not pruinose ..... 164. *B. sabulicola*
- 83b. Style not persistent.
- 85a. Fruit oblong or oblong-ellipsoid.
- 86a. Fruit oblong; inflorescences 5–18 cm; leaves subleathery, obovate or oblong-obovate ..... 165. *B. feddeana*
- 86b. Fruit oblong-ellipsoid; inflorescences 2.5–3.5 cm; leaves papery, narrowly obovate-lanceolate or narrowly elliptic ..... 166. *B. haoi*
- 85b. Fruit globose or subglobose.
- 87a. Fruit globose, apex lacunose ..... 167. *B. jamesiana*

- 87b. Fruit ovoid-ellipsoid or subglobose, apex flat ..... 168. *B. iliensis*
- 74b. Leaves spinose-serrate or sometimes entire.
- 88a. Leaves spinose-serrate, sometimes entire; petals entire at apex ..... 169. *B. farreri*
- 88b. Leaves spinose-serrate.
- 89a. Sepals in 3 or 4 whorls.
- 90a. Sepals in 3 whorls; leaves thinly papery, abaxially pale green ..... 170. *B. honanensis*
- 90b. Sepals in 4 whorls; leaves thickly papery, abaxially brown when dry ..... 171. *B. pingwuensis*
- 89b. Sepals in 2 whorls.
- 91a. Style persistent.
- 92a. Petals elliptic, apex emarginate; leaves abaxially not pruinose ..... 172. *B. tianshuiensis*
- 92b. Petals oblong-obovate, apex incised; leaves abaxially pruinose ..... 173. *B. henryana*
- 91b. Style not persistent.
- 93a. Leaves suborbicular to broadly elliptic.
- 94a. Petals emarginate at apex; stem spines simple or 3-fid ..... 174. *B. kansuensis*
- 94b. Petals entire at apex; stem spines absent or simple.
- 95a. Leaves abaxially whitish, slightly pruinose ..... 175. *B. anhweiensis*
- 95b. Leaves abaxially yellow-green, not pruinose ..... 176. *B. dasystachya*
- 93b. Leaves oblong, elliptic, ovate, or obovate.
- 96a. Leaves obovate.
- 97a. Leaves narrowly obovate, abaxially whitish; style persistent, short ..... 180. *B. pseudotibetica*
- 97b. Leaves oblong-obovate, abaxially pale yellow-green; style not persistent ..... 181. *B. dubia*
- 96b. Leaves oblong or elliptic.
- 98a. Leaves oblong to ovate, 5–10 × 2.5–5 cm, abaxially pale green; spines 3-fid ..... 177. *B. amurensis*
- 98b. Leaves elliptic, 1.5–5 × 0.6–1.8 cm; spines absent, simple, or 3-fid.
- 99a. Petals entire at apex; anther connective slightly prolonged, shortly apiculate;  
ovules 5 or 6 ..... 178. *B. shensiensis*
- 99b. Petals slightly emarginate at apex; anther connective not prolonged, truncate;  
ovules 2 ..... 179. *B. hersii*
- 1b. Flowers solitary or fascicled.
- 100a. Flowers solitary.
- 101a. Leaves abaxially pruinose.
- 102a. Sepals in 3 whorls.
- 103a. Petals entire at apex; ovules 3 or 4 ..... 1. *B. candidula*
- 103b. Petals 2-lobate at apex; ovules 6–12.
- 104a. Petals emarginate at apex; fruit ovoid, black, with strict style ..... 2. *B. chrysosphaera*
- 104b. Petals incised at apex; fruit oblong-ovoid, red, with bent style at apex ..... 3. *B. temolaica*
- 102b. Sepals in 2 whorls.
- 105a. Leaves entire; anther connective shortly apiculate; fruit ovoid; ovules 3 or 4(–6) ..... 4. *B. dictyophylla*
- 105b. Leaf margin 1–6-spinose-serrate; anther connective truncate; fruit globose or subglobose;  
ovules 5–8.
- 106a. Plants 1–1.5 m tall; leaf margin 1–7-spinose-serrate; pedicels 3–7 mm; fruit pruinose,  
style persistent ..... 5. *B. approximata*
- 106b. Plants 10–20 cm tall; leaf margin 1- or 2-spinose-serrate; fruiting pedicels to 23 mm;  
fruit not pruinose, style not persistent ..... 6. *B. medogensis*
- 101b. Leaves abaxially not or slightly pruinose.
- 107a. Leaves entire.
- 108a. Sepals in 3 whorls ..... 7. *B. parisepala*
- 108b. Sepals in 2 whorls.
- 109a. Shoots pubescent; petals entire at apex; ovules 6 ..... 8. *B. angulosa*
- 109b. Shoots glabrous; petals 2-lobate at apex; ovules 3–5.
- 110a. Leaves oblong-oblongeolate, oblanceolate, or oblong-obovate.
- 111a. Leaves oblong-oblongeolate; style not persistent ..... 9. *B. qiaojiaensis*
- 111b. Leaves oblanceolate or oblong-obovate; style persistent ..... 10. *B. woomungensis*
- 110b. Leaves obovate, oblong, or elliptic.
- 112a. Leaf blade leathery, margin thickened; anther connective truncate ..... 11. *B. crassilimba*
- 112b. Leaf blade herbaceous, margin not thickened; anther connective apiculate.
- 113a. Fruit obovoid, style persistent; ovules 4 or 5 ..... 14. *B. tsarica*
- 113b. Style not persistent; ovules 3 or 4.
- 114a. Fruit globose; spines 5-fid, conspicuously longer than leaves; pedicels 3–5 mm ..... 12. *B. longispina*

- 114b. Fruit oblong-ovoid or ovoid; spines 3-fid, subequal to or shorter than leaves;  
pedicels 10–30 mm ..... 13. *B. muliensis*
- 107b. Leaf margin spinose-serrate or entire and sometimes 1–6-spinose-serrate.
- 115a. Leaves entire and sometimes 1–6-spinose-serrate.
- 116a. Pedicels 15–30 mm.
- 117a. Pedicels stout, tip bent; fruit large (1.3–1.5 × 1.2–1.3 cm); ovules 11 ..... 15. *B. daiana*
- 117b. Pedicels slender, straight; fruit small (ca. 6.5 × 4–5 mm); ovules 4 or 5 ..... 16. *B. asmyana*
- 116b. Pedicels shorter than 10 mm.
- 118a. Shoots pubescent.
- 119a. Plants 20–30 cm tall; fruit elliptic-ovoid, style persistent; ovules 4 ..... 17. *B. multicaulis*
- 119b. Plants ca. 1 m tall; fruit subglobose, style not persistent; ovules 6 or 7 ..... 18. *B. kangdingensis*
- 118b. Shoots glabrous.
- 120a. Fruit oblong, tip bent; leaves elliptic or oblanceolate ..... 19. *B. campylotropia*
- 120b. Fruit ovoid, oblong-ovoid, or ovoid-globose, tip not bent; leaves obovate or narrowly  
oblanceolate.
- 121a. Petals entire at apex; fruit ovoid; spines 3–5-fid ..... 20. *B. everestiana*
- 121b. Petals emarginate or incised at apex; spines 1–3-fid.
- 122a. Leaves slightly papery, elliptic; ovules solitary ..... 21. *B. mianningensis*
- 122b. Leaves subleathery or papery, narrowly obovate or oblanceolate; ovules 2.
- 123a. Leaf margin applanate; anther connective prolonged; pedicels 5–10 mm;  
style not persistent ..... 22. *B. minutiflora*
- 123b. Leaf margin revolute; anther connective not prolonged; pedicels 1–3 mm;  
style persistent or not ..... 23. *B. graminea*
- 115b. Leaf margin spinose-serrate.
- 124a. Sepals in 3 whorls.
- 125a. Pedicels 4–10 mm; stems densely verruculose; leaves abaxially grayish green ..... 24. *B. verruculosa*
- 125b. Pedicels 15–20 mm; stems sometimes scarcely verruculose; leaves abaxially slightly glaucous ... 25. *B. concinna*
- 124b. Sepals in 2 whorls.
- 126a. Style persistent.
- 127a. Leaves elliptic; fruit ellipsoid, black, not pruinose ..... 26. *B. alpicola*
- 127b. Leaves oblong-ovate; fruit ovoid or oblong-ovoid, red, pruinose ..... 4. *B. dictyophylla*
- 126b. Style not persistent.
- 128a. Spines of stems 3–9-fid.
- 129a. Spines 3–7-fid; petals obtusely emarginate at apex; leaf margin coarsely aristate-dentate ..... 27. *B. sibirica*
- 129b. Spines 3–9-fid; petals entire at apex; leaf margin spinose-serrate ..... 28. *B. erythroclada*
- 128b. Spines of stems 3-fid.
- 130a. Leaves oblanceolate, subleathery; fruit black; ovules 1 or 2 ..... 30. *B. paraspecta*
- 130b. Leaves obovate or elliptic; fruit red.
- 131a. Leaves narrowly obovate; fruit ovoid or oblong-ovoid, 1–1.4 cm; ovules 3 or 4 ..... 13. *B. muliensis*
- 131b. Leaves elliptic or obovate; fruit broadly ellipsoid, to 2 cm; ovules 6 or 7 ..... 29. *B. fengii*
- 100b. Flowers fascicled.
- 132a. Shrubs deciduous.
- 133a. Leaf margin entire or only 1- or 2-spinose-serrate.
- 134a. Shoots, pedicels, and leaf margins pubescent ..... 31. *B. hobsonii*
- 134b. Shoots, pedicels, and leaf margins glabrous.
- 135a. Sepals in 3 whorls ..... 32. *B. reticulineris*
- 135b. Sepals in 2 whorls.
- 136a. Pedicels 20–40 mm; flowers 2–4-fascicled ..... 33. *B. yunnanensis*
- 136b. Pedicels 2–12 mm.
- 137a. Pedicels 2–5 mm; fruit black or red ..... 34. *B. ulicina*
- 137b. Pedicels 8–12 mm; fruit red.
- 138a. Leaf blade elliptic or oblanceolate, margin rarely 1- or 2-spinose-serrate; fruit slightly  
pruinose; ovules 2 ..... 35. *B. mullineris*
- 138b. Leaf blade obovate or suborbicular, margin entire; fruit not pruinose; ovules 3 ..... 36. *B. hypericifolia*
- 133b. Leaf margin spinose-serrate.
- 139a. Pedicels 2–4 mm; ovules solitary ..... 37. *B. tsienii*
- 139b. Pedicels 12–30 mm; ovules 2–11.
- 140a. Petals incised or emarginate at apex.
- 141a. Petals emarginate at apex; veins not conspicuous ..... 38. *B. morrisonensis*

- 141b. Petals incised at apex; veins conspicuous or raised.
- 142a. Leaves oblanceolate; sepals in 3 whorls; ovules 2 ..... 39. *B. yui*
- 142b. Leaves oblong or obovate-oblong; sepals in 2 whorls; ovules 6–10 ..... 40. *B. diaphana*
- 140b. Petals entire at apex.
- 143a. Sepals in 3 whorls ..... 41. *B. circumserrata*
- 143b. Sepals in 2 whorls.
- 144a. Leaf margin 15–40-spinose-serrate; petals obovate; anther connective truncate ..... 41. *B. circumserrata*
- 144b. Leaf margin 5–12-spinose-serrate; petals oblong; anther connective apiculate ..... 42. *B. aemulans*
- 132b. Shrubs evergreen.
- 145a. Leaf margin entire or 1- or 2-spinose-serrate.
- 146a. Stems without spines or with very weak spines.
- 147a. Stems without spines; leaves broadly oblong-ovate, abaxially not pruinose, stramineous when dry; branches dark gray ..... 43. *B. hypoxantha*
- 147b. Stems without spines or with very weak spines; leaves abaxially pruinose or glaucous.
- 148a. Leaves leathery, oblong-obovate or oblong-elliptic, apex obtuse, abaxially glaucous; shoots stramineous ..... 44. *B. holocraspedon*
- 148b. Leaves thickly leathery, elliptic, narrowly elliptic, or oblanceolate, apex acuminate, abaxially slightly pruinose; shoots dark purple ..... 45. *B. ziyunensis*
- 146b. Stems with spines, usually 3-fid.
- 149a. Ovules 3–5.
- 150a. Leaves obovate or obovate-spatulate, 0.6–2.5 cm; fruit globose ..... 50. *B. wilsoniae*
- 150b. Leaves elliptic, lanceolate, or oblanceolate, to 3–7 cm; fruit ellipsoid or oblong.
- 151a. Leaf blade elliptic or oblanceolate, to 3 cm, margin conspicuously revolute; style not persistent ..... 51. *B. taliensis*
- 151b. Leaf blade lanceolate or oblong-elliptic, to 7 cm, margin not revolute; style persistent, short ..... 52. *B. subholophylla*
- 149b. Ovules 1 or 2.
- 152a. Petals entire at apex; leaves 3.5–7 cm wide ..... 46. *B. pingshanensis*
- 152b. Petals emarginate at apex; leaves less than 2 cm wide.
- 153a. Flowers 2–4-fascicled; leaves obovate ..... 47. *B. obovatifolia*
- 153b. Flowers 6–15-fascicled; leaves oblong-elliptic, oblong-lanceolate, or oblanceolate.
- 154a. Leaves oblanceolate, 8–16 mm wide, abaxially not pruinose ..... 48. *B. wuyiensis*
- 154b. Leaves oblong-elliptic to oblong-lanceolate, 3–5(–8) mm wide, abaxially pruinose ..... 49. *B. replicata*
- 145b. Leaf margin spinose-serrate or spinose-dentate, rarely entire.
- 155a. Leaves elliptic, oblong, ovate, or obovate.
- 156a. Petals entire at apex.
- 157a. Sepals in 3 whorls.
- 158a. Leaf margin 1–3-aristate-dentate on each side; pedicels to 3.5 cm ..... 90. *B. dongchuanensis*
- 158b. Leaf margin spinose-serrate; pedicels to 2 cm.
- 159a. Leaf margin flat, 2–6-spinose-serrate on each side; pedicels 10–20 mm; ovules 3 or 4 .... 91. *B. parapruinosa*
- 159b. Leaf margin slightly revolute, 12–16-spinose-serrate on each side; pedicels 1–4 mm; ovules solitary ..... 92. *B. jinshajiangensis*
- 157b. Sepals in 2 whorls.
- 160a. Flowers 7–15-fascicled; sepals lanceolate; petals oblong; leaves elliptic, ovate, or obovate .... 93. *B. kawakamii*
- 160b. Flowers 3–8-fascicled; sepals ovate, obovate, or ovate-elliptic; petals obovate.
- 161a. Leaf margin 10–25-spinose-serrate on each side; berry not pruinose ..... 94. *B. bicolor*
- 161b. Leaf margin 3–10-spinose-serrate on each side; berry pruinose.
- 162a. Leaves ovate-elliptic, abaxially not pruinose; outer sepals ovate ..... 95. *B. chunanensis*
- 162b. Leaves elliptic, abaxially pruinose; outer sepals obovate ..... 96. *B. jinfoshanensis*
- 156b. Petals emarginate or incised at apex.
- 163a. Petals incised at apex.
- 164a. Ovules solitary.
- 165a. Leaf margin flat, 3–7-spinose-serrate; flowers 2–6-fascicled; petals obovate ..... 97. *B. hayatana*
- 165b. Leaf margin revolute, 6–15-spinose-serrate; flowers 5–20-fascicled; petals ovate ..... 98. *B. cavaleriei*
- 164b. Ovules 2 or 3.
- 166a. Leaf blade rhombic-elliptic to lanceolate, margin 20–40-spinulose-serrate on each side; petals obovate-spatulate ..... 99. *B. aristatoserrulata*
- 166b. Leaf blade elliptic or elliptic to obovate, margin 1–16-spinose-serrate on each side; petals ovate or obovate.

- 167a. Leaf blade elliptic, margin 12–16-spinose-serrate on each side, abaxially not pruinose; flowers 2–5-fascicled; style persistent, short ..... 100. *B. silvicola*
- 167b. Leaf blade elliptic to obovate, margin 1–6-aristate-dentate on each side, rarely entire, abaxially pruinose; flowers 8–25-fascicled; style not persistent ..... 101. *B. pruinosa*
- 163b. Petals emarginate at apex.
- 168a. Sepals in 3 whorls.
- 169a. Leaf blade elliptic or narrowly elliptic, margin revolute, abaxially pruinose; ovules 4 ..... 102. *B. laojunshanensis*
- 169b. Leaf blade oblong or oblong-elliptic, margin flat, abaxially not pruinose.
- 170a. Leaf margin 15–25-spinose-serrate on each side; berry not pruinose, style not persistent; ovules 1 or 2 ..... 103. *B. sargentiana*
- 170b. Leaf margin 5–18-spinose-serrate on each side; berry pruinose, style persistent; ovules 2 or 3.
- 171a. Flowers 3–7-fascicled; petals cuneate at base; berry dark purple ..... 104. *B. lempergiana*
- 171b. Flowers 7–20-fascicled; petals clawed at base; berry red ..... 105. *B. soulieana*
- 168b. Sepals in 2 whorls.
- 172a. Stem spines absent or very weak; leaves oblong or narrowly elliptic ..... 106. *B. impedita*
- 172b. Stem spines 3-fid.
- 173a. Flowers 30–50-fascicled; ovules 5 or 6 ..... 107. *B. hsiyunensis*
- 173b. Flowers less than 25-fascicled; ovules 1–5.
- 174a. Ovules solitary.
- 175a. Leaf margin 20–30-spinose-serrate on each side; flowers 6–20-fascicled; style not persistent ..... 108. *B. deinacantha*
- 175b. Leaf margin 6–16-spinose-serrate on each side; flowers 3–7-fascicled; style persistent, short.
- 176a. Leaves abaxially not pruinose; flowers 3–5-fascicled; berry not pruinose ..... 109. *B. valida*
- 176b. Leaves abaxially pruinose; flowers 5–7-fascicled; berry pruinose ..... 110. *B. nemorosa*
- 174b. Ovules 2–5.
- 177a. Style persistent.
- 178a. Leaf margin 1–6-spinose-serrate on each side.
- 179a. Leaf blade oblong-elliptic, margin 2–10-spinose-serrate on each side; berry ellipsoid or obovoid, not pruinose ..... 111. *B. chingii*
- 179b. Leaf blade elliptic, broadly elliptic, or obovate, margin 1–4-spinose-serrate on each side, rarely entire; berry ovoid, pruinose ..... 112. *B. vinifera*
- 178b. Leaf margin 7–40-spinose-serrate on each side.
- 180a. Leaf blade elliptic, margin 20–40-spinose-serrate on each side; ovules 1 or 2; berry pruinose ..... 113. *B. dumicola*
- 180b. Leaf blade oblong-elliptic to lanceolate, margin 7–15-spinose-serrate on each side; ovules 4 or 5; berry not pruinose ..... 114. *B. fallax*
- 177b. Style not persistent.
- 181a. Flowers 10–17-fascicled; pedicels to 35 mm; ovules 2; leaf margin spinose-serrate ..... 118. *B. malipoensis*
- 181b. Flowers 2–6-fascicled; pedicels less than 15 mm; ovules 3–5; leaf margin sinuate or flat.
- 182a. Leaf margin sinuate, conspicuously revolute, abaxially brown, not pruinose ... 115. *B. guizhouensis*
- 182b. Leaf margin flat, abaxially pruinose or slightly so.
- 183a. Leaf blade oblong-obovate, margin 3- or 4-spinose-serrate on each side; pedicels 12–15 mm; berry pruinose ..... 116. *B. lijiangensis*
- 183b. Leaf blade elliptic or ovate-oblong, margin 12–25-spinose-serrate on each side; pedicels 7–13 mm; berry not pruinose ..... 117. *B. xanthoclada*
- 155b. Leaves linear, lanceolate, elliptic-lanceolate, or oblanceolate.
- 184a. Leaves linear or linear-lanceolate.
- 185a. Leaf blade 4–15 cm × 2–10 mm, margin conspicuously revolute, 3–26-spinulose-serrate on each side; ovules 1 or 2 ..... 53. *B. insolita*
- 185b. Leaf margin not conspicuously revolute; ovules 2–4.
- 186a. Leaf blade 1.5–16 cm × 3–6 mm, margin 4–17-spinulose-serrate on each side, adaxially dark green; ovules 2 or 3 ..... 54. *B. sanguinea*
- 186b. Leaf blade 6–9 cm × 10–15 mm, margin 12–24-spinose-serrate on each side, adaxially shiny; ovules 4 ..... 55. *B. lubrica*

- 184b. Leaves lanceolate, elliptic-lanceolate, or oblanceolate.
- 187a. Sepals in 3 whorls.
- 188a. Petals emarginate or incised at apex.
- 189a. Pedicels 5–15 mm; ovules 4 or 5.
- 190a. Leaves  $1.5-3 \times 0.3-0.5$  cm; petals elliptic or oblong; style persistent, short ..... 62. *B. multiovula*
- 190b. Leaves  $5-11 \times 1-2$  cm; petals obovate; style not persistent ..... 63. *B. gagnepainii*
- 189b. Pedicels 10–35 mm; ovules 2(–4).
- 191a. Leaves oblong-lanceolate or narrowly elliptic, abaxially slightly pruinose; flowers 2–6-fascicled ..... 64. *B. triacanthophora*
- 191b. Leaves lanceolate, abaxially not pruinose; flowers 4–16-fascicled.
- 192a. Leaves  $6-15 \times 1.3-4$  cm; petals emarginate at apex; anther connective truncate; ovules 2 ..... 65. *B. xingwenensis*
- 192b. Leaves  $5-11 \times 1-2$  cm; petals incised at apex; anther connective rounded; ovules 2–4 ..... 66. *B. veitchii*
- 188b. Petals entire at apex.
- 193a. Berry subglobose; ovules 5–7; shoots dark red ..... 56. *B. insignis*
- 193b. Berry ellipsoid, oblong, or obovoid; ovules 1–5.
- 194a. Ovules 2–5; style not persistent.
- 195a. Petals obtusely emarginate at apex, clawed at base; ovules 4 or 5 ..... 60. *B. delavayi*
- 195b. Petals rounded, entire at apex, not clawed at base; ovules 2 ..... 61. *B. davidii*
- 194b. Ovules solitary; style persistent, conspicuous.
- 196a. Pedicels 8–12(–20) mm; petals elliptic; berry red ..... 57. *B. wangii*
- 196b. Pedicels 15–22 mm; petals obovate or ovate-elliptic; berry black.
- 197a. Leaf margin pectinate-spinose-serrate; petals ovate-elliptic; berry not pruinose ..... 58. *B. pectinocraspedon*
- 197b. Leaf margin spinose-serrate, petals obovate; berry pruinose ..... 59. *B. kunmingensis*
- 187b. Sepals in 2 whorls.
- 198a. Stems without spines.
- 199a. Leaf margin 15–20-spinose-serrate on each side; berry globose, red, not pruinose, style not persistent ..... 67. *B. pingbienensis*
- 199b. Leaf margin 2–4-aristate-dentate on each side; flowers 2–10-fascicled; berry pomiform or ellipsoid, purplish black, pruinose, style persistent ..... 68. *B. griffithiana*
- 198b. Stems with 3-fid spines.
- 200a. Ovules solitary.
- 201a. Funicles  $3-6 \times$  longer than ovules; berry ovoid, red ..... 69. *B. sublevis*
- 201b. Funicles equal to or shorter than ovules; berry ellipsoid, oblong, obovoid, or globose.
- 202a. Petals entire at apex.
- 203a. Branches purplish brown; flowers 6–12-fascicled; anther connective truncate; style not persistent ..... 70. *B. wuliangshanensis*
- 203b. Branches yellow or yellow-brown; flowers 10–20-fascicled; anther connective rounded; style persistent.
- 204a. Sepals ovate; petals clawed at base ..... 71. *B. vernalis*
- 204b. Sepals lanceolate; petals cuneate at base ..... 72. *B. levis*
- 202b. Petals emarginate or incised at apex.
- 205a. Petals incised at apex; berry ovoid-ellipsoid or ovoid-globose ..... 73. *B. bergmanniae*
- 205b. Petals emarginate at apex; berry oblong or ellipsoid.
- 206a. Leaf margin more than 25-spinose-serrate on each side.
- 207a. Leaf blade narrowly lanceolate, 9–16 cm, margin 25–35-spinose-serrate on each side; berry not pruinose ..... 74. *B. iteophylla*
- 207b. Leaf blade elliptic-lanceolate, 4–9 cm, margin 35–60-spinose-serrate on each side; berry pruinose or not ..... 75. *B. ferdinandi-coburgii*
- 206b. Leaf margin less than 20-spinose-serrate on each side.
- 208a. Leaf margin conspicuously revolute; pedicels 3–4 cm or 4–12 mm ..... 76. *B. grodtmanniana*
- 208b. Leaf margin flat; pedicels 8–20 mm.
- 209a. Anther connective not prolonged; berry pruinose, style persistent ..... 77. *B. julianae*
- 209b. Anther connective prolonged; berry sometimes pruinose, style not persistent ..... 78. *B. liophylla*
- 200b. Ovules 2–4.
- 210a. Petals entire.

- 211a. Leaf blade abaxially pruinose, margin 2–7-aristate-dentate on each side; pedicels 10–25 mm; berry obovoid, style persistent ..... 79. *B. taronensis*
- 211b. Leaf blade abaxially not pruinose, margin 8–14-spinose-serrate on each side; berry ellipsoid, style not persistent.
- 212a. Shoots purplish red; leaves lanceolate; fruit stalks 10–15 mm; berry slightly pruinose ..... 80. *B. photiniifolia*
- 212b. Shoots pale yellow; leaves elliptic or elliptic-lanceolate; fruit stalks 10–15 mm; berry sometimes pruinose ..... 81. *B. fujianensis*
- 210b. Petals emarginate or incised.
- 213a. Petals deeply incised; berry ovoid ..... 82. *B. atrocarpa*
- 213b. Petals emarginate; berry ellipsoid or obovoid.
- 214a. Berry obovoid.
- 215a. Leaf blade lanceolate, margin 10–20-spinose-serrate on each side; flowers 5–30-fascicled; style persistent ..... 83. *B. zanlanscianensis*
- 215b. Leaf blade elliptic-lanceolate, margin 15–30-spinose-serrate on each side; flowers 2–5-fascicled; style not persistent ..... 84. *B. fallaciosa*
- 214b. Berry ellipsoid.
- 216a. Leaf margin conspicuously revolute; flowers 6–25-fascicled ..... 85. *B. amabilis*
- 216b. Leaf margin flat; flowers 2–8-fascicled.
- 217a. Leaf margin 30–60-spinose-serrulate on each side; berry not pruinose; pedicels red ..... 86. *B. arguta*
- 217b. Leaf margin 4–25-spinose-serrate on each side; berry pruinose.
- 218a. Leaf blade abaxially pruinose, margin 4–7-spinose-serrate on each side; pedicels 6–10 mm; style persistent, short ..... 87. *B. jiangxiensis*
- 218b. Leaf blade abaxially not pruinose, margin 8–25-spinose-serrate on each side; pedicels 10–25 mm; style not persistent.
- 219a. Leaf blade leathery, lanceolate, 10–17 × 2–2.5 cm, margin 10–25-spinose-serrate on each side ..... 88. *B. weixinensis*
- 219b. Leaf blade subleathery, lanceolate or elliptic-lanceolate, 4–9 × 1.2–2.2 cm, margin 8–15-spinose-serrate on each side ..... 89. *B. subacuminata*

**1. *Berberis candidula*** (C. K. Schneider) C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 402. 1905.

单花小檗 *dan hua xiao bo*

*Berberis hookeri* Lemaire var. *candidula* C. K. Schneider, Ill. Handb. Laubholz. 1: 303. 1904.

Shrubs, evergreen, ca. 1 m tall. Stems gray-brown, verruculose; young shoots pale green; spines 3-fid, subterete, 1–1.5 cm. Petiole very short or leaf subsessile; leaf blade adaxially very shiny, deep green, elliptic to ovate, 1–2 × 0.5–1 cm, thickly leathery, abaxially white pruinose, both surfaces inconspicuously reticulate veined, base cuneate, margin conspicuously revolute, 1–4-spinose-serrate on each side, apex acuminate. Flowers solitary. Pedicels 4–10 mm, glabrous. Sepals in 3 whorls; outer sepals yellowish red, oblong-ovate, ca. 4 × 2 mm, apex acute; median sepals oblong-obovate, ca. 7 × 5 mm; inner sepals obovate, ca. 10 × 8 mm. Petals obovate, ca. 8 × 6 mm, base cuneate, glands ovate, apex entire. Stamens ca. 5 mm; anther connective prolonged, truncate. Ovules 3 or 4. Berry ellipsoid, 8–9 × 4–5 mm, thinly pruinose, style not persistent. Fl. Apr–May, fr. Jun–Sep.

• Montane roadsides, thickets; 1200–3000 m. Hubei, Sichuan.

**2. *Berberis chrysosphaera*** Mulligan, Bull. Misc. Inform. Kew 1940: 77. 1940.

黄球小檗 *huang qiu xiao bo*

Shrubs, evergreen. Mature stems dark red, sparsely verruculose; internodes 1.5–3 cm; spines 3-fid, 1–2 cm, sulcate. Leaves subsessile; leaf blade adaxially shiny, dark green, elliptic or obovate-elliptic, 1.5–4 cm × 4–10 mm, leathery, abaxially pruinose, not veined, finely papillose, adaxially ± not veined, base attenuate, margin conspicuously revolute, 5–12-spinose-serrate on each side, apex acuminate. Flowers solitary. Pedicels 1.8–2.5 cm. Sepals in 3 whorls; outer sepals ovate, ca. 4 × 3 mm, apex acute; median sepals obovate-elliptic, ca. 7 × 6 mm; inner sepals ca. 10 × 8 mm. Petals obovate, ca. 8 × 6 mm, basal glands oblong, apex slightly emarginate. Stamens ca. 5 mm; anther connective slightly prolonged, truncate. Ovules 9–12. Berry black, ovoid, ca. 10 × 6 mm, slightly pruinose, style not persistent. Fl. May, fr. Oct–Nov.

• Granite cliffs in valleys, forest understories; 2700–3000 m. SE Xizang.

**3. *Berberis temolaica*** Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941 [*“telomaica”*].

林芝小檗 *lin zhi xiao bo*

*Berberis temolaica* var. *artiseppala* Ahrendt.

Shrubs, deciduous, to 2 m tall. Stems dark purple, terete, glabrous, not verruculose; internodes 1.5–3 cm; spines 3-fid, pale purplish brown, 5–15 mm, slightly sulcate. Petiole 1–4 mm or leaf subsessile; leaf blade adaxially dark blue-green, slightly pruinose, oblong-obovate, 2–4.2 × 0.8–1.5 cm, papery, abax-

ially white pruinose, adaxially slightly pruinose, abaxially inconspicuously reticulate veined, adaxially with branched veins, base cuneate, margin entire, sometimes 1–5-aristate-dentate on each side, apex rounded. Flowers solitary. Pedicels 8–13 mm, pruinose. Sepals in 3 whorls; outer sepals ovate, ca.  $5 \times 3.2$  mm, pruinose, apex acute; median sepals obovate, ca.  $7 \times 5$  mm; inner sepals obovate-orbicular, ca.  $8 \times 7.5$  mm. Petals broadly obovate, ca.  $7 \times 6$  mm, base with separate glands, apex emarginate. Stamens ca. 4 mm; anther connective slightly prolonged, truncate or obtuse. Ovules 7–9. Berry red when mature, oblong-ovoid,  $11\text{--}14 \times 6\text{--}7$  mm, pruinose, apex bent; style persistent, short. Fl. Jun–Jul, fr. Aug–Sep.

- *Abies* forests; ca. 4000 m. Xizang.

#### 4. *Berberis dictyophylla* Franchet, Pl. Delavay. 39. 1889.

刺红珠 ci hong zhu

Shrubs, deciduous, 1–2.5 m tall. Stems blackish gray or yellow-brown; young shoots purplish red, subterete, pruinose or not; spines 3-fid, sometimes simple, pale yellow or grayish, 1–3 cm. Leaves subsessile; leaf blade adaxially dark green, narrowly obovate, oblong, or elliptic,  $1\text{--}2.5 \text{ cm} \times 6\text{--}8$  mm, thickly papery or subleathery, abaxially white pruinose or not pruinose, both surfaces with raised lateral and reticulate veins, base cuneate, margin entire, apex rounded or obtuse. Flowers solitary. Pedicels 3–10 mm, sometimes pruinose. Sepals in 2 whorls; outer sepals linear-oblong, ca.  $6.5 \times 2.5$  mm; inner sepals oblong-elliptic,  $8\text{--}9 \times \text{ca. } 4$  mm. Petals narrowly obovate, ca.  $8 \times 3\text{--}6$  mm, base clawed, with widely separated glands, apex entire. Stamens 4.5–5 mm; anther connective slightly prolonged, shortly apiculate. Ovules 3–6. Berry red, ovoid, ovoid-globose, or oblong-ovoid,  $9\text{--}14 \times 6\text{--}8$  mm, pruinose; style persistent, sometimes bent. Fl. May–Jun, fr. Jul–Sep.

- Mountain slopes, thickets, forest understories, river beaches, streamsides, forest margins, roadsides; 2500–4800 m. Qinghai, Sichuan, Xizang, Yunnan.

- 1a. Branchlets usually pruinose; leaf blade narrowly obovate or oblong, abaxially pruinose; ovules 3 or 4; fruit ovoid or ovoid-globose ..... 4a. var. *dictyophylla*
- 1b. Branchlets not pruinose; leaf blade elliptic, abaxially not pruinose; ovules 5 or 6; fruit oblong-ovoid ..... 4b. var. *epruinosa*

#### 4a. *Berberis dictyophylla* var. *dictyophylla*

刺红珠(原变种) ci hong zhu (yuan bian zhong)

Branchlets subterete, usually pruinose. Leaf blade narrowly obovate or oblong, abaxially pruinose. Ovules 3 or 4. Fruit ovoid or ovoid-globose.

- Mountain slopes, thickets, forest understories, river beaches, forest margins; 2500–4000 m. Sichuan, Xizang, Yunnan.

#### 4b. *Berberis dictyophylla* var. *epruinosa* C. K. Schneider in Sargent, Pl. Wilson. 1: 353. 1913.

无粉刺红珠 wu fen ci hong zhu

*Berberis ambrozyana* C. K. Schneider.

Branchlets slightly sulcate, not pruinose. Leaf blade elliptic, abaxially not pruinose. Ovules 5 or 6. Fruit oblong-ovoid.

- Mountain thickets, forest margins, forest understories, roadsides, streamsides; 2500–4800 m. Qinghai, Sichuan, Xizang, Yunnan.

#### 5. *Berberis approximata* Sprague, Bull. Misc. Inform. Kew 1909: 256. 1909.

近似小檗 jin si xiao bo

*Berberis dictyophylla* Franchet var. *approximata* (Sprague) Rehder; *B. stiebriana* C. K. Schneider.

Shrubs, deciduous, 1–1.5 m tall. Stems dark brown, angulate, glabrous, sparsely verruculose; shoots reddish brown; spines 3-fid, gray or pale yellow, 1–2.1 cm, adaxially subsulcate. Leaf blade adaxially pale green, narrowly obovate, obovate, or narrowly elliptic,  $1\text{--}2.2 \text{ cm} \times 4\text{--}7$  mm, papery, abaxially pruinose, conspicuously reticulate veined, base cuneate, margin entire or 1–7-spinose-serrate on each side, apex rounded or acute. Flowers solitary. Pedicels 3–7 mm, glabrous. Sepals in 2 whorls; outer sepals elliptic, ca.  $4.5 \times 3$  mm; inner sepals obovate,  $6\text{--}7 \times 3.5\text{--}4$  mm. Petals obovate or elliptic, ca.  $5 \times 3.2$  mm, base clawed, with closely spaced glands, apex slightly emarginate; lobes acute. Stamens ca. 3.5 mm; anther connective truncate. Ovules 4–6, shortly funiculate. Berry red, ovoid,  $8\text{--}10 \times 6\text{--}7$  mm, slightly pruinose, style persistent. Fl. May–Jun, fr. Sep–Oct.

- Mountain slopes, thickets, forests, forest margins; 2900–4300 m. Qinghai, Sichuan, Xizang, Yunnan.

This species is a dominant species of thickets in the Xiangcheng region of Sichuan.

#### 6. *Berberis medogensis* T. S. Ying, Acta Phytotax. Sin. 37: 350. 1999.

矮生小檗 ai sheng xiao bo

Shrubs, low, 10–20 cm tall. Stems pale yellow, shiny, glabrous, sulcate; young branchlets dark purple, conspicuously sulcate; spines 3-fid, concolorous, 3–13 mm. Leaves subsessile; leaf blade adaxially dark green, obovate,  $7\text{--}13 \times 3\text{--}5$  mm, papery, abaxially thickly pruinose, abaxially with conspicuously raised midvein and lateral veins, reticulate veins inconspicuous, adaxially with slightly raised midvein, base cuneate, margin thickened but not revolute, 1- or 2-spinose-serrate on each side, apex aristate-cuspidate. Flowers unknown. Fruit solitary; fruit stalks dark purple, to 2.3 cm, glabrous; berry red, subglobose, ca.  $1.1 \times 1$  cm, not pruinose, style not persistent; seeds 6 or 7. Fl. unknown, fr. Nov.

- Alpine thickets; 3300–3400 m. Xizang (Mêdog).

#### 7. *Berberis parisepala* Ahrendt, Gard. Chron., ser. 3, 109: 100. 1941.

等萼小檗 deng e xiao bo

*Berberis everestiana* Ahrendt var. *nambuensis* Ahrendt.

Shrubs, deciduous, to 1.5 m tall. Branches dark gray-brown, pubescent, markedly sulcate, not verruculose; shoots brownish; spines weak, 3-fid, rarely simple or 5-fid, 4–16 mm.

Petiole 2–5 mm; leaf blade shiny, abaxially pale green, adaxially yellow-green, obovate or narrowly obovate, 1.5–2.8 × 0.6–1.2 cm, papery, abaxially with slightly raised midvein, both surfaces with inconspicuous lateral and reticulate veins, base cuneate, margin entire or rarely 1–3-spinose-serrate on each side, apex rounded. Flowers solitary. Pedicels 5–12 mm, pubescent; bracteoles yellow, ovate, ca. 1.3 mm, apex acute. Sepals in 3 whorls, equal in size, 8–9 × 6.5–7.5 mm. Petals ca. 7.5 × 4 mm, basal glands separate, apex emarginate. Stamens ca. 5 mm; anther connective not prolonged, truncate. Ovules 4. Berry red, ellipsoid, 10–11 × 7–8 mm, not pruinose, style persistent. Fl. May–Jun, fr. Sep–Oct.

Thickets, alpine meadows; 3600–3900 m. Xizang [Bhutan, Myanmar, Nepal].

**8. *Berberis angulosa*** Wallich ex J. D. Hooker & Thomson, Fl. Ind. 1: 227. 1855.

有棱小檗 *you leng xiao bo*

Shrubs, deciduous, to 2 m tall. Branches dark brown, pubescent, sulcate; shoots yellow-brown, puberulous; spines simple or 3(or 5)-fid, 7–12 mm, slender, rarely puberulous. Leaf blade abaxially shiny, pale yellow-green, adaxially shiny, yellow-green, obovate, 1.5–2.5 × 0.7–1.4 cm, papery, both surfaces glabrous, inconspicuously veined, base cuneate, margin entire, apex obtuse or acute. Flowers solitary. Pedicels pendulous, 3–5 mm, pubescent; bracteoles ovate, ca. 3.5 × 2 mm, apex acuminate. Sepals in 2 whorls; outer sepals elliptic, ca. 5.5 × 3.5 mm; inner sepals obovate, ca. 9.2 × 6.1 mm. Petals obovate, ca. 6 × 4.8 mm, base clawed, glands separate and oblong, apex entire, rounded. Stamens ca. 4 mm; anther connective slightly prolonged, rounded. Ovules 6, subsessile. Berry shiny, red, subglobose, 10–12 × 9–12 mm, not pruinose, style persistent or not. Fl. May–Jun, fr. Jul–Aug.

Sparse forests, thickets, grasslands; 3500–4500 m. Qinghai, Xizang [NE India, Nepal].

**9. *Berberis qiaojaensis*** S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 1. 1985.

巧家小檗 *qiao jia xiao bo*

Shrubs, deciduous, small, 30–50 cm tall. Branches dark brown, terete, black verruculose; shoots purplish red, angulate; spines 3-fid, concolorous, slender, adaxially slightly sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially shiny, deep green, oblong-oblancheolate, 1–1.3 cm × 4–5 mm, papery, abaxially with markedly raised midvein and lateral veins, reticulate veins inconspicuous, not pruinose, purplish red, base cuneate, margin thickened, entire, apex rounded. Flowers unknown. Berry solitary, ellipsoid or oblong-ellipsoid, 1–1.2 cm × 5–7 mm, slightly pruinose, style not persistent; seeds 4. Fl. unknown, fr. Oct.

• Grasslands at mountain summits; ca. 3300 m. Yunnan.

**10. *Berberis woomungensis*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 4. 1985.

乌蒙小檗 *wu meng xiao bo*

Shrubs, deciduous, to 1 m tall. Branches brown, black

verruculose; shoots curved, brownish red, sulcate; spines 3-fid, 1–1.7 cm, adaxially slightly sulcate, yellow-brown. Leaves sessile; leaf blade abaxially pale green, adaxially green, oblong-obovate or oblanceolate, 1–2 cm × 5–7 mm, papery, abaxially not pruinose, midvein raised, reticulate veins not conspicuous on both surfaces, base attenuate, margin entire, apex rounded or acute. Flowers solitary. Pedicels 5–10 mm, glabrous. Sepals in 2 whorls; outer sepals oblong, ca. 7 × 3–4 mm; inner sepals oblong-elliptic, ca. 6 × 4 mm. Petals oblong-obovate, ca. 4 × 2 mm, base clawed and with approximate oblanceolate glands, apex emarginate with acute lobes. Stamens ca. 4 mm; anther connective not prolonged, truncate. Ovules 3, shortly funiculate. Berry red, oblong, ca. 10 × 5–6 mm, slightly pruinose, style not persistent. Fl. May, fr. Nov.

• Thickets; 3700–4400 m. Yunnan.

**11. *Berberis crassilimba*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 2. 1985.

厚檐小檗 *hou yan xiao bo*

Shrubs, evergreen, to 1 m tall. Branches gray-brown, terete, not verruculose; shoots purplish red, sulcate; spines 3-fid, dark yellow-brown, ca. 1.5 cm, adaxially slightly sulcate. Leaves subsessile; leaf blade adaxially green, oblong to obovate, ca. 1.2 × 0.5 cm, leathery, adaxially not pruinose, midvein and lateral veins conspicuous, base cuneate, margin thickened, entire, apex rounded, mucronate. Flowers solitary. Pedicels 4–8 mm, glabrous. Sepals in 2 whorls; outer sepals oblong-elliptic, ca. 7 × 3.5 mm, apex obtuse; inner sepals broadly obovate, ca. 7 × 5 mm, apex rounded. Petals obovate, 5–6 × 2.5–3 mm, base clawed, with separate oblong glands, apex emarginate. Stamens 3–3.5 mm; anther connective truncate. Ovules 3, funiculate. Berry globose or ellipsoid, 5–7 × 5–6 mm, not pruinose, style not persistent. Fl. Mar–Jun, fr. Oct.

• Open slopes; ca. 3600 m. Sichuan, Yunnan.

**12. *Berberis longispina*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 148. 1985.

长刺小檗 *chang ci xiao bo*

Shrubs, deciduous, 70–80 cm tall. Branches purplish red, sulcate, not verruculose; spines 5-fid, pale brown, 1.3–2 cm, adaxially sulcate. Leaves subsessile; leaf blade abaxially pale yellow-green, adaxially dark green, oblong-obovate, 4–9 × 2–3 mm, papery, abaxially not pruinose, veins inconspicuous, adaxially glabrous, base attenuate, margin entire, apex acute. Flowers solitary. Pedicels 3–5 mm, glabrous; bractlets lanceolate, ca. 3 × 1 mm. Sepals in 2 whorls; outer sepals oblong, ca. 4 × 2 mm; inner sepals obovate, ca. 4.5 × 2.2 mm. Petals obovate, ca. 3.8 × 1.5 mm, base with separate glands, apex emarginate. Stamens ca. 2.1 mm; anther connective acute. Ovules 3. Berry red, globose, ca. 7 × 7 mm, not pruinose, style not persistent. Fl. May, fr. Jun–Aug.

• Beside springs on shaded slopes; 4000–4100 m. Xizang.

**13. *Berberis muliensis*** Ahrendt, Bull. Misc. Inform. Kew 1939: 268. 1939.

木里小檗 *mu li xiao bo*

Shrubs, deciduous, to 2 m tall. Branches gray-brown, sulcate, not pruinose; shoots shiny, red; internodes 2–5 cm; spines 3-fid, yellow-brown, 1.5–3 cm, slender, sometimes absent. Petiole 2–3 mm; leaf blade abaxially sometimes grayish green, adaxially dark green, narrowly obovate or oblong-obovate, 1.5–3 × 0.3–1.1 cm, papery, abaxially pruinose, midvein raised, adaxially with slightly impressed midvein, both surfaces with conspicuous lateral and reticulate veins, base cuneate, margin applanate-entire or spinose-serrate, apex rounded or acute. Flowers solitary. Pedicels 1–3 cm, not pruinose; bractlets yellow, broadly obovate, ca. 2.5 × 2.5 mm. Sepals in 2 whorls; outer sepals ovate, 7–8 × 4–5 mm, apex acute; inner sepals obovate, 9–10 × 6–7 mm. Petals obovate, ca. 6.5 × 5.5 mm, base with narrowly elliptic glands, apex shortly emarginate. Stamens ca. 5 mm; anther connective prolonged, apiculate. Ovules 3 or 4. Berry red, ovoid or oblong-ovoid, 10–14 × 6–9 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Aug–Sep.

• Thickets, forests, river beaches by forest margins, grassy slopes, rocky slopes; 2800–4300 m. Sichuan, Xizang, Yunnan.

- 1a. Leaves entire ..... 13a. var. *muliensis*  
1b. Leaves spinose-serrate ..... 13b. var. *atuntzeana*

### 13a. *Berberis muliensis* var. *muliensis*

木里小檗(原变种) mu li xiao bo (yuan bian zhong)

*Berberis capillaris* Cox ex Ahrendt; *B. ludlowii* Ahrendt; *B. ludlowii* var. *capillaris* (Cox ex Ahrendt) Ahrendt; *B. ludlowii* var. *deleica* (Ahrendt) Ahrendt; *B. macrosepala* J. D. Hooker & Thomson var. *deleica* Ahrendt; *B. tianbaoshanensis* S. Y. Bao.

Leaf margin entire.

• Thickets, *Abies* forests, river beaches by forest margins; 2800–4300 m. Sichuan, Xizang, Yunnan.

13b. *Berberis muliensis* var. *atuntzeana* Ahrendt, Bull. Misc. Inform. Kew 1939: 269. 1939.

阿墩小檗 a dun xiao bo

*Berberis ludlowii* var. *saxiclivicola* Ahrendt; *B. muliensis* var. *beimanica* Ahrendt.

Leaf margin 2–7-spinose-serrate on each side.

• Thickets, grassy slopes, rocky slopes, forests, forest margins; 3100–4200 m. Sichuan, Xizang, Yunnan.

14. *Berberis tsarica* Ahrendt, J. Bot. 79(Suppl.): 48. 1941.

隐脉小檗 yin mai xiao bo

Shrubs, deciduous, low, less than 1 m tall. Branches dark purplish red or dark black, sometimes pale yellow, sulcate; shoots pubescent; internodes 5–10 mm; spines 3–5-fid, weak, 3–11 mm. Leaves sessile; leaf blade abaxially grayish or grayish white, adaxially dark green, obovate, 5–12 × 2–5 mm, herbaceous, abaxially pruinose, base cuneate, margin entire, apex obtuse. Flowers solitary. Pedicels 4–7 mm, glabrous or sparsely puberulous; bractlets red, ovate, ca. 2.3 × 1 mm, apex acute.

Sepals in 2 whorls; outer sepals ovate, 3.5–5 × 2.5–3 mm, apex acute; inner sepals oblong-obovate, 5–6.5 × 3.5–4 mm. Petals oblong-obovate, 3.5–4 × 2–2.3 mm, base cuneate with oblong-elliptic glands, apex emarginate with 2 acute lobes. Stamens 2.5–3 mm; anther connective slightly prolonged, truncate or rounded. Ovules 3 or 4, shortly funiculate. Berry obovoid, 8–9 × ca. 6 mm; style persistent, short. Fl. Jun, fr. Oct.

• Alpine thickets, thicket-meadows; 3900–4400 m. Xizang.

15. *Berberis daiana* T. S. Ying, Acta Phytotax. Sin. 37: 345. 1999.

城口小檗 cheng kou xiao bo

Shrubs, semi-evergreen, 0.5–1 m tall. Branches gray-brown, sulcate, sparsely black verruculose; shoots pale yellow, glabrous; spines 3(or 5)-fid, concolorous, 5–12 mm, slender. Petiole usually red, 2–5 mm; leaf blade abaxially pale yellow-green, adaxially deep green, elliptic-obovate or obovate, 2–5 × 1.2–2.2 cm, papery, both surfaces glabrous, abaxially not pruinose, midvein conspicuously raised, adaxially with complanate midvein, both surfaces with markedly raised reticulate veins, base cuneate, margin entire or inconspicuously 3–8(–20)-spinose-serrate on each side, sometimes conspicuously 10–20-spinose-serrate on each side, apex rounded. Flowers solitary. Pedicels 1.5–2.5 cm, stout, glabrous, tip bent. Sepals in 2 whorls; outer sepals elliptic, 7.5–8 × 4.5–5 mm; inner sepals broadly obovate-elliptic, 7–7.2 × ca. 5 mm. Petals obovate, ca. 6 × 4 mm, base clawed and with separate elliptic glands, apex narrowly incised with acute lobes. Stamens ca. 3 mm; anther connective prolonged, rounded. Ovules 11. Fruit stalk curved at apex, stout, glabrous. Berry red, subglobose, 1.3–1.5 × 1.2–1.3 cm, slightly pruinose, style not persistent; seeds 6 or 7. Fl. Jun, fr. Aug–Sep.

• Thickets on mountain slopes, weedy places, rock crevices; 2200–2500 m. Sichuan.

16. *Berberis asmyana* C. K. Schneider in Sargent, Pl. Wilson. 1: 357. 1913.

直梗小檗 zhi geng xiao bo

Shrubs, evergreen, to 1.5 m tall. Branches brownish gray, sulcate, sparsely black verruculose; spines 3-fid, weak, pale yellow, terete, 3–9 mm. Leaves subsessile; leaf blade abaxially pale green, adaxially shiny, deep green, elliptic or obovate-elliptic, 1–3 × 0.6–1 cm, thinly leathery, abaxially not pruinose, midvein markedly raised, adaxially with impressed midvein, both surfaces with inconspicuous secondary and reticulate veins, base cuneate, margin occasionally entire, otherwise 1–4-spinose-serrate on each side, apex acute. Flowers solitary. Pedicels straight, 2–4 cm, slender, glabrous; bractlets ovate, ca. 1.8 mm. Sepals in 2 whorls; outer sepals ovate, ca. 3 × 2.5 mm; inner sepals obovate-orbicular, ca. 5 × 4.5 mm. Petals obovate, ca. 4.5 × 3.2 mm, base clawed and with approximate glands, apex slightly emarginate. Stamens ca. 3.2 mm; anther connective truncate. Ovules 4 or 5, sessile. Berry ellipsoid, (6.5–)7–8 × 4–5 mm, slightly pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

• Mountain thickets, grassy slopes; 3000–3200 m. Sichuan.

**17. *Berberis multicaulis*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 147. 1985.

多枝小檗 duo zhi xiao bo

Shrubs, small, 20–30 cm tall, much branched. Branches dark gray, sulcate; shoots pale yellow, puberulous, sparsely verruculose; spines 3-fid, pale brown or pale yellow, 5–14 mm, slender, puberulous. Leaves subsessile; leaf blade abaxially shiny, pale yellow-green, adaxially green, obovate or elliptic, 7–16 × 4–6 mm, papery, abaxially with conspicuously raised midvein, adaxially with slightly raised midvein, lateral veins 2–4 pairs, both surfaces with inconspicuous reticulate veins, not pruinose, base cuneate, margin slightly thickened, puberulous, becoming glabrous, margin entire or 1–3-spinose-serrate on each side, apex obtuse, acute, or mucronate. Flowers solitary. Pedicels 2–3 mm, glabrous; bractlets oblong-lanceolate, ca. 4 × 1.8 mm. Sepals in 2 whorls; outer sepals oblong, ca. 5 × 3 mm, apex acute; inner sepals obovate-oblong, ca. 8 × 4 mm. Petals elliptic, ca. 6 × 3.2 mm, base clawed and with separate glands, apex emarginate. Stamens ca. 4 mm; anther connective prolonged, shortly apiculate and with 1 tooth. Ovules 4. Berry red, ovoid-ellipsoid, ca. 8 × 4 mm, slightly pruinose, with short style. Fl. Jun, fr. Aug.

• Thickets on sunny slopes, grassy slopes; 3500–4200 m. Xizang.

**18. *Berberis kangdingensis*** T. S. Ying, Acta Phytotax. Sin. 37: 349. 1999.

康定小檗 kang ding xiao bo

Shrubs, deciduous, ca. 1 m tall. Stems with closely spaced branches; branches pale yellow-brown, terete or subangular, puberulous, sparsely black verruculose; spines (3 or) 5-fid, pale yellow, 5–10 mm, slender. Leaves subsessile; leaf blade abaxially yellow-green, adaxially green, narrowly elliptic or obovate-elliptic, 7–11 × 2–4 mm, papery, abaxially not pruinose, midvein conspicuously raised, adaxially with raised midvein, both surfaces with markedly raised reticulate veins, base cuneate, margin entire or occasionally 1- or 2-spinose-serrate on each side, apex acute. Flowers solitary. Pedicels 4–5 mm, glabrous. Sepals in 2 whorls; outer sepals elliptic, ca. 4.5 × 3.5 mm; inner sepals obovate-oblong, ca. 5.5 × 4.1 mm. Petals obovate, ca. 5 × 3.1 mm, base cuneate and with separate elliptic glands, apex emarginate. Stamens ca. 3 mm; anther connective slightly prolonged, rounded, obtuse. Ovules 6 or 7. Berry subglobose, ca. 9 × 8 mm, thickly pruinose, style not persistent. Fl. Jun, fr. Oct–Nov.

• Rock crevices on mountain slopes; 2600–3400 m. Sichuan.

**19. *Berberis campylotropa*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 152. 1985.

弯果小檗 wan guo xiao bo

Shrubs, deciduous, to 1.3 m tall. Branches dark gray or purplish brown, subsulcate, black verruculose; shoots pale red; spines 3-fid or simple, weak, 4–8 mm. Leaves subsessile; leaf blade abaxially grayish white, adaxially dark green, elliptic or oblanceolate, 0.8–2 cm × 3–8 mm, papery, abaxially with markedly raised midvein, adaxially with complanate midvein,

lateral veins 3 or 4 pairs, both surfaces not pruinose, with conspicuous reticulate veins, base cuneate, margin entire or remotely 1–5-spinose-serrate on each side, apex acute. Flowers solitary, sometimes 2- or 3-fascicled. Ovules 2 or 3. Berry red, oblong, 1–1.2 cm × 4–5 mm, slightly pruinose, with bent style. Fl. unknown, fr. Aug.

• Mountain slopes, roadsides; ca. 3700 m. Xizang.

**20. *Berberis everestiana*** Ahrendt, J. Linn. Soc., Bot. 57: 116. 1961.

珠峰小檗 zhu feng xiao bo

Shrubs, deciduous, 20–30 cm tall. Branches purplish black, sulcate, glabrous; shoots pale purplish red; internodes 6–10(–20) mm; spines 3–5-fid, sometimes simple, 8–12 mm. Leaves shortly petiolate; leaf blade abaxially pale yellow-green, adaxially green, obovate, ca. 12 × 4 mm, papery, abaxially not pruinose, base attenuate, margin entire, apex rounded or acute. Flowers solitary. Pedicels 5–9 mm, glabrous; bractlets lanceolate, ca. 4 × 1 mm. Sepals in 2 whorls; outer sepals 6–7 × 4–4.5 mm; inner sepals 7–8 × 5–6 mm. Petals 6–6.5 × 3–3.5 mm, apex entire. Stamens ca. 3 mm; anther connective slightly prolonged, truncate. Ovules 3 or 4. Berry ovoid, 7–10 × 4–6 mm, without or with an extremely short style; seeds purple. Fl. Jun, fr. Aug–Sep.

Narrow valley slopes, valley floors, rocky soils, alpine thickets, alpine meadows; 3800–5000 m. Xizang [Nepal].

**21. *Berberis mianningensis*** T. S. Ying, Acta Phytotax. Sin. 37: 347. 1999.

冕宁小檗 mian ning xiao bo

Shrubs, deciduous, ca. 50 cm tall. Branches dark gray, sulcate, not verruculose; shoots pale yellow, glabrous; spines simple or 3-fid, pale yellow, terete, ca. 1 cm, slender. Leaves subsessile; leaf blade abaxially pale yellow-green, adaxially green, elliptic or narrowly elliptic, occasionally oblanceolate, 1–2 cm × 2–4 mm, papery, abaxially not pruinose, with conspicuously raised midvein, adaxially with slightly raised midvein, with 3 or 4 pairs of lateral veins, both surfaces with inconspicuous reticulate veins, base cuneate, margin entire or 1–3-spinose-serrate on each side, apex acute or rounded. Flowers solitary. Fruit green (immature), obovoid-ellipsoid, 8–9 × 4–5 mm, not pruinose, style persistent and short; seeds 1. Fl. unknown, fr. Jul–Aug.

• Thickets; 2600–2700 m. Sichuan.

**22. *Berberis minutiflora*** C. K. Schneider, Ill. Handb. Laubholz. 2: 914. 1912.

小花小檗 xiao hua xiao bo

*Berberis angulosa* Wallich ex J. D. Hooker & Thomson var. *brevipes* Franchet; *B. brevipes* (Franchet) C. K. Schneider (1908), not Greene (1901); *B. minutiflora* var. *glabramea* Ahrendt; *B. minutiflora* var. *yulungshanensis* S. Y. Bao.

Shrubs, deciduous, to 1.5 m tall. Branches pale yellow, glabrous, sulcate, scarcely black verruculose; shoots dark purple, initially pubescent, becoming glabrous; spines 3-fid, 4–12

mm. Leaves subsessile; leaf blade adaxially deep green, narrowly obovate or oblanceolate, 10–20 × 2.5–4 mm, thickly papery or subleathery, abaxially papillate, not pruinose, adaxially glabrous, both surfaces with inconspicuous reticulate veins, base cuneate, margin entire or 1–3-spinose-serrate on each side, apex acute. Flowers solitary. Pedicels 5–10 mm, slender; bractlets red, ovate, ca. 1.4 cm, apex acute. Sepals in 2 whorls; outer sepals oblong-ovate, ca. 4 × 2.2 mm, apex obtuse; inner sepals oblong-obovate, ca. 5.5 × 3 mm. Petals ca. 4.5 × 2.5 mm, base not clawed, with separate glands, apex incised with acute lobes. Stamens ca. 2.2 mm; anther connective slightly prolonged, rounded. Ovules 2. Berry red, ovoid or ovoid-ellipsoid, 6–9(–12) × 5–7 mm, sometimes slightly pruinose, style not persistent. Fl. Apr–Jun, fr. Sep–Oct.

• Thickets, grassy slopes, rocky slopes, *Pinus densata* forests; 2500–3800 m. Sichuan, Xizang, Yunnan.

**23. *Berberis graminea*** Ahrendt, J. Bot. 80(Suppl.): 110. 1942.

狭叶小檗 *xia ye xiao bo*

Shrubs, deciduous, low, ca. 30 cm tall. Branches purplish brown; shoots dark green, sparsely black verruculose, glabrous; spines simple, 3(or 5)-fid, concolorous, 6–12 mm. Leaves subsessile; leaf blade abaxially grayish green, adaxially dark green, narrowly obovate, 8–20 × 2–6 mm, papery, abaxially slightly pruinose, scarcely papillose, adaxially with veins branched, scarcely reticulate, base cuneate, margin entire, occasionally 2- or 3-spinose-serrulate on each side, conspicuously revolute, apex acute or near rounded. Flowers solitary. Pedicels 1–3 mm, glabrous; bractlets oblong-elliptic, ca. 2.5 mm. Sepals in 2 whorls; outer sepals oblong-ovate, ca. 5 × 3 mm; inner sepals elliptic-obovate, 6–6.5 × 5–5.3 mm. Petals ca. 5.3 × 4–4.5 mm, base with separate, elliptic glands, apex incised with rounded lobes. Stamens ca. 2 mm; anther connective not prolonged, truncate. Ovules 2. Berry red, oblong, 6–8 × 4–5 mm, not pruinose; style persistent and short, or not persistent. Fl. May–Jun, fr. Sep–Oct.

• Grassy mountain slopes, *Pinus* forests; 3000–3600 m. Sichuan.

**24. *Berberis verruculosa*** Hemsley & E. H. Wilson, Bull. Misc. Inform. Kew 1906: 151. 1906.

疣枝小檗 *you zhi xiao bo*

Shrubs, evergreen, to 1 m tall. Branches brownish yellow, terete, densely verruculose; shoots yellow green, densely pubescent and verruculose; spines pale yellow, 1–2 cm, adaxially subsulcate. Leaves subsessile; leaf blade abaxially grayish green, adaxially shiny, dark green, obovate-elliptic or elliptic, 1–2 × 0.6–1.1 cm, leathery, abaxially pruinose, densely papillose, midvein conspicuously raised, lateral veins 3 or 4 pairs, adaxially with midvein impressed, both surfaces with inconspicuous reticulate veins, base cuneate, margin slightly revolute, 2–4-spinose-serrate on each side, apex acute. Flowers solitary. Pedicels 4–10 mm, glabrous. Sepals in 3 whorls; outer sepals ovate, ca. 4 × 3 mm; median sepals ovate, ca. 6 × 5 mm; inner sepals obovate, ca. 10 × 8 mm. Petals elliptic or obovate, 5.5–6 × ca. 3 mm, base cuneate, with separate glands, apex emarginate or retuse with rounded lobes. Stamens ca. 3.5 mm; anther connective slightly prolonged, rounded. Ovules 4–6.

Berry oblong-ovoid, 10–12 × 6–7 mm, pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

• Thickets, rock crevices, forests; 1900–3200 m. Gansu, Sichuan, Yunnan.

**25. *Berberis concinna*** J. D. Hooker, Bot. Mag. 79: t. 4744. 1853.

雅洁小檗 *ya jie xiao bo*

Shrubs, semi-evergreen, low. Stems stout, glabrous, very sulcate; branches shiny, dark red, sometimes scarcely verruculose; internodes 1–2 cm; spines 3-fid, orange, 1–1.3 cm, sulcate. Petiole 1–5 mm; leaf blade abaxially grayish white, adaxially shiny, dark green, oblong-obovate, 1–3 × 0.5–1.4 cm, abaxially papillate, adaxially lateral veins 3 or 4 pairs, base cuneate, margin 3–5-spinose-serrate, apex rounded, mucronulate. Flowers solitary. Pedicels 1.5–2 cm; bractlets red, oblong-triangular, 2–2.5 × 1.5–2 mm. Sepals in 3 whorls; outer sepals oblong-ovate, 4–6 × 3–4 mm, apex subacute; median and inner sepals obovate, equal in size, 9–10 × 6–7 mm. Petals obovate, ca. 6.5 × 4–5 mm, base with concolorous glands, apex emarginate with rounded lobes. Stamens 4–4.5 mm; anther connective not prolonged, truncate. Ovules 6–8. Berry dark red, oblong, 13–16 × 6–8 mm. Fl. Jun–Jul, fr. Sep–Oct.

Habitat unknown; ca. 3700 m. Xizang [India (Sikkim), Nepal].

**26. *Berberis alpicola*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 253. 1939.

高山小檗 *gao shan xiao bo*

Shrubs, evergreen, to 1.3 m tall. Branches pale gray, sulcate; spines 3-fid, terete, 1–1.5 cm. Leaves shortly petiolate; leaf blade abaxially shiny, pale green, adaxially shiny, green, elliptic to oblong-elliptic, 1–2.5 × 0.7–1 cm, leathery, abaxially not pruinose, midvein and lateral veins markedly raised, adaxially with impressed midvein, lateral veins conspicuous, base cuneate, margin sometimes revolute, 2–8-spinose-serrate on each side, apex acute. Flowers solitary. Pedicels 1.2–1.6 cm, glabrous. Sepals in 2 whorls; outer sepals smaller than inner sepals. Petals 6, base with separate glands. Stamens 9. Ovules 4, sessile. Berry black, ellipsoid, ca. 8 × 5 mm, not pruinose; style persistent, short. Fl. May–Jun, fr. Sep–Oct.

• Streamsides in mountain regions; ca. 3600 m. Taiwan.

**27. *Berberis sibirica*** Pallas, Reise Russ. Reich. 2: 737. 1773.

西伯利亚小檗 *xi bo li ya xiao bo*

*Berberis borealisinensis* Nakai.

Shrubs, deciduous, to 1 m tall. Branches dark gray, glabrous; shoots reddish brown, puberulous, sulcate; spines 3–9-fid, 3–11 mm, slender, spreading at base to 2 mm wide, or partly leaflike. Petiole 3–5 mm; leaf blade abaxially pale yellow-green, adaxially deep green, obovate, oblanceolate, or obovate-oblong, 1–2.5 cm × 5–8 mm, papery, abaxially not pruinose, both surfaces with conspicuous raised veins, lateral veins 4 or 5 pairs, base cuneate, margin sometimes repand, coarsely 4–7-aristate-dentate on each side, apex rounded, obtuse, or aristate. Flowers solitary. Pedicels 7–12 mm, glabrous. Sepals in 2

whorls; outer sepals oblong-ovate, ca.  $4 \times 2$  mm; inner sepals obovate, ca.  $4.5 \times 2.5$  mm. Petals obovate, ca.  $4.5 \times 2.5$  mm, base with separate glands, apex shortly emarginate. Stamens 2.5–3 mm; anther connective truncate. Ovules 5–8. Berry red, obovoid,  $7-9 \times 6-7$  mm, not pruinose, style not persistent. Fl. May–Jul, fr. Aug–Sep.

Alpine slopes, talus slopes, desert regions, forests; 1400–3000 m. Hebei, Nei Mongol, Shanxi, Xinjiang, NE China [Mongolia, Russia (Siberia)].

**28. *Berberis erythroclada*** Ahrendt, J. Bot. 79(Suppl.): 49. 1941.

红枝小檗 hong zhi xiao bo

*Berberis erythroclada* var. *trulungensis* Ahrendt.

Shrubs, deciduous, to 1.5 m tall. Branches shiny, dark red, glabrous, sulcate; internodes 8–25 mm; spines (3–)5–7(–9)-fid, orange, 5–10 mm. Leaves subsessile; leaf blade abaxially ultimately pale dark green, adaxially dark green, obovate or obovate-elliptic,  $1-2.8 \text{ cm} \times 3-15 \text{ mm}$ , papery, abaxially initially slightly grayish pruinose, midvein conspicuously raised, adaxially veins obviously branched or openly reticulate, base cuneate, margin 1–15-spinose-serrate on each side, apex rounded or obtuse. Flowers solitary. Pedicels  $1.5-2.5 \text{ cm}$ , very slender. Sepals in 2 whorls; outer sepals oblong-elliptic,  $5.5-6.5 \times 3-3.7 \text{ mm}$ ; inner sepals obovate,  $7-8 \times 4-4.5 \text{ mm}$ , (sometimes outer and inner sepals equal). Petals obovate,  $5-6.5 \times 2.5-4.5 \text{ mm}$ , base with separate narrowly oblong glands, apex subentire. Stamens 3–4 mm; anther connective slightly prolonged, subretuse. Ovules 6–9, often funiculate. Berry unknown. Fl. Jun–Jul, fr. unknown.

• Slopes; 4000–4300 m. Xizang.

**29. *Berberis fengii*** S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 3. 1985.

大果小檗 da guo xiao bo

Shrubs, deciduous, to 1 m tall. Branches dark brown, sulcate, black verruculose; spines 3-fid, yellow-brown,  $1.5-2.5 \text{ cm}$ , slender, adaxially slightly sulcate. Petiole 2–3 mm; leaf blade adaxially olivaceous, elliptic or obovate,  $1.5-2.5 \times 0.5-1.5 \text{ cm}$ , papery, abaxially slightly pruinose, midvein and lateral veins obviously raised, reticulate veins conspicuous, adaxially with slightly raised midvein, lateral and reticulate veins conspicuous, base cuneate, margin closely spinulose-subserulate, apex rounded, mucronate. Flowers unknown. Fruit solitary; stalk ca. 1 cm, stout; berry red, broadly ellipsoid, ca.  $2 \times 1.2-1.4 \text{ cm}$ , blue pruinose, style not persistent; seeds 6 or 7. Fl. unknown, fr. Oct.

• Grassy slopes; 3000–3700 m. Yunnan.

**30. *Berberis paraspecta*** Ahrendt, J. Linn. Soc., Bot. 57: 47. 1961.

鸡脚连 ji jiao lian

Shrubs, evergreen, to 2 m tall. Branches brown; shoots stramineous, glabrous, sulcate; spines 3-fid, concolorous, to 3 cm, stout. Leaves subsessile; leaf blade lanceolate,  $3-6.5 \times 0.7-1 \text{ cm}$ , subleathery, abaxially with raised midvein, lateral veins inconspicuous, adaxially with complanate or slightly impressed

midvein, lateral veins conspicuous, base cuneate, margin 7–15-spinose-serrate on each side, apex acute or shortly acuminate. Flowers solitary. Pedicels 3–4 mm. Berry black, oblong,  $9-12 \times 6-7 \text{ mm}$ , blue pruinose, style not persistent; seeds 1 or 2. Fl. unknown, fr. Nov.

• Forest understories; 2500–2700 m. Yunnan.

**31. *Berberis hobsonii*** Ahrendt, J. Linn. Soc., Bot. 57: 137. 1961.

毛梗小檗 mao geng xiao bo

Shrubs, deciduous, to 2 cm tall. Branches deep gray, sulcate, puberulous; spines simple or 3-fid, weak, 0.6–1.7 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially deep green, obovate or oblanceolate,  $1.5-3.5 \times 0.8-1.5 \text{ cm}$ , abaxially not pruinose, midvein and lateral veins markedly raised, adaxially veins inconspicuous, base cuneate, margin puberulous, entire, occasionally 1- or 2-spinose-serrate on each side, apex obtuse. Flowers 5–10-fascicled or subfascicled. Pedicels 6–12 mm, densely puberulous. Sepals in 2 whorls; outer sepals ca.  $3.5 \times 2 \text{ mm}$ ; inner sepals ca.  $5 \times 3 \text{ mm}$ . Petals ca.  $4.5 \times 3 \text{ mm}$ , base with separate glands, apex entire. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 5 or 6. Berries red, subglobose,  $8-9 \times 7-8 \text{ mm}$ , not pruinose, style not persistent. Fl. Jun–Jul, fr. Aug–Sep.

• *Abies* forests, *Quercus* forests, thickets; 3400–4300 m. Xizang.

**32. *Berberis reticulineris*** T. S. Ying, Acta Phytotax. Sin. 37: 305. 1999, not *B. reticulineria* (C. Y. Wu ex S. Y. Bao) Laferrière (1997).

芒康小檗 mang kang xiao bo

Shrubs, deciduous, 1–2 m tall. Branches terete, glabrous; shoots pale gray, sulcate; spines 3-fid, pale yellow,  $1-2.5 \text{ cm}$ . Leaves subsessile; leaf blade abaxially pale green, adaxially dark green, oblanceolate or elliptic,  $0.7-2.1 \text{ cm} \times 3-8 \text{ mm}$ , papery, abaxially not pruinose, adaxially glabrous, both surfaces with conspicuous reticulate veins, base attenuate, margin entire or 1–4-spinose-serrate on each side, apex acute. Flowers 3- or 4-fascicled. Pedicels 1–2 mm or 1–1.5 cm, slender, glabrous. Sepals in 3 whorls; outer sepals lanceolate-oblong, ca.  $3 \times 1 \text{ mm}$ ; median sepals elliptic, ca.  $4 \times 2 \text{ mm}$ ; inner sepals oblong-elliptic or obovate-oblong,  $5.5-6 \times 2.5-2.7 \text{ mm}$ . Petals elliptic, base cuneate, with separate glands, apex acute, incised with acute lobes. Stamens ca. 2.5 mm; anther connective prolonged, rounded. Ovules (2 or)3, very shortly funiculate. Fruit unknown. Fl. Jun–Jul, fr. Aug–Oct.

• Forest margins, sunny slopes; ca. 1600 m or 3400–3900 m. Gansu, Sichuan, Xizang.

- 1a. Pedicels 10–15 mm; inner sepals oblong-elliptic ..... 32a. var. *reticulineris*  
1b. Pedicels 1–2 mm; inner sepals obovate-oblong ..... 32b. var. *brevipedicellata*

**32a. *Berberis reticulineris* var. *reticulineris***

芒康小檗(原变种) mang kang xiao bo (yuan bian zhong)

Pedicels 1–1.5 cm, slender, glabrous. Inner sepals oblong-elliptic.

- Forest margins; 3400–3900 m. Sichuan, Xizang.

**32b. *Berberis reticulineris* var. *brevipedicellata*** T. S. Ying, *Acta Phytotax. Sin.* 37: 307. 1999.

无梗小檗 wu geng xiao bo

Pedicels very short, 1–2 mm, glabrous. Inner sepals obovate-oblong.

- Sunny slopes; ca. 1600 m. Gansu.

**33. *Berberis yunnanensis*** Franchet, *Bull. Soc. Bot. France* 33: 388. 1886.

云南小檗 yun nan xiao bo

Shrubs, deciduous, to 1 m tall. Branches yellow-brown; shoots dark red, sulcate, black verruculose; spines 3-fid, 1–2.5 cm, slender. Leaves shortly petiolate; leaf blade abaxially pale green, adaxially dark green, becoming purplish red in autumn, obovate or oblong-obovate, 3–6 × 1–2 cm, papery, abaxially papillose, midvein and lateral veins slightly raised, adaxially with 3 or 4 pairs of lateral veins, base attenuate, cuneate, margin usually entire, occasionally 2- or 3-spinose-serrate on each side, apex rounded or mucronate. Flowers usually 2–4-fascicled, sometimes to 10-flowered. Pedicels 2–4 cm, glabrous. Sepals in 2 whorls; outer sepals oblong-obovate, ca. 5 × 2.5 mm; inner sepals similar to outer sepals in form, 7–8 × 4–5 mm. Petals obovate, ca. 5 × 3 mm, base with separate glands, apex emarginate, with rounded lobes. Stamens ca. 4 mm; anther connective prolonged, subapiculate. Ovules 2 or 3. Berry purplish red, oblong-ovoid, 10–12 × 5–7 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Aug–Oct.

- Understories of *Picea* forests, margins of *Abies* forests, thickets, grassy slopes; 3100–4200 m. Sichuan, Xizang, Yunnan.

**34. *Berberis ulicina*** J. D. Hooker & Thomson, *Fl. Ind.* 1: 227. 1855.

尤里小檗 you li xiao bo

Shrubs, deciduous, to 1 m tall. Branches and shoots pale purplish red, sometimes slightly grayish white, terete; spines 3-fid, pale yellow, 0.8–2.5 cm, stout, adaxially sulcate. Leaves subsessile; leaf blade abaxially gray-green, adaxially dark green, linear-oblancoate, 0.8–2.2 cm × 1–4 mm, abaxially not pruinose, midvein slightly raised, lateral and reticulate veins inconspicuous, adaxially inconspicuously veined, base attenuate, margin 1–3-spinose-serrate on each side, occasionally entire, apex aristate. Flowers 3–5-fascicled, sometimes forming a subracemose inflorescence. Pedicels 2–5 mm. Sepals in 2 whorls; outer sepals lanceolate, 4–4.5 × 0.8–1 mm; inner sepals obovate-oblong, 6–6.5 × 3–3.5 mm. Petals oblancoate, 5–5.1 × 2–2.2 mm, base clawed, with very separate glands, apex incised with acute lobes. Stamens 3–3.5 mm; anther connective not prolonged, shortly apiculate. Ovary 3–3.2 mm; ovules 3–5. Berry black or red, globose, 3–3.5 × ca. 3 mm, not pruinose, style ca. 0.8 mm; seeds 5. Fl. May–Jun, fr. Jul–Aug.  $2n = 28$ .

- Slopes, floodlands, mixed forests, streamsides; 2500–3700 m. Xinjiang, W Xizang [Kashmir].

**35. *Berberis nullinervis*** T. S. Ying in C. Y. Wu, *Fl. Xizang*. 2: 141. 1985.

无脉小檗 wu mai xiao bo

Shrubs, deciduous, to 1.5 m tall. Branches dark gray; shoots red, slightly sulcate, glabrous; spines 3-fid, 5–11 mm. Leaves subsessile; leaf blade adaxially green, elliptic or oblanceolate, 1.2–2.1 cm × 5–8 mm, papery, abaxially rugose, veins very inconspicuous, adaxially smooth, midvein impressed, base cuneate, margin entire, occasionally 1- or 2-spinose-serrate on each side, apex acuminate or acute. Flowers 3- or 4-fascicled. Ovules 2. Fruit stalk 8–11 mm, glabrous; berry red, ellipsoid, ca. 9 × 5 mm, scarcely pruinose; style not persistent, sometimes apex slightly bent; seeds 2. Fl. unknown, fr. Aug–Sep.

- Streamsides in thickets, foot of mountains; 4200–4300 m. Xizang (Namling).

**36. *Berberis hypericifolia*** T. S. Ying in C. Y. Wu, *Fl. Xizang*. 2: 140. 1985.

异叶小檗 yi ye xiao bo

Shrubs, deciduous, 1–2 m tall. Branches shiny, purplish red, not sulcate, sparsely black verruculose; internodes 1.2–3 cm; spines simple, concolorous, 6–10 mm. Petiole 2–5 mm; leaf blade abaxially pale yellow-green, brown when dry, adaxially dark green, obovate, occasionally suborbicular, 0.7–2.5 × 0.4–1.7 cm, papery, abaxially with conspicuous midvein and lateral veins, adaxially inconspicuously veined, base cuneate, margin entire, occasionally 1- or 2-spinose-serrate on each side, apex obtuse or rounded, mucronate. Flowers 3–6-fascicled. Pedicels 8–14 mm. Ovules 3. Berry red, oblong, ca. 10 × 5 mm, not pruinose, style not persistent; seeds 3. Fl. unknown, fr. Aug–Sep.

- In slash; ca. 4300 m. Xizang.

**37. *Berberis tsienii*** T. S. Ying, *Acta Phytotax. Sin.* 37: 307. 1999.

永思小檗 yong si xiao bo

Shrubs, deciduous, ca. 1.5 m tall. Branches and shoots dark brown, very conspicuously sulcate, glabrous; spines 3-fid, weak, pale yellow, 2–5 mm. Leaves subsessile; leaf blade abaxially yellow-green, adaxially shiny, dark green, elliptic or obovate-elliptic, sometimes obovate, 7–15 × 3–6 mm, papery, abaxially midvein slightly raised, lateral and reticulate veins inconspicuous, not pruinose, adaxially veins inconspicuous, base cuneate, margin 1–3-spinose-serrulate on each side, apex acute. Flowers unknown. Inflorescence with 3–6-fascicled berries; fruit stalk purplish red, 3–4 mm, glabrous; berry ellipsoid, 6–8 × ca. 3 mm, not pruinose; style persistent, short; seeds 1. Fl. Jun–Jul, fr. Jul–Aug.

- Thickets; ca. 2100 m. Guizhou.

**38. *Berberis morrisonensis*** Hayata, *J. Coll. Sci. Imp. Univ. Tokyo* 30(1): 25. 1911.

玉山小檗 yu shan xiao bo

Shrubs, deciduous. Branches dark red, sparsely verrucu-

lose; shoots green; spines 3-fid, 1–1.5 cm. Leaves shortly petiolate; leaf blade abaxially pale green, sometimes gray-white, adaxially dark green, obovate or obovate-lanceolate, 1.5–2.5 × 0.5–1 cm, both surfaces with conspicuously raised reticulate veins, base attenuate, margin 4–7-spinose-serrate on each side, apex rounded, obtuse. Flowers 2–5-fascicled, rarely solitary. Pedicels often pendulous, 1.2–2.5 cm, slender. Sepals in 3 whorls; outer sepals lanceolate or narrowly ovate, 4–4.5 × 1.5–2.5 mm, apex acuminate; median sepals oblong-elliptic, 5.5–6.5 × 3–3.5 mm; inner sepals narrowly obovate, ca. 7.5 × 4 mm. Petals broadly elliptic, 5–6 × 3.5–4 mm, apex emarginate. Anther connective obtuse or truncate. Ovules 4–7. Berry scarlet, subglobose, 8–9 × 7–8 mm. Fl. and fr. unknown.

● Alpine areas; 3000–4300 m. Taiwan.

**39. *Berberis yui*** T. S. Ying, Acta Phytotax. Sin. 37: 309. 1999 [“yuii”].

德浚小檗 de jun xiao bo

Shrubs, deciduous, ca. 1.5 m tall. Branches deep gray, not verruculose; shoots pale gray, sulcate; spines 3-fid, pale yellow, 0.5–1.6 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially dark green, oblanceolate or obovate-elliptic, 1–2.5 cm × 4–9 mm, papery, abaxially not pruinose, both surfaces with markedly raised reticulate veins, base attenuate, margin closely 9–16-spinulose-serrulate on each side, apex rounded, obtuse, occasionally acute. Flowers 5–8-fascicled. Pedicels 1.2–1.7 cm, glabrous; bractlets lanceolate, ca. 2.5 × 0.6 mm. Sepals in 3 whorls; outer sepals lanceolate, ca. 4.2 × 1.5 mm; median sepals elliptic, ca. 4.5 × 2 mm; inner sepals elliptic, ca. 4 × 2 mm. Petals obovate, ca. 3.5 × 2 mm, base clawed, with separate glands, apex incised. Stamens ca. 2.5 mm; anther connective prolonged, rounded, obtuse. Ovules 2, funiculate. Fruit unknown. Fl. Jun, fr. unknown.

● Thickets, alpine meadows, grassy slopes; 3600–4200 m. Sichuan.

**40. *Berberis diaphana*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 23: 309. 1877.

鲜黄小檗 xian huang xiao bo

*Berberis diaphana* var. *uniflora* Ahrendt.

Shrubs, deciduous, 1–3 m tall. Shoots green; branches gray, sulcate, verruculose; spines 3-fid, pale yellow, 1–2 cm, stout. Leaves shortly petiolate; leaf blade abaxially pale green, adaxially dark green, oblong or obovate-oblong, 1.5–4 × 0.5–1.6 cm, papery, abaxially sometimes slightly pruinose, adaxially with raised lateral and reticulate veins, base cuneate, margin 2–14-spinose-serrate on each side, occasionally entire, apex slightly obtuse. Flowers 2–5-fascicled, occasionally solitary. Pedicels 1.2–2.2 cm. Sepals in 2 whorls; outer sepals subovate, ca. 8 × 5.5 mm; inner sepals elliptic, ca. 9 × 6 mm. Petals ovate-elliptic, 6–7 × 5–5.5 mm, base clawed, with separate glands, apex acute, incised. Stamens ca. 4.5 mm; anther connective truncate. Ovules 6–10. Berry red, ovoid-oblong, 1–1.2 cm × 6–7 mm, occasionally pruinose; style persistent, apex slightly bent. Fl. May–Jun, fr. Jul–Sep.

● Thickets, meadows, forests, forest margins; 1600–3200 m. Gansu, Qinghai, Shaanxi.

**41. *Berberis circumserrata*** (C. K. Schneider) C. K. Schneider in Sargent, Pl. Wilson. 3: 435. 1917.

秦岭小檗 qin ling xiao bo

Shrubs, deciduous, to 1 m tall. Branches yellow or yellowish brown, sulcate, sparsely black verruculose; internodes 1.5–4 cm; spines 3-fid, 1.5–3 cm. Leaves very shortly petiolate; leaf blade abaxially gray-white, adaxially dark green, obovate-oblong or obovate, occasionally suborbicular, 1.5–3.5 × 0.5–2.5 cm, papery, abaxially pruinose, both surfaces with conspicuously raised reticulate veins, base attenuate, margin closely 15–40-spinulose-serrulate on each side, apex rounded. Flowers 2–5-fascicled. Pedicels (0.8–)1.5–3 cm, glabrous. Sepals in 2 or 3 whorls; outer sepals oblong-elliptic, 7–8 × 4–5 mm; inner sepals obovate-oblong, 9–10 × 6–7 mm. Petals obovate, 7–7.5 × 4–4.5 mm, base clawed, with separate glands, apex entire or emarginate. Stamens ca. 4 mm; anther connective rounded or truncate. Ovules (3–)6 or 7 (or 8). Berry red, ellipsoid or oblong, (1–)1.3–1.5 cm × 5–6 (–7) mm, not pruinose, style persistent. Fl. May, fr. Jul–Sep.

● Mountain slopes, ridges, forest margins, thickets, runlet sides; 1400–3500 m. Gansu, Henan, Hubei, Qinghai, Shaanxi.

- 1a. Sepals in 2 whorls; petals entire at apex; ovules (3–)6 or 7 (or 8) ..... 41a. var. *circumserrata*
- 1b. Sepals in 3 whorls; petals emarginate at apex; ovules 3–5 ..... 41b. var. *occidentior*

**41a. *Berberis circumserrata* var. *circumserrata***

秦岭小檗(原变种) qin ling xiao bo (yuan bian zhong)

*Berberis diaphana* Maximowicz var. *circumserrata* C. K. Schneider in Sargent, Pl. Wilson. 1: 354. 1913; *B. circumserrata* var. *subarmata* Ahrendt.

Pedicels 1.5–3 cm. Sepals in 2 whorls. Petals entire at apices. Ovules (3–)6 or 7 (or 8). Fruit 1.3–1.5 cm × 5–6 mm.

● Mountain slopes, forest margins, thickets, runlet sides; 1400–3300 m. Gansu, Henan, Hubei, Qinghai, Shaanxi.

**41b. *Berberis circumserrata* var. *occidentior*** Ahrendt, J. Linn. Soc., Bot. 57: 122. 1961.

多萼小檗 duo e xiao bo

Pedicels 0.8–1.5 cm. Sepals in 3 whorls. Petals emarginate at apices. Ovules 3–5. Fruit 1–1.2 cm × 6–7 mm.

● Ridges; ca. 3500 m. SW Gansu.

**42. *Berberis aemulans*** C. K. Schneider in Sargent, Pl. Wilson. 3: 434. 1917.

峨眉小檗 e mei xiao bo

*Berberis diaphana* Maximowicz var. *tachiensis* Ahrendt, p.p.

Shrubs, deciduous, to 2 m tall. Branches dark purple, black verruculose; shoots green, sulcate; spines 3-fid, orange, 6–10 mm, adaxially slightly sulcate. Petiole 2–5 mm; leaf blade abaxially pale gray, adaxially dark green, oblong-obovate or elliptic, 2–4 × 1–2 cm, papery, abaxially pruinose, adaxially

with reticulate veins, base cuneate, margin 5–12-spinose-serrate on each side, apex rounded, obtuse. Flowers 2–4-fascicled, occasionally solitary or 2 or 3 flowers in simple racemes. Pedicels 2–3 cm. Sepals in 2 whorls, oblong-elliptic; outer sepals 7–7.5 × 4–4.5 mm; inner sepals 7.5–8 × 4.5–5 mm. Petals oblong, ca. 5 × 3.7 mm, base with separate glands, apex entire. Stamens ca. 4 mm; anther connective prolonged, apiculate. Ovules 7–11. Berry orange, ovoid, 1.5–1.6 cm × 7–8 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Jul–Oct.

- Thickets, roadsides, slopes; 2900–3200 m. Sichuan.

**43. *Berberis hypoxantha*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 6. 1985.

黄背小檗 huang bei xiao bo

Shrubs, evergreen, to 2 m tall. Branches black-gray, terete, not spinose. Petiole 4–6 mm; leaf blade abaxially becoming stramineous when dry, adaxially green, oblong or broadly ovate, 3–4 × 2–2.5 cm, leathery, abaxially not pruinose, with inconspicuous lateral and reticulate veins, adaxially with slightly conspicuous lateral veins, base cuneate, apex rounded. Flowers unknown. Fruit stalk 1.8–2 cm, glabrous; berry green (immature), 4–12-fascicled, oblong, pruinose, style not persistent. Fl. unknown, fr. May.

- Forest margins at mountain summits. SE Yunnan (Xichou).

**44. *Berberis holocraspedon*** Ahrendt, J. Bot. 79(Suppl.): 22. 1941.

风庆小檗 feng qing xiao bo

Shrubs, evergreen, 1–2 m tall. Stems terete; branches grayish brown; shoots pale yellow, glabrous, sparsely black verruculose; spines 3-fid, pale yellow, 7–20 mm. Petiole 2–3 mm; leaf blade abaxially gray, adaxially dark green and shiny, oblong-lanceolate or oblong-elliptic, 4–10 × 1.5–2.5 cm, leathery, abaxially sometimes slightly pruinose, with raised midvein, lateral veins conspicuous, adaxially with slightly impressed midvein, lateral veins slightly conspicuous, both surfaces with inconspicuous reticulate veins, base cuneate, margin very slightly revolute, entire or 1- or 2-spinose-subserulate on each side, apex obtuse, apiculate. Flowers unknown. Inflorescence with 3–12 fascicled berries; fruit stalk reddish, 1–1.5 cm, stout; berry black, ellipsoid, 7–10 × ca. 6 mm, not pruinose, style not persistent; seeds 2. Fl. unknown, fr. Jun–Nov.

- Dry slopes, thickets, bamboo forests; 1700–3100 m. Yunnan.

**45. *Berberis ziyunensis*** P. K. Hsiao & Z. Yu Li, Acta Bot. Yunnan. 21: 30. 1999.

紫云小檗 zi yun xiao bo

Shrubs, evergreen, 1.5–2.5 m tall. Branches dark gray, terete, glabrous; shoots purplish black, shiny; spines absent or very weak, 3-fid, pale yellow, 5–6 mm. Petiole 2–3 mm; leaf blade abaxially pale yellow, adaxially deep green, elliptic or narrowly elliptic, occasionally oblanceolate, 4–11 × 1–3 cm, thickly leathery, abaxially slightly pruinose, midvein conspicuously raised, lateral veins inconspicuous, adaxially with impressed midvein, lateral veins inconspicuous, base cuneate, margin slightly revolute, entire or inconspicuously 1–3-spinu-

lose-subserulate on each side, apex acuminate or acute. Flowers 4–10-fascicled, sometimes to 25 flowers. Pedicels purplish brown when dry, 1.5–2 cm, glabrous; bractlets triangular-ovate, ca. 2.2 × 1 mm. Outer sepals oblong, ca. 2.2 × 1.9 mm; inner sepals obovate, ca. 4 × 2.5 mm. Petals obovate, ca. 3.5 × 3 mm, base not clawed, with separate glands, apex entire. Stamens ca. 2.3 mm; anther connective truncate. Ovules 2, shortly funiculate. Berry dark red, ellipsoid; style persistent, short. Fl. Mar–Apr, fr. Apr–May.

- Thickets; 1000–1300 m. Guizhou.

**46. *Berberis pingshanensis*** W. C. Sung & P. K. Hsiao, Acta Phytotax. Sin. 12: 387. 1974.

屏山小檗 ping shan xiao bo

Shrubs, evergreen, to 2 m tall. Branches gray; shoots purplish brown, sulcate, glabrous; spines 3-fid, concolorous with shoots, ca. 5 mm. Petiole 2–3 mm; leaf blade abaxially brown when dry, adaxially deep green, elliptic, 8–17 × 3.5–7 cm, subleathery, abaxially not pruinose, midvein conspicuously raised, lateral and reticulate veins slightly raised, adaxially with impressed midvein, lateral veins slightly raised, base broadly cuneate or subrounded, margin entire, apex acute. Flowers 8–20-fascicled. Pedicels purplish brown, 1.5–3 cm, glabrous; bractlets ovate-triangular, ca. 1 mm. Sepals in 2 whorls; outer sepals broadly elliptic, ca. 4 × 3 mm; inner sepals suborbicular or reniform-orbicular, ca. 4 × 4–5 mm. Petals suborbicular, base with separate glands, apex entire or obtusely emarginate. Stamens ca. 2 mm; anther connective truncate. Ovules 2, funicles ca. as long as ovules. Berry black, not or slightly pruinose. Fl. May–Jun, fr. Jun–Jul.

- Roadsides, sides of rocks; ca. 800 m. Sichuan.

**47. *Berberis obovatifolia*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 146. 1985.

裂瓣小檗 lie ban xiao bo

Shrubs, evergreen, low, ca. 0.5 m tall. Stems sulcate; branches gray; shoots pale red, glabrous; spines 3-fid, pale yellow, 8–20 mm. Leaves sessile; leaf blade abaxially shiny, green, adaxially dark green, obovate, 1–2.3 × 0.5–1.4 cm, thinly leathery, abaxially openly reticulate, not pruinose, adaxially openly veined, base cuneate, margin entire, apex rounded, mucronate. Flowers 2–4-fascicled. Sepals in 2 whorls; outer sepals elliptic, ca. 3.6 × 1.6–2 mm; inner sepals oblong-elliptic, ca. 6.5 × 4 mm. Petals broadly elliptic, ca. 4.7 × 3.1 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective truncate. Ovules 2, shortly funiculate. Immature fruit seen, style not persistent. Fl. May, fr. Jun–Jul.

- Beside ditches on mountains; ca. 3900 m. Xizang.

**48. *Berberis wuyiensis*** C. M. Hu, Bull. Bot. Res., Harbin 6(2): 7. 1986.

武夷小檗 wu yi xiao bo

Shrubs, evergreen, 1–1.5 m tall. Branches gray; shoots pale yellow, sulcate, sparsely verruculose; internodes 3–6 cm; spines 3-fid, pale yellow-brown, subterete, 1–2 cm. Petiole 1–3 mm; leaf blade adaxially dark green, oblanceolate or elliptic-

obovate, 3.5–7 × 0.8–1.6 cm, leathery, abaxially not pruinose, midvein markedly raised, lateral veins conspicuous, reticulate veins inconspicuous, adaxially with impressed midvein, lateral and reticulate veins inconspicuous, base cuneate, margin 2–(6)-serrate on each side, occasionally entire, apex acute, aristate. Flowers 6–12-fascicled. Pedicels reddish, 8–10 mm; bractlets lanceolate, 1.8–2.5 mm. Sepals in 2 whorls; outer sepals lanceolate or ovate-lanceolate, 3–3.5 mm; inner sepals oblong, 3.5–4.5 mm. Petals obovate, 3–4.5 mm, base slightly clawed, with glands, apex emarginate. Stamens 2.5–3.5 mm; anther connective obtuse or mucronate. Ovules (1 or) 2. Berry elliptic-oblong, ca. 7.5 mm, not pruinose, style persistent. Fl. May–Jun, fr. Jul–Sep.

• Sparse forests, thickets at mountain summits; 1900–2100 m. Fujian, Jiangxi.

**49. *Berberis replicata*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 200. 1919.

卷叶小檗 *juan ye xiao bo*

Shrubs, evergreen, to 1.5 m tall. Branches weak, terete, obviously verruculose; spines 3-fid, pale yellow, 1–2 cm, sulcate. Petiole 1–2 mm; leaf blade adaxially shiny, dark green, oblong-elliptic or oblong-lanceolate, 1.5–3.5(–4.5) cm × 3–5(–8) mm, abaxially pruinose, midvein conspicuously raised, both surfaces with inconspicuous lateral and reticulate veins, base attenuate, margin slightly revolute, entire or 1–3-spinose-serrate on each side, apex acute, aristate. Flowers 3–7-fascicled. Pedicels reddish, 5–13 mm; bractlets ca. 2 mm. Sepals in 2 whorls; outer sepals reddish, ovate or suborbicular, 3.5–4 × ca. 3 mm; inner sepals suborbicular, 6–7 × 5–6 mm. Petals obovate, 5–5.2 × 3.5–4 mm, base clawed, with separate glands, apex entire. Stamens ca. 3 mm; anther connective truncate or obtuse. Ovules 2, sessile. Berry purplish black, oblong, 6–8 × 3–5 mm, not pruinose; style persistent, short. Fl. and fr. Apr–Jun.

• Thickets, roadsides on mountain slopes; 1800–3000 m. Yunnan.

**50. *Berberis wilsoniae*** Hemsley, Bull. Misc. Inform. Kew 1906: 151. 1906 [*"wilsonae"*].

金花小檗 *jin hua xiao bo*

Shrubs, semi-evergreen, ca. 1 m tall, with arching branches. Branches brownish gray; shoots dark red, sulcate, scarcely black verruculose; spines 3-fid, sometimes simple or absent, pale yellow or pale purplish red, 1–2 cm, slender. Leaves subsessile; leaf blade abaxially gray, adaxially dark gray-green, obovate or obovate-spatulate or oblanceolate, 6–25 × 2–6 mm, leathery, abaxially often slightly pruinose, with raised reticulate veins, adaxially with conspicuous reticulate veins, base cuneate, margin entire, occasionally 1- or 2-spinulose-serrulate on each side, apex rounded, obtuse or subacute. Inflorescence a fascicle of 4–7 flowers or a 3–7-flowered raceme. Pedicels brownish, 3–7 mm; bractlets ovate. Sepals in 2 whorls; outer sepals ovate, 3–4 × 2–3 mm; inner sepals obovate-orbicular or obovate, 5–5.5 × 3.5–4 mm. Petals obovate, ca. 4 × 2 mm, apex emarginate, with acute lobes. Stamens ca. 3 mm; anther connective slightly prolonged, obtuse. Ovules 3–5. Berry reddish, subglobose, 6–7 × 4–5 mm, slightly pruinose, style persistent. Fl. Jun–Sep, fr. Jan–Feb of following year.

• Slopes, thickets, rocky beaches, riverbanks, roadsides, forest margins, streamsides, *Pinus* forests, rock crevices, dry slopes; 1000–4000 m. Gansu, Guizhou, Shaanxi, Sichuan, Xizang, Yunnan.

1a. Inflorescence a fascicle of flowers ..... 50a. var. *wilsoniae*

1b. Inflorescence a raceme ..... 50b. var. *guhtzunica*

**50a. *Berberis wilsoniae* var. *wilsoniae***

金花小檗(原变种) *jin hua xiao bo* (yuan bian zhong)

*Berberis parvifolia* Sprague (1908), not Lindley (1847); *B. stapfiana* C. K. Schneider; *B. subcaulialata* C. K. Schneider; *B. wilsoniae* var. *parvifolia* Ahrendt; *B. wilsoniae* var. *stapfiana* (C. K. Schneider) C. K. Schneider; *B. wilsoniae* var. *subcaulialata* (C. K. Schneider) C. K. Schneider.

Inflorescence with 4–7 fascicled flowers.

• Slopes, thickets, rocky beaches, riverbanks, roadsides, forest margins, streamsides; 1000–4000 m. Gansu, Sichuan, Xizang, Yunnan.

**50b. *Berberis wilsoniae* var. *guhtzunica*** (Ahrendt) Ahrendt, J. Linn. Soc., Bot. 57: 216. 1961.

古宗金花小檗 *gu zong jin hua xiao bo*

*Berberis subcaulialata* var. *guhtzunica* Ahrendt, J. Bot. 79(Suppl.): 76. 1941; *B. wilsoniae* var. *latior* Ahrendt.

Inflorescence a raceme, 3–7-flowered, to 1.5 cm.

• Thickets, roadsides, *Pinus* forests, rock crevices, dry slopes; 1600–3200 m. Guizhou, Shaanxi, Sichuan, Xizang, Yunnan.

**51. *Berberis taliensis*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 252. 1939.

大理小檗 *da li xiao bo*

Shrubs, evergreen, to 1.2 m tall. Stems terete; branches yellow-brown or gray-brown, sulcate, scarcely verruculose; spines 3-fid, pale yellow, 8–20 mm, adaxially conspicuously sulcate. Leaves sessile; leaf blade adaxially shiny, dark green, narrowly elliptic or oblanceolate, 1.2–3 cm × 3–5 mm, leathery, abaxially pruinose, midvein raised, adaxially with impressed midvein, lateral and reticulate veins inconspicuous, base cuneate, margin conspicuously revolute, entire, apex acuminate, mucronate. Flowers 2–7-fascicled. Pedicels brownish gray, 7–12 mm; bractlets ovate, ca. 3 mm. Sepals in 2 whorls; outer sepals ovate-elliptic, ca. 4.5 × 3 mm; inner sepals broadly elliptic, ca. 6 × 4 mm. Petals obovate, ca. 5.5 × 3.5 mm, base cuneate, slightly clawed, with separate glands, apex entire, slightly emarginate. Stamens ca. 3.5 mm; anther connective not prolonged, truncate. Ovules 4, sessile. Berry oblong, 8–12 × ca. 5 mm, white pruinose, style not persistent. Fl. and fr. May–Jul.

• *Pinus* forests; 3000–3900 m. Yunnan.

**52. *Berberis subholophylla*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 13. 1985.

近缘小檗 *jin yuan xiao bo*

Shrubs, evergreen, 1.5–2.5 m tall. Branches gray-brown, terete; shoots yellow-brown, glabrous, not verruculose; spines 3-fid, concolorous, ca. 1 cm. Leaves subsessile; leaf blade adaxially deep green, oblong-elliptic or lanceolate, 4–7 × 1–1.7

cm, leathery, abaxially pruinose, midvein raised, lateral veins conspicuous, adaxially with slightly impressed midvein, lateral veins 4–8 pairs, reticulate veins inconspicuous, base cuneate, margin flat, entire or 2–4-spinulose-serrulate on each side, apex obtuse, apiculate. Flowers unknown. Infructescence with 3–8-fascicled berries; fruit stalk ca. 1.6 cm, glabrous; berry ellipsoid or oblong, 6–8 × 3–5 mm, pruinose, style persistent; seeds 3 or 4. Fl. unknown, fr. Jun.

- Mixed forests; 2800–2900 m. Yunnan.

**53. *Berberis insolita*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 257. 1939.

西昌小檗 *xi chang xiao bo*

*Berberis atrocarpa* C. K. Schneider var. *suijiangensis* S. Y. Bao.

Shrubs, evergreen, 1–2 m tall. Stems terete; branches gray; shoots pale yellow, angulate, sparsely black verruculose; spines 3-fid, pale yellow, ca. 4 cm. Leaves subsessile; leaf blade adaxially dark green, linear-oblong or linear, 4–15 cm × 1.5–10 mm, thinly leathery, adaxially not pruinose, midvein conspicuously raised, lateral veins conspicuous, reticulate veins inconspicuous, base attenuate, margin strongly revolute, 3–26-spinulose-serrulate on each side, apex acuminate. Flowers unknown. Infructescence with 3–11-fascicled berries; fruit stalk dark purplish red, 4–20 mm, glabrous; berry red, ellipsoid, ca. 7 × 4 mm, not or slightly white pruinose; style persistent, short; seeds 1 or 2. Fl. unknown, fr. May–Oct.

- Thickets, forests, roadsides; 1000–2500 m. Guizhou, Sichuan, Yunnan.

**54. *Berberis sanguinea*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 8: 194. 1885.

血红小檗 *xue hong xiao bo*

*Berberis panlanensis* Ahrendt.

Shrubs, evergreen, to 3 m tall. Stems very sulcate; branches dark gray; shoots pale yellow, sparsely black verruculose; spines 3-fid, pale yellow, 1–3 mm. Leaves subsessile; leaf blade abaxially shiny, pale yellow-green, adaxially dark green, linear-lanceolate, 1.5–6 cm × 3–6 mm, slightly leathery, abaxially not pruinose, midvein conspicuously raised, adaxially with obviously impressed midvein, both surfaces with inconspicuous lateral and reticulate veins, base cuneate, margin 7–14-spinulose-serrulate on each side, apex acute or acuminate, aristate. Flowers 2–7-fascicled. Pedicels reddish, 7–20 mm; bractlets red. Sepals in 3 whorls; outer sepals red, ovate, ca. 3 × 2 mm, apex acute; median and inner sepals yellow, elliptic, ca. 5 × 4.5 mm. Petals obovate, ca. 4 × 3 mm, base with separate lanceolate glands, apex slightly emarginate. Stamens ca. 3 mm; anther connective not prolonged, rounded or truncate. Ovules 2 or 3. Berry purplish red, ellipsoid, 7–12 × 4–5 mm, not pruinose, style not persistent. Fl. Apr–May, fr. Jul–Oct.

- Thickets, forests, roadsides, streamsides, sunny slopes, grassy slopes; 1100–2700(–3800) m. Hubei, Sichuan.

**55. *Berberis lubrica*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 265. 1939.

亮叶小檗 *liang ye xiao bo*

Shrubs, evergreen, to 1 m tall. Stems angulate-sulcate, black verruculose; spines 3-fid, concolorous, flat. Petiole 1–3 mm; leaf blade abaxially pale yellow-green, adaxially green, both surfaces shiny, narrowly lanceolate, 6–9 × 1–1.5 cm, leathery, abaxially lateral and reticulate veins inconspicuous, not pruinose, margin markedly revolute, 12–24-spinose-serrate on each side, apex acuminate. Flowers 6–10-fascicled. Pedicels 5–10 mm, glabrous; bractlets ovate, ca. 2.5 × 1.5 mm, apex acute. Sepals in 2 whorls; outer sepals ovate, ca. 3.5 × 2 mm, apex acute; inner sepals obovate, 6–7 × ca. 4.5 mm. Petals oblong-obovate, ca. 3.5 × 2 mm, base cuneate, with separate glands, apex subentire. Stamens ca. 3.5 mm; anther connective conspicuously prolonged, truncate. Ovules 4. Fruit unknown. Fl. May–Jun, fr. unknown.

- Habitat unknown; ca. 2800 m. Sichuan.

**56. *Berberis insignis*** J. D. Hooker & Thomson subsp. *incrassata* (Ahrendt) D. F. Chamberlain & C. M. Hu, Notes Roy. Bot. Gard. Edinburgh 42: 537. 1985.

球果小檗 *qiu guo xiao bo*

*Berberis incrassata* Ahrendt, Gard. Chron., ser. 3, 105: 371. 1939; *B. incrassata* var. *bucahwangensis* Ahrendt; *B. incrassata* var. *fugongensis* S. Y. Bao.

Shrubs, evergreen, 1–2 m tall. Branches brownish yellow to dark red, terete, glabrous; spines absent. Petiole 2–4 mm; leaf blade abaxially shiny, pale yellow-green, adaxially dark grayish green, elliptic to elliptic-lanceolate, 5–16 × 2–6 cm, leathery, both surfaces not pruinose, abaxially with raised midvein, adaxially with impressed midvein, both surfaces with visible lateral veins, base cuneate, margin coarsely 12–24-aristate-dentate on each side, apex acuminate. Flowers (4–)8–15-fascicled. Pedicels 1–2.4 cm, slender, slightly thickened toward apex, glabrous. Sepals in 3 whorls; outer sepals ovate, ca. 4 × 3 mm, apex acute; median sepals ovate-elliptic, ca. 6 × 5 mm, apex obtuse; inner sepals obovate, ca. 7 × 6 mm. Petals obovate, ca. 6 × 4 mm, base cuneate, with separate glands, apex entire. Stamens ca. 4 mm; anther connective truncate. Ovules 5–7. Berry purplish red or black, subglobose, 6–7 × 5–6 mm, not pruinose, style persistent and conspicuous. Fl. Apr–May, fr. Aug–Oct.

- Thickets, broad-leaved forests, mixed forests, bamboo forests; 1200–2400 m. Xizang, Yunnan.

**57. *Berberis wangii*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 246. 1939.

西山小檗 *xi shan xiao bo*

*Berberis pruinosa* Franchet var. *viridifolia* C. K. Schneider, p.p.; *B. schneideriana* Ahrendt.

Shrubs, evergreen, 1.5–2 m tall. Stems and branches brownish gray, terete, sulcate; shoots densely black or yellow-brown verruculose; spines 3-fid, terete, 1–3.5 cm. Petiole 2–4 mm; leaf blade abaxially yellow-green, adaxially shiny, dark green, elliptic or elliptic-lanceolate, 6–10 × 1.2–2 cm, leathery, both surfaces not pruinose, abaxially with conspicuously raised midvein, adaxially with slightly impressed midvein, both sur-

faces with conspicuous lateral veins, reticulate veins fine, base cuneate, margin flat, 5–18-spinose-serrate on each side, apex acute, aristate. Flowers 6–17-fascicled. Pedicels 0.8–2 cm. Sepals in 3 whorls; outer sepals triangular, ca. 2.5 mm, apex caudate-acuminate; median sepals oblong, ca. 3 mm, apex acute; inner sepals elliptic, 4–4.5 × 2–2.5 mm, apex obtuse. Petals elliptic, 3–3.5 mm, base not clawed, with ovate glands, apex entire, rounded. Stamens ca. 2.5 mm; anther connective subtruncate. Ovules solitary, shortly funiculate. Berry red, ellipsoid, 7–8 × ca. 3.5 mm, not pruinose, style persistent. Fl. Mar, fr. Aug–Nov.

- Thickets, mixed forests, sandy slopes; 1600–2300 m. Yunnan.

**58. *Berberis pectinocraspedon*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 11. 1985.

疏齿小檗 shu chi xiao bo

Shrubs, evergreen, 2–3 m tall. Branches black gray, terete; shoots brownish gray, scarcely black verruculose; spines 3-fid, concolorous, 7–10 mm, slender. Leaves shortly petiolate; leaf blade abaxially pale brown when dry, adaxially slightly shiny, oblong-elliptic or lanceolate, 4–12 × 1.5–3 cm, leathery, abaxially with obviously raised veins, adaxially with slightly impressed midvein, lateral veins conspicuous, base cuneate, margin closely 25–30-spinulose-suberrulate on each side, apex obtuse. Flowers (10–)15–20-fascicled. Pedicels 1.6–2.2 cm, weak, glabrous; bractlets triangular, apex acute. Sepals in 3 whorls; outer sepals triangular-ovate, ca. 3 × 3 mm, apex acute; median sepals oblong-ovate, ca. 4 × 2 mm, apex mucronate; inner sepals oblong, ca. 4 × 2 mm, apex mucronate. Petals ovate-elliptic, ca. 4 × 3 mm, base attenuate, with separate glands, apex subrounded, mucronate. Stamens ca. 3 mm; anther connective truncate. Ovules solitary; funicles ca. as long as ovules. Berry oblong, not pruinose, style persistent. Fl. and fr. Apr–Aug.

- Thickets; 700–1900 m. Yunnan.

**59. *Berberis kunmingensis*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 8. 1985.

昆明小檗 kun ming xiao bo

Shrubs, evergreen, ca. 2 m tall. Branches yellow-brown, terete, sulcate, black verruculose; spines 3-fid, weak, yellow-brown, 1–1.5 cm. Petiole 8–10 mm; leaf blade abaxially yellow-brown, adaxially dark brown when dry, oblong-lanceolate or oblong-elliptic, 8–14 × 3–5 cm, leathery, abaxially with flat midvein, adaxially with slightly impressed midvein, lateral and reticulate veins conspicuously raised, base cuneate, margin 20–25-spinose-serrate on each side, apex obtuse. Flowers 10–20-fascicled. Pedicels 1.5–1.8 cm, slender. Sepals in 3 whorls; outer sepals ovate, ca. 2.5 × 1.5 mm, apex acute; median sepals lanceolate, ca. 10 × 3 mm; inner sepals obovate-oblong, ca. 12 × 4 mm. Petals obovate, ca. 10 × 2.5 mm, base cuneate, with oblong glands, apex entire. Stamens ca. 3 mm; anther connective truncate. Ovules solitary, shortly funiculate. Berry oblong, ca. 7 × 3 mm, pruinose, style persistent. Fl. and fr. unknown.

- Thickets, forest margins. Yunnan.

**60. *Berberis delavayi*** C. K. Schneider in Sargent, Pl. Wilson. 1: 364. 1913.

显脉小檗 xian mai xiao bo

*Berberis delavayi* var. *wachinensis* Ahrendt; *B. phanera* C. K. Schneider; *B. subcoriacea* Ahrendt.

Shrubs, evergreen, 1–3 m tall. Branches brownish gray or brownish yellow, terete, glabrous, black verruculose; spines 3-fid, concolorous, 1–3 cm, adaxially sulcate. Leaves shortly petiolate; leaf blade abaxially shiny, both surfaces deep green, oblong-elliptic or elliptic-lanceolate, 4.5–7 × 1.2–1.8 cm, leathery, both surfaces not pruinose, abaxially with raised midvein, adaxially with impressed midvein, both surfaces with conspicuous lateral and reticulate veins, base cuneate, margin undulate, slightly revolute, 7–12-spinose-serrulate on each side, apex acute. Flowers 2–6-fascicled. Pedicels green in flower, red in fruit, slender. Sepals in 3 whorls; outer sepals ovate, ca. 3 × 1.5 mm, apex obtuse; median sepals suborbicular or ovate-orbicular, ca. 5 × 4 mm; inner sepals similar to median sepals in form, ca. 7 × 5.5 mm. Petals oblong-obovate, ca. 5.5 × 4.5 mm, base clawed, with separate glands, apex subrounded, obtusely emarginate. Stamens ca. 3.5 mm; anther connective slightly prolonged, truncate. Ovules 3 or 4. Berry ellipsoid, ca. 1.2 × 0.6 cm, thickly blue pruinose, style not persistent. Fl. Jun–Sep, fr. Oct–Dec.

- *Abies* forests, thickets, streamsides, *Pinus* forests; 1800–4000 m. Sichuan, Yunnan.

**61. *Berberis davidii*** Ahrendt, J. Linn. Soc., Bot. 57: 56. 1961.

密叶小檗 mi ye xiao bo

*Berberis densa* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 254. 1939, not Planchon & Linden (1862); *B. wallichiana* Candolle f. *parvifolia* Franchet.

Shrubs, evergreen, ca. 1 m tall. Branches brownish gray, sulcate, black verruculose; shoots brownish yellow, glabrous; spines 3-fid, concolorous, ca. 2 cm, slender, adaxially sulcate. Petiole 2–5 mm; leaf blade abaxially yellowish green, adaxially dark green, elliptic or elliptic-lanceolate, 2–4.5 × 1–1.5 cm, leathery, abaxially not pruinose, midvein obviously raised, lateral veins 4–6 pairs, reticulate veins inconspicuous, base cuneate, apex obtuse, aristate. Flowers 6–8-fascicled. Pedicels weak, to 3 cm, glabrous. Sepals in 3 whorls; outer sepals suborbicular, ca. 2 × 2 mm; median sepals suborbicular, ca. 4 × 4 mm; inner sepals oblong-elliptic, ca. 6 × 3 mm. Petals obovate-elliptic, ca. 5.5 × 3.2 mm, base attenuate, with separate glands, apex rounded, entire. Stamens ca. 4 mm; anther connective prolonged, truncate. Ovules 2. Berry ellipsoid, 8–9 × ca. 7 mm, gray pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

- Grassy slopes, grasslands, riversides; 2000–3500 m. Yunnan.

**62. *Berberis multiovula*** T. S. Ying, Acta Phytotax. Sin. 37: 309. 1999.

多珠小檗 duo zhu xiao bo

Shrubs, evergreen, ca. 1 m tall. Branches and shoots pale gray, sulcate; spines 3-fid, pale yellow, 1–2.3 cm. Leaves sub-

sessile; leaf blade abaxially pale green, adaxially deep green, linear-lanceolate or narrowly elliptic, 1.5–3 cm × 3–5 mm, thinly leathery, both surfaces not pruinose, abaxially with conspicuously raised midvein, adaxially with slightly raised midvein, both surfaces with inconspicuous lateral and reticulate veins, base abruptly narrowed, margin 3–7-spinose-serrate on each side, apex aristate. Flowers 2–4-fascicled. Pedicels 5–11 mm, slender, glabrous. Sepals in 3 whorls; outer sepals triangular-ovate, ca. 3 × 2 mm; median sepals ovate, ca. 4 × 3 mm; inner sepals obovate, ca. 5.5 × 4 mm. Petals elliptic or oblong, ca. 4.1 × 2.2 mm, base not clawed, with separate glands, apex emarginate, lobes rounded. Stamens ca. 3 mm; anther connective prolonged, truncate. Ovules 5. Berry ellipsoid, 8–10 × 3–5 mm, not pruinose, style persistent. Fl. May, fr. Jun–Jul.

- Forest margins; 2900–3000 m. Sichuan.

**63. *Berberis gagnepainii*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 8: 196. 1908 [*"gagnepainii"*].

湖北小檗 hu bei xiao bo

Shrubs, evergreen, 1–2 m tall. Stems terete. Branches dark gray; shoots stramineous, sulcate, scarcely verruculose; spines concolorous, 1–4 cm, stout, adaxially flat or sulcate. Leaves subsessile; leaf blade abaxially yellow-green, adaxially dark green, sometimes grayish green or shiny, lanceolate or ovate-lanceolate to elliptic-lanceolate, 3.5–14 × 0.4–2.5 cm, leathery, abaxially not pruinose, midvein conspicuously raised, lateral veins slightly raised, reticulate veins inconspicuous, adaxially with slightly impressed midvein, lateral and reticulate veins conspicuous, base cuneate, margin 6–20(–40)-spinose-serrate on each side, apex acuminate. Flowers 2–8(–15)-fascicled. Pedicels ca. 3 mm. Sepals in 3 whorls; outer sepals oblong-ovate, ca. 4.5 × 4 mm, apex acute; median sepals elliptic to ovate, ca. 6.5 × 5.5 mm; inner sepals obovate, ca. 8 × 7 mm. Petals obovate, ca. 7 × 6 mm, base cuneate, with separate glands, apex emarginate or obtusely emarginate with obtuse lobes. Ovules 4 or 5. Berry red, oblong-ovoid, 8–10 × ca. 6 mm, slightly blue pruinose, style not persistent. Fl. May–Jun, fr. Jun–Oct.

- Montane thickets, forest margins, forest understories, on sides of rocks; 700–2800 m. Guizhou, Hubei, Sichuan, Yunnan.

- 1a. Leaf blade lanceolate, adaxially dark green, margin 6–20-spinose-serrate on each side ..... 63a. var. *gagnepainii*
- 1b. Leaf blade ovate-lanceolate or elliptic-lanceolate, adaxially very shiny, margin 20–40-spinose-serrate on each side ..... 63b. var. *omeiensis*

**63a. *Berberis gagnepainii* var. *gagnepainii***

湖北小檗(原变种) hu bei xiao bo (yuan bian zhong)

*Berberis caudatifolia* S. Y. Bao; *B. gagnepainii* var. *filipes* Ahrendt; *B. gagnepainii* var. *lanceifolia* Ahrendt; *B. gagnepainii* f. *pluriflora* Ahrendt.

Leaf blade adaxially dark green, lanceolate, margin 6–20-spinose-serrate on each side.

- Montane thickets, forests, forest margins, on sides of rocks; 700–2700 m. Guizhou, Hubei, Sichuan, Yunnan.

**63b. *Berberis gagnepainii* var. *omeiensis*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 264. 1939.

眉山小檗 mei shan xiao bo

Leaf blade adaxially very shiny, ovate-lanceolate or elliptic-lanceolate, margin 20–40-spinose-serrate on each side.

- Forest understories, forest margins; 1700–2800 m. Sichuan.

**64. *Berberis triacanthophora*** Fedde, Bot. Jahrb. Syst. 36(Beibl. 82): 43. 1905.

芒齿小檗 mang chi xiao bo

Shrubs, evergreen, 1–2 m tall. Stems terete; branches dark gray or brown; shoots reddish, scarcely verruculose; spines 3-fid, concolorous, 1–2.5 cm. Leaves subsessile; leaf blade abaxially gray-green, adaxially deep green, shiny, linear-lanceolate, oblong-lanceolate, or narrowly elliptic, 2–6 cm × 2.5–8 mm, leathery, abaxially papillose, sometimes slightly pruinose, midvein raised, both surfaces with inconspicuous lateral and reticulate veins, base cuneate, margin occasionally entire or 2–8-spinose-serrate on each side, apex acuminate or acute, aristate. Flowers 2–6-fascicled. Pedicels 1.5–2.5 cm, glabrous; bractlets reddish, ovate, ca. 1 mm. Sepals in 3 whorls; outer sepals ovate-orbicular, ca. 2 × 1.8 mm; median sepals ovate, ca. 3.5 × 2.5 mm, apex acute; inner sepals obovate, ca. 5 × 4 mm, apex obtuse. Petals obovate, ca. 4 × 3 mm, base cuneate, with separate oblong glands, apex emarginate. Stamens ca. 2 mm; anther connective prolonged, truncate. Ovules 2 or 3. Berry blue-black, ellipsoid, 6–8 × 4–5 mm, slightly pruinose. Fl. May–Jun, fr. Jun–Oct.

- Mixed forests; 500–2100 m. Guizhou, Hubei, Hunan, Shaanxi, Sichuan.

**65. *Berberis xingwenensis*** T. S. Ying, Acta Phytotax. Sin. 37: 311. 1999.

兴文小檗 xing wen xiao bo

Shrubs, evergreen, to 2.5 m tall. Branches gray-brown, terete, glabrous; spines 3-fid, yellow-brown, ca. 1 cm, slender, adaxially flat. Petiole ca. 5 mm, sometimes leaf subsessile; leaf blade abaxially yellow-green, adaxially dark green, shiny, elliptic-lanceolate or lanceolate, 6–15 × 1.3–4 cm, leathery, abaxially not pruinose, midvein and lateral veins obviously raised, reticulate veins visible, adaxially with slightly impressed midvein, lateral and reticulate veins slightly raised, base cuneate, margin 10–15-spinose-serrate on each side, apex acuminate. Flowers 5–16-fascicled, red. Pedicels 2–2.7 cm, slender. Sepals in 3(or 4) whorls; outer sepals ovate, 2.5–2.8 × 1.5–2 mm, apex acute; median sepals broadly elliptic, 4.5–5 × ca. 4 mm, apex obtuse; inner sepals elliptic, 5–5.2(–6) × 3.5–4 mm, rounded. Petals obovate, 4.5–5.1 × 3.2–4 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 2.8 mm; anther connective prolonged, truncate. Ovules 2. Berry red, pyriform, ca. 6 × 3 mm, not pruinose; style persistent, short. Fl. Apr–May, fr. Jul–Sep.

- Mixed forests on slopes; ca. 1800 m. Sichuan.

**66. *Berberis veitchii*** C. K. Schneider in Sargent, Pl. Wilson. 1: 363. 1913.

巴东小檗 *ba dong xiao bo*

Shrubs, evergreen, 1–1.5 m tall. Stems terete; branches pale grayish yellow, not verruculose; shoots reddish, glabrous; spines 3-fid, pale yellow, 1.5–3 cm, adaxially sulcate. Leaves subsessile; leaf blade abaxially pale yellow, shiny, adaxially dark green, lanceolate, 5–11 × 1–2 cm, thinly leathery, abaxially not pruinose, midvein raised, lateral veins slightly raised, adaxially with impressed midvein, base cuneate, margin slightly undulate, slightly revolute, 10–30-spinose-serrate on each side, apex acuminate. Flowers 2–10-fascicled. Pedicels 1.5–3.5 cm, glabrous; bractlets ovate, ca. 2 × 2 mm. Sepals in 3 whorls; outer sepals reddish brown, oblong-ovate, ca. 3.5 × 3 mm; median sepals obovate, concave, ca. 5 × 4 mm; inner sepals obovate, concave, ca. 7.5 × 5.5 mm. Petals obovate, base clawed, with approximate glands, apex rounded and narrowly incised. Stamens ca. 4 mm; anther connective slightly prolonged, obtuse. Ovules 2–4. Berry ovoid to ellipsoid, ca. 9 × 6 mm, blue pruinose, style not persistent. Fl. May–Jun, fr. Aug–Oct.

- Thickets, forests, forest margins, streamsides; 2000–3300 m. N Guizhou, Hubei, Sichuan.

**67. *Berberis pingbienensis*** S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 12. 1985.

屏边小檗 *ping bian xiao bo*

Shrubs, evergreen, to 2 m tall. Branches brownish gray, terete, sulcate, not verruculose; spines absent. Petiole short; leaf blade abaxially brownish yellow, adaxially yellow-green, not shiny, oblanceolate or obovate, 5–11 × 1.5–2.5 cm, leathery, abaxially with raised midvein and lateral veins, reticulate veins not visible, adaxially with slightly impressed midvein, reticulate veins conspicuous, base cuneate, margin 15–20-spinose-serrate on each side, apex acute. Flowers unknown. Fruit 2- or 3-fascicled; fruit stalk 1.5–2 cm; berry red, subglobose, 5–7 × ca. 4 mm, not pruinose, style not persistent. Fl. unknown, fr. Apr.

- Forest margins on limestone mountains; ca. 1900 m. Yunnan.

**68. *Berberis griffithiana*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 403. 1905.

错那小檗 *cuo na xiao bo*

Shrubs, evergreen, 2–3 m tall. Branches pale yellow, terete, sometimes sulcate, glabrous; spines 3-fid, 1.2–2.5 cm. Leaves sessile; leaf blade abaxially shiny, pale green, adaxially dark green or grayish white, elliptic-lanceolate, 1.2–3.2 cm × 4–9 mm, leathery, abaxially with conspicuously raised midvein, lateral and reticulate veins inconspicuous, adaxially with slightly raised midvein, lateral veins visible, reticulate veins inconspicuous, base cuneate, margin slightly revolute, slightly undulate, 2–4-spinulose-serrulate on each side, apex acute, aristate. Flowers 2–10-fascicled. Pedicels 1.1–2.2 cm; bractlets ovate, ca. 2 × 1 mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate, ca. 5 × 4 mm, apex acute; inner sepals oblong-

obovate, ca. 7 × 4.5 mm, rounded, obtuse. Petals obovate, ca. 7 × 4 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 5 mm; anther connective prolonged, apiculate. Ovules 3 or 4. Berry purplish black, pyriform or ellipsoid, 7–9 × 5–6 mm, pruinose, style persistent. Fl. May–Jun, fr. Jul.

Roadsides, forest margins, thickets, *Tsuga* forests, *Rhododendron* forests, bamboo groves, floodlands; 2100–5300 m. Xizang [Bhutan].

- 1a. Leaf blade green, abaxially not pruinose ..... 68a. var. *griffithiana*
- 1b. Leaf blade grayish white, abaxially pruinose ..... 68b. var. *pallida*

**68a. *Berberis griffithiana* var. *griffithiana***

错那小檗(原变种) *cuo na xiao bo* (yuan bian zhong)

*Berberis subpteroclada* Ahrendt; *B. subpteroclada* var. *impar* Ahrendt.

Leaf blade green, abaxially not pruinose.

Roadsides, forest margins, thickets, *Tsuga* forests, *Rhododendron* forests, bamboo groves; 2500–3300 m. Xizang [Bhutan].

**68b. *Berberis griffithiana* var. *pallida*** (J. D. Hooker & Thomson) D. F. Chamberlain & C. M. Hu, Notes Roy. Bot. Gard. Edinburgh 42: 547. 1985.

灰叶小檗 *hui ye xiao bo*

*Berberis wallichiana* Candolle var. *pallida* J. D. Hooker & Thomson, Fl. Ind. 1: 226. 1855; *B. bhutanensis* Ahrendt; *B. leptopoda* Ahrendt; *B. replicata* W. W. Smith var. *dispar* Ahrendt; *B. taronensis* Ahrendt var. *trimensis* Ahrendt.

Leaf blade grayish white, abaxially pruinose.

Thickets, floodlands; 2100–5300 m. SE Xizang [E Bhutan].

**69. *Berberis sublevis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 83. 1916.

近光滑小檗 *jin guang hua xiao bo*

*Berberis sublevis* var. *exquista* Ahrendt; *B. sublevis* var. *grandifolia* C. K. Schneider; *B. sublevis* var. *microcarpa* (J. D. Hooker & Thomson) Ahrendt; *B. wallichiana* Candolle var. *gracilipes* Ahrendt; *B. wallichiana* var. *microcarpa* J. D. Hooker & Thomson.

Shrubs, evergreen, 1–3 m tall. Branches grayish brown, sulcate, scarcely verruculose; spines 3-fid, concolorous, 1–2 cm, slender, adaxially flat. Leaves shortly petiolate; leaf blade abaxially pale green, adaxially dark green, linear-lanceolate, 4–12 × 1–1.5 cm, thinly leathery, abaxially not pruinose, midvein conspicuously raised, lateral veins slightly raised, adaxially with slightly impressed midvein, lateral veins visible, both surfaces with inconspicuous reticulate veins, base cuneate, margin slightly revolute, closely 10–20-spinose-serrate on each side, sometimes entire, apex acuminate. Flowers 5–30-fascicled. Pedicels 7–15 mm, slender. Sepals in 2 whorls; outer sepals reddish, ovate, ca. 2.5 × 2 mm, apex subacute; inner sepals obovate to oblong-elliptic, ca. 5 × 3 mm. Petals obovate, 5–5.5 × ca. 3 mm, base clawed, with separate glands, apex emarginate.

Stamens ca. 3.5 mm; anther connective obtuse. Ovules solitary; funicles 3–6 × longer than ovules. Berry purplish red, ovoid, 6–7 × 3–3.5 mm, not pruinose; style persistent, short. Fl. and fr. May–Nov.

Thickets, forests, streamsides; 1500–2700 m. Sichuan, Yunnan [NE India to Myanmar].

"*Berberis prainiana* Stapf" belongs here but is a nomen nudum and was therefore not validly published (*Vienna Code*, Art. 32.1(d)).

**70. *Berberis wuliangshanensis*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 14. 1985.

无量山小檗 wu liang shan xiao bo

Shrubs, evergreen, to 3 m tall. Branches purplish brown, terete, sulcate, glabrous; internodes 5–8 cm; spines 3-fid, colorous, 1–3.5 cm, stout, adaxially sulcate, sometimes weak or absent. Petiole 3–5 mm, sometimes leaf subsessile; leaf blade abaxially brownish red, adaxially yellow-green, lanceolate, elliptic-lanceolate, or elliptic, 6–13 × 2–3.5 cm, leathery, abaxially with raised midvein and lateral veins, reticulate veins visible, adaxially with slightly impressed midvein, lateral veins visible, reticulate veins inconspicuous, base cuneate, margin 15–35-spinose-serrate on each side, apex acuminate. Flowers 6–12-fascicled. Pedicels 1.5–2 cm. Sepals in 2 whorls; outer sepals suborbicular, ca. 4 × 3.5 mm, apex rounded; inner sepals elliptic, ca. 7 × 5 mm. Petals obovate, ca. 6 × 3.5 mm, base cuneate, with separate glands, apex entire, rounded. Stamens ca. 4.5 mm; anther connective prolonged, truncate. Ovules solitary. Berry black, oblong-ellipsoid, 7–8 × ca. 3 mm, not or slightly pruinose, style not persistent. Fl. Apr–May, fr. Oct–Nov.

● Evergreen broad-leaved forests, slopes; 1800–2500 m. Yunnan.

**71. *Berberis vernalis*** (C. K. Schneider) D. F. Chamberlain & C. M. Hu, Notes Roy. Bot. Gard. Edinburgh 42: 554. 1985.

春小檗 chun xiao bo

*Berberis ferdinandi-coburgii* C. K. Schneider var. *vernalis* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 249. 1939.

Shrubs, evergreen, 1–2 m tall. Branches brownish yellow or stramineous, sulcate, sparsely black verruculose; spines colorous, terete, 1.5–3.5 cm, stout. Petiole 2–4 mm; leaf blade abaxially brownish yellow, adaxially deep green, shiny, elliptic to elliptic-lanceolate or oblong-elliptic, 3–12 × 0.7–3 cm, leathery, abaxially not pruinose, midvein conspicuously raised, adaxially with slightly impressed midvein, both surfaces with conspicuous lateral veins, reticulate veins slightly visible, base cuneate, margin sometimes slightly revolute, 10–24-spinose-serrate on each side, apex acute, aristate. Flowers 8–30-fascicled. Pedicels 1–2 cm, slender, glabrous. Sepals in 2 whorls; outer sepals ovate, ca. 3 × 1.3 mm, apex acute; inner sepals broadly elliptic, ca. 5 × 3 mm, apex acuminate. Petals obovate, 3.5–4.5 × 1.5–2.5 mm, base clawed, with separate glands, apex entire, rounded. Stamens ca. 3 mm; anther connective truncate. Ovules solitary, subsessile. Berry black, ellipsoid, 5–7 × ca. 4 mm, not pruinose, style persistent. Fl. and fr. Jun–Oct.

● Thickets, forests; 1300–2600 m. Hunan, Yunnan.

**72. *Berberis levis*** Franchet, Bull. Soc. Bot. France 33: 386. 1886.

平滑小檗 ping hua xiao bo

*Berberis levis* var. *brachyphylla* Ahrendt; *B. willeana* C. K. Schneider; *B. willeana* var. *serrulata* C. K. Schneider.

Shrubs, evergreen, 0.5–1.5 m tall. Branches brownish gray, terete; shoots brownish yellow, sulcate, densely black verruculose; spines 3-fid, 1–4 cm, stout, terete or adaxially flat. Leaves subsessile; leaf blade adaxially dark yellow-green, elliptic, narrowly elliptic, or lanceolate, 3–10 × 0.7–1.7 cm, leathery, adaxially not pruinose, midvein raised, both surfaces with lateral and reticulate veins inconspicuous, base cuneate, margin 5–15(–20)-spinose-serrate on each side, apex shortly acuminate, aristate. Flowers 7–25-fascicled. Pedicels 1–2 cm, glabrous. Sepals in 2 whorls; outer sepals obovate or triangular, 3–5 × 1–1.5 mm; inner sepals obovate or lanceolate, 4–5 × 1–2 mm. Petals obovate or broadly obovate, 5–6 × ca. 2.5 mm, base cuneate, with separate glands, apex entire or slightly emarginate, rounded or mucronate. Stamens 3–4 mm; anther connective prolonged, obtuse. Ovules solitary, shortly funiculate. Berry black, ellipsoid, 7–8 × 5–6 mm, not or scarcely pruinose, style persistent. Fl. Apr–May, fr. Sep–Nov.

● Evergreen broad-leaved forests, *Pinus* forests, slopes; 2100–2900 m. Sichuan, Yunnan.

**73. *Berberis bergmanniae*** C. K. Schneider in Sargent, Pl. Wilson. 1: 362. 1913.

汉源小檗 han yuan xiao bo

Shrubs, evergreen, 1–2 m tall. Branches brownish yellow or brown, sulcate, sparsely black verruculose; spines 3-fid, pale yellow, 1.5–2.5 cm, stout. Petiole short, or leaf subsessile; leaf blade abaxially pale green, adaxially deep green, shiny on both surfaces, oblong-elliptic or elliptic, 3–7 × 1–2 cm, thickly leathery, both surfaces not pruinose, abaxially with markedly raised midvein, adaxially with conspicuously impressed midvein, both surfaces with slightly raised lateral veins, reticulate veins inconspicuous, base cuneate, margin thickened, slightly revolute, not or sometimes undulate, 2–12-spinose-serrate on each side, apex acute or acuminate. Flowers 5–20-fascicled. Pedicels 7–15 mm. Sepals in 2 whorls; outer sepals ovate, ca. 5.5 × 3.5 mm; inner sepals obovate, ca. 7 × 5 mm. Petals obovate, ca. 6 × 5 mm, base clawed, with separate glands, apex rounded, incised. Stamens ca. 4.5 mm; anther connective truncate. Ovules 1 or 2. Fruit stalk dark brown, to 2 cm; berry black, ovoid-ellipsoid or ovoid-globose, 8–9 × ca. 6 mm, blue pruinose, style persistent and conspicuous; seeds 1 or 2. Fl. Mar–May, fr. May–Oct.

● Thickets, forests, sunny slopes; 1200–2500 m. Sichuan.

- 1a. Leaf margin not undulate, 2–12-spinose-serrate on each side ..... 73a. var. *bergmanniae*
- 1b. Leaf margin undulate, 2–6-spinose-dentate on each side ..... 73b. var. *acanthophylla*

**73a. *Berberis bergmanniae* var. *bergmanniae***

汉源小檗(原变种) han yuan xiao bo (yuan bian zhong)

Leaf blade shiny on both surfaces, margin not undulate, 2–12-spinose-serrate on each side.

- Thickets, forests; 1200–2000 m. Sichuan.

**73b. *Berberis bergmanniae* var. *acanthophylla*** C. K. Schneider in Sargent, Pl. Wilson. 1: 362. 1913.

汶川小檗 *wen chuan xiao bo*

Leaf blade dark colored adaxially, margin undulate, 2–6-spinose-dentate on each side.

- Sunny slopes, thickets; 2000–2500 m. Sichuan.

**74. *Berberis iteophylla*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 7. 1985.

鼠叶小檗 *shu ye xiao bo*

Shrubs, evergreen, to 1.5 m tall. Branches brownish gray, terete, sulcate, sparsely black verruculose; shoots pale yellow; spines 3-fid, 1–1.2 cm, slender. Leaves compactly fascicled; petiole ca. 5 mm; leaf blade abaxially pale yellow-green, linear-lanceolate, 9–16 × 1.4–2.4 cm, leathery, abaxially not pruinose, midvein and lateral veins raised, adaxially with conspicuously impressed midvein, lateral veins slightly visible, both surfaces with inconspicuous reticulate veins, base cuneate, margin closely 25–35-spinose-serrate on each side, apex acute. Flowers 12–20-fascicled. Pedicels ca. 1.5 cm, slender, glabrous. Sepals in 2 whorls; outer sepals triangular-ovate, ca. 3 × 2 mm, apex acute; inner sepals oblong, ca. 4 × 3 mm, apex acuminate. Petals obovate, ca. 3 × 2 mm, base attenuate, clawed, with approximate glands, apex rounded, slightly emarginate. Stamens ca. 2 mm; anther connective truncate. Ovules solitary, shortly funiculate. Berry (immature) ellipsoid, not pruinose, style persistent. Fl. and fr. Apr–Aug.

- Slopes, streamside, thickets, forests; ca. 2200 m. Yunnan (Shuangbai).

**75. *Berberis ferdinandi-coburgii*** C. K. Schneider in Sargent, Pl. Wilson. 1: 364. 1913.

大叶小檗 *da ye xiao bo*

Shrubs, evergreen, to 2 m tall. Branches sulcate, scarcely black verruculose; spines 3-fid, 7–15 mm, slender, adaxially sulcate. Petiole 2–4 mm; leaf blade abaxially brownish yellow, adaxially shiny, castaneous, elliptic-oblongate, 4–9 × 1.5–2.5 cm, leathery, both surfaces not pruinose, abaxially with raised midvein and lateral veins, adaxially with impressed midvein and lateral veins, both surfaces with visible reticulate veins, base cuneate, margin sometimes slightly revolute, 35–60-spinose-serrate on each side, apex acute, aristate. Flowers 8–18-fascicled. Pedicels 1–2 cm, slender, glabrous; bractlets reddish, ca. 1.5 mm. Sepals in 2 whorls, ovate, ca. 5 × 3 mm. Petals narrowly obovate, 3.5–4.5 × 1.5–2.5 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective truncate. Ovules solitary, sessile. Berry black, ellipsoid or ovoid, 7–8 × 5–6 mm, not or sometimes slightly pruinose, style persistent. Fl. and fr. Jun–Oct.

- Thickets; 100–2700 m. Yunnan.

**76. *Berberis grodtmanniana*** C. K. Schneider, Oesterr. Bot. Z. 67: 32. 1918 [*“grodtmannia”*].

安宁小檗 *an ning xiao bo*

Shrubs, evergreen, 1–1.5 m tall. Branches dark gray or yellow, stout, very sulcate, not verruculose; spines 3-fid, 1–3 cm, stout, adaxially flat. Leaves sessile; leaf blade abaxially pale green, adaxially deep green, lanceolate, 3–6 × 0.4–1.2 cm, leathery, abaxially not pruinose, midvein conspicuously raised, lateral and reticulate veins inconspicuous, adaxially with impressed midvein, lateral veins slightly visible, base cuneate, margin conspicuously revolute or not, 7–12(–15)-spinose-serrate on each side, apex acute or acuminate, aristate. Flowers 5–10-fascicled. Pedicels (3–)4–12 mm; bractlets ca. 1 mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate, ca. 2 × 1 mm, apex acute; inner sepals ovate-elliptic, ca. 5.5 × 3 mm. Petals obovate, 4.5–5 × 2.5–3 mm, apex emarginate. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules solitary, sessile. Berry ellipsoid, 8–9 × ca. 4 mm, not or sometimes slightly pruinose; style persistent, short. Fl. Apr–May, fr. May–Aug.

- Forests, thickets, roadsides, runlet sides; 1900–3500 m. Sichuan, Yunnan.

- 1a. Branches dark gray; leaf margins revolute; pedicels 4–12 mm ..... 76a. var. *grodtmanniana*
- 1b. Branches yellow; leaf margins not revolute; pedicels 3–4 mm ..... 76b. var. *flavoramea*

**76a. *Berberis grodtmanniana* var. *grodtmanniana***

安宁小檗(原变种) *an ning xiao bo* (yuan bian zhong)

Branches dark gray. Leaf margin conspicuously revolute. Pedicels 4–12 mm.

- *Quercus* forests, thickets, roadsides, mixed forests, runlet sides; 1900–3100 m. Sichuan.

**76b. *Berberis grodtmanniana* var. *flavoramea*** C. K. Schneider in Sargent, Pl. Wilson. 1: 360. 1913.

黄茎小檗 *huang jing xiao bo*

Branches yellow. Leaf margin not revolute. Pedicels 3–4 mm.

- Forests; 3300–3500 m. Yunnan.

**77. *Berberis julianae*** C. K. Schneider in Sargent, Pl. Wilson. 1: 360. 1913.

豪猪刺 *hao zhu ci*

*Berberis julianae* var. *oblongifolia* Ahrendt; *B. julianae* var. *patungensis* Ahrendt.

Shrubs, evergreen, 1–3 m tall. Branches yellow-brown or gray-brown; shoots pale yellow, sulcate, scarcely black verruculose; spines 3-fid, concolorous, 1–4 cm, stout, adaxially sulcate. Petiole 1–4 mm; leaf blade abaxially pale green, adaxially deep green, elliptic, lanceolate, or oblanceolate, 3–10 × 1–3 cm, leathery, both surfaces not pruinose, abaxially with raised midvein, lateral veins slightly raised or not, adaxially with im-

pressed midvein, lateral veins slightly visible, both surfaces with inconspicuous reticulate veins, base cuneate, margin 10–20-spinose-serrate on each side, apex acuminate. Flowers 10–25-fascicled. Pedicels 8–15 mm; bractlets ovate, ca.  $2.5 \times 1.5$  mm, apex acute. Sepals in 2 whorls; outer sepals ovate, ca.  $5 \times 3$  mm, apex acute; inner sepals oblong-elliptic, ca.  $7 \times 4$  mm, apex rounded, obtuse. Petals oblong-elliptic, ca.  $6 \times 3$  mm, base clawed, with oblong glands, apex emarginate. Anther connective not prolonged. Ovules solitary. Berry blue-black, oblong,  $7-8 \times 3.5-4$  mm, white pruinose, style persistent. Fl. Mar, fr. May–Nov.  $2n = 28+2B^*$ .

● Slopes, forests, thickets, bamboo groves; 1100–2100 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan.

**78. *Berberis liophylla*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 247. 1939.

滑叶小檗 hua ye xiao bo

Shrubs, evergreen, 1–2 m tall. Branches brownish gray, terete; shoots brownish yellow, sulcate, glabrous; spines 3-fid, concolorous, 1–2.5 cm, slender, adaxially flat. Leaves subsessile; leaf blade abaxially brownish yellow, adaxially dark yellow-green, elliptic to lanceolate,  $2.5-6 \times 1-1.5$  cm, leathery, both surfaces not pruinose, abaxially with raised midvein, adaxially with slightly impressed midvein, both surfaces with visible lateral veins, reticulate veins inconspicuous, base cuneate, margin sometimes slightly revolute, 5–10-spinose-serrate on each side, apex acute. Flowers 2–10-fascicled. Pedicels 8–15 mm; bractlets ovate, apex acute. Sepals in 2 whorls; outer sepals ovate, ca.  $4 \times 1.5$  mm, apex acute; inner sepals obovate, ca.  $4 \times 2$  mm. Petals obovate, ca.  $3 \times 1.5$  mm, base clawed, with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective prolonged, obtuse. Ovules solitary, subsessile. Berry ellipsoid,  $7-8 \times 3-4$  mm, sometimes pruinose, style persistent. Fl. Mar–Apr, fr. Jun–Sep.

● Forest margins, thickets; 2100–2800 m. Sichuan, Yunnan.

**79. *Berberis taronensis*** Ahrendt, J. Bot. 79(Suppl.): 23. 1941.

独龙小檗 du long xiao bo

Shrubs, evergreen, 1–2 m tall. Branches dark gray, subterete, not verruculose; shoots pale yellow, sometimes sulcate; spines 3-fid, pale yellow, 5–15 mm, adaxially slightly sulcate. Leaves subsessile; leaf blade abaxially pale yellow-green, adaxially shiny, deep green, narrowly oblong-elliptic or oblong-lanceolate,  $2.5-6 \times 0.6-1.5$  cm, leathery, abaxially slightly pruinose, papillose, midvein conspicuously raised, lateral veins slightly raised, adaxially with impressed midvein, lateral veins slightly visible, both surfaces with inconspicuous reticulate veins, base cuneate, margin sometimes slightly revolute, 2–7-spinose-serrate on each side or aristate-dentate, apex acute. Flowers 2–12-fascicled. Pedicels dark red, 1–2.5 cm, slender; bractlets red, ovate, ca. 1 mm, apex acute. Sepals in 2 whorls, obovate; outer sepals ca.  $4 \times 2.5$  mm; inner sepals ca.  $6 \times 4$  mm. Petals ovate, ca.  $5.5 \times 3$  mm, base clawed, with approximate glands, apex entire. Stamens ca. 4 mm; anther connective distinctly prolonged, obtuse. Ovules 3. Berry yellow-green (immature), becoming red (mature), obovoid,  $7-8 \times 4-5$  mm, blue pruinose, style persistent. Fl. May, fr. Jun–Aug.

● Thickets, forests, forest margins; 2000–2600 m. Xizang, Yunnan.

**80. *Berberis photiniifolia*** C. M. Hu, Bull. Bot. Res., Harbin 6(2): 4. 1986 [*“photiniaefolia”*].

石楠小檗 shi nan xiao bo

Shrubs, evergreen, to 2 m tall. Branches dark gray; shoots deep purple, terete, glabrous; internodes 3–6 cm; spines 3-fid, 1–2 cm. Petiole very short; leaf blade adaxially green, shiny, lanceolate,  $4-8.5 \times 1.5-2.8$  cm, leathery, abaxially glaucous, not pruinose, midvein distinctly raised, lateral and reticulate veins conspicuous, adaxially with slightly impressed midvein, lateral veins slightly raised, reticulate veins inconspicuous, base cuneate, margin flat, 8–15-spinose-serrate on each side, apex acuminate. Flowers (2–)4–8-fascicled. Pedicels 1–1.5 cm; bractlets triangular-ovate. Sepals in 2 whorls; outer sepals ovate-oblong, 3–3.5 mm; inner sepals obovate or suborbicular, ca.  $4 \times 3.2$  mm. Petals obovate, ca. 3 mm, base clawed, with separate glands, apex subentire. Stamens ca. 2.5 mm; anther connective truncate. Ovules 3 or 4. Berry ovoid-ellipsoid,  $7-8 \times 4-5$  mm, slightly pruinose, style not persistent. Fl. and fr. unknown.

● Mountain summits; ca. 1000 m. Guangdong.

**81. *Berberis fujianensis*** C. M. Hu, Bull. Bot. Res., Harbin 6(2): 5. 1986.

福建小檗 fu jian xiao bo

Shrubs, evergreen, ca. 1 m tall. Branches deep gray, sulcate; shoots pale yellow, terete, sparsely black verruculose; spines 3-fid, 1–2 cm, adaxially flat or slightly sulcate. Petiole 3–5 mm; leaf blade abaxially shiny, adaxially green, slightly shiny, elliptic or elliptic-lanceolate,  $3-5(-7) \times 1-2(-2.5)$  cm, leathery, both surfaces not pruinose, abaxially glaucous, midvein obviously raised, adaxially with slightly impressed midvein, lateral veins slightly raised, both surfaces with inconspicuous reticulate veins, base attenuate, margin 8–14-spinose-serrate on each side, apex acute or subacuminate. Flowers (2–)4–8-fascicled. Pedicels 4–7 mm, slender; bractlets triangular-ovate, ca. 1.5 mm, apex acute. Sepals in 2 whorls; outer sepals broadly obovate or suborbicular, ca. 3.5 mm, apex rounded. Petals obovate, ca. 3 mm, base clawed, with approximate glands, apex entire, rounded, or slightly emarginate. Stamens ca. 2 mm; anther connective shortly apiculate. Ovules 2 or 3. Berry green (immature), ellipsoid,  $6-7 \times 3-4$  mm, sometimes pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

● Thickets, forest margins, sparse forests; 1400–2100 m. Fujian.

**82. *Berberis atrocarpa*** C. K. Schneider in Sargent, Pl. Wilson. 3: 437. 1917.

黑果小檗 hei guo xiao bo

*Berberis atrocarpa* var. *subintegra* Ahrendt; *B. silvicola* C. K. Schneider var. *angustata* Ahrendt.

Shrubs, evergreen, 1–2 m tall. Branches brownish gray or brownish black, angulate to sulcate, finely black verruculose; spines 3-fid, pale yellow, 1–4 cm, adaxially flat. Petiole short; leaf blade abaxially pale green, adaxially deep green, shiny,

lanceolate or oblong-elliptic,  $3-7 \times 0.7-1.4$  cm, thickly leathery, both surfaces not pruinose, abaxially with obviously raised midvein, adaxially with impressed midvein, both surfaces with indistinct lateral and reticulate veins, base cuneate, margin remotely 5-10-spinose-serrate on each side, occasionally subentire, apex acute. Flowers 3-10-fascicled. Pedicels reddish, 5-10 mm, glabrous. Sepals in 2 whorls; outer sepals oblong-obovate, ca.  $4 \times 2$  mm; inner sepals obovate, ca.  $7 \times 4$  mm. Petals obovate, ca.  $6 \times 4.5$  mm, base cuneate, with separate glands, apex rounded, deeply incised. Stamens ca. 4 mm. Ovules 2, sessile or very shortly funiculate. Berry black, ovoid, ca.  $5 \times 4$  mm, not pruinose, style persistent. Fl. Apr, fr. May-Aug.

• Thickets, *Pinus* forests, margins of evergreen broad-leaved forests, on rocks; 600-2800 m. Hunan, Sichuan, Yunnan.

**83. *Berberis zanlanscianensis*** Pampanini, Nuovo Giorn. Bot. Ital., n.s., 22: 293. 1915.

鄂西小檗 *e xi xiao bo*

Shrubs, evergreen, 1-2.5 m tall. Branches dark gray, angulate, not verruculose; shoots purplish red, glabrous; spines 3-fid, pale yellow, 1-1.5 cm, sometimes absent. Petiole 2-6 mm; leaf blade abaxially pale green or reddish brown, adaxially deep green, lanceolate, elliptic-lanceolate, or obovate-lanceolate,  $3-13 \times 1-2.2$  cm, leathery, both surfaces not pruinose, abaxially with conspicuously raised midvein and lateral veins, adaxially with impressed midvein, lateral veins slightly raised, both surfaces with slightly visible reticulate veins, base attenuate, margin slightly revolute when dry, 10-20-spinose-serrate on each side, apex subacuminate. Flowers 5-30-fascicled. Pedicels purplish red, 1-2.5 cm. Petals longer than outer sepals. Ovules 1-3. Berry black, ovoid,  $7-9 \times 4-5$  mm, not pruinose; style persistent, short. Seeds 1-3. Fl. Mar-May, fr. May-Sep.

• Roadsides, forests, thickets; 1400-1700 m. Hubei, Sichuan.

**84. *Berberis fallaciosa*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 258. 1939.

南川小檗 *nan chuan xiao bo*

Shrubs, evergreen, 1-3 m tall. Branches dark gray, terete, glabrous; shoots gray, sulcate, scarcely verruculose; spines 3-fid, pale yellow, 1-4 cm. Petiole 2-6 mm; leaf blade abaxially yellow-green, adaxially deep green, lanceolate, elliptic-lanceolate, or obovate-lanceolate,  $3-13 \times 1-2.2$  cm, leathery, abaxially with conspicuously raised midvein, lateral veins slightly raised, adaxially with obviously impressed midvein, lateral veins slightly visible, both surfaces with inconspicuous reticulate veins, base attenuate, margin often revolute, 15-30-spinose-serrate on each side, apex subacuminate. Flowers 2-5-fascicled. Pedicels reddish, 1-2.5 cm; bractlets broadly ovate, apex obtuse. Sepals in 2 whorls, obovate; outer sepals ca.  $3.5 \times 3$  mm; inner sepals ca.  $5 \times 4$  mm. Petals oblong-obovate, ca.  $4 \times 2.3$  mm, base clawed, with approximate glands, apex emarginate. Stamens ca. 3 mm; anther connective slightly prolonged, apiculate. Ovules 2, sessile. Berry obovoid,  $6-9 \times 5-6$  mm, not pruinose, style not persistent. Fl. Apr-May, fr. Jun-Oct.

• Thickets, forests, roadsides, streamsides; 1000-2700 m. Hubei, Sichuan.

**85. *Berberis amabilis*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 257. 1939.

可爱小檗 *ke ai xiao bo*

*Berberis amabilis* var. *holophylla* C. Y. Wu & S. Y. Bao.

Shrubs, evergreen, 1-2 m tall. Branches brownish gray, terete; shoots pale yellow, angulate, verruculose, glabrous; spines 3-fid, subterete, sometimes adaxially sulcate, 1-3 cm. Petiole 1-2 mm; leaf blade adaxially green, oblong-elliptic, elliptic-lanceolate, or oblanceolate,  $4-8 \times 1-1.5$  cm, leathery, abaxially white pruinose, with obviously raised midvein, lateral veins conspicuous, adaxially with obviously impressed midvein, lateral veins inconspicuous, both surfaces with inconspicuous reticulate veins, base cuneate, margin usually revolute, 3-6-spinose-serrate on each side, sometimes entire, apex acute, aristate. Flowers 6-25-fascicled. Pedicels red, 1-1.8 cm, slender, glabrous; bractlets ovate, ca.  $2 \times 1.5$  mm, apex acuminate. Sepals in 2 whorls; outer sepals broadly ovate, ca.  $5 \times 4$  mm; inner sepals elliptic or elliptic-oblong,  $6-7 \times$  ca. 4 mm. Petals obovate,  $6-7 \times$  ca. 4 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 5 mm; anther connective prolonged, apiculate. Ovules 2, sessile. Berry black, ellipsoid,  $6-8 \times 3-5$  mm, not pruinose, style not persistent. Fl. and fr. Jun-Aug.

Thickets, forest margins, shaded places on slopes; 1800-3300 m. Yunnan [N Myanmar].

**86. *Berberis arguta*** (Franchet) C. K. Schneider, Bull. Herb. Boissier, sér. 2, 8: 197. 1908.

锐齿小檗 *rui chi xiao bo*

*Berberis wallichiana* Candolle f. *arguta* Franchet, Bull. Soc. Bot. France 33: 388. 1886.

Shrubs, evergreen, 1-1.5 m tall. Branches stramineous to brownish gray, terete, glabrous; spines 3-fid, concolorous, 2.5-4 cm, stout, adaxially sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially dark green, lanceolate to oblong-lanceolate,  $4.5-14 \times 1.5-2.5$  cm, leathery, abaxially not pruinose, lateral veins 13-16 pairs, both surfaces with obviously raised reticulate veins, base cuneate, margin 30-60-spinose-serrulate on each side, apex acuminate. Flowers 6-8-fascicled. Pedicels red, to 1.5 cm, glabrous. Sepals in 2 whorls; outer sepals broadly ovate, ca.  $3.5 \times 3$  mm, apex obtuse; inner sepals oblong-elliptic, ca.  $5 \times 3.5$  mm, apex obtuse. Petals obovate, ca.  $4.5 \times 3.5$  mm, base clawed, with oblong glands, apex rounded, emarginate. Stamens ca. 4 mm; anther connective truncate. Ovules 2, sessile. Berry black, ellipsoid to globose,  $6-8 \times 4-5$  mm, not pruinose, style persistent and very short; seeds 2. Fl. May-Jun, fr. Sep-Oct.

• Margins of valley forests; 1600-1800 m. Guizhou, Yunnan.

**87. *Berberis jiangxiensis*** C. M. Hu, Bull. Bot. Res., Harbin 6(2): 9. 1986.

江西小檗 *jiang xi xiao bo*

Shrubs, evergreen, ca. 1 m tall. Branches dark brown; shoots pale yellow-green, sulcate, not verruculose; spines 3-fid,

concolorous, 1–2.5 cm. Petiole 1–3 mm; leaf blade adaxially shiny, green, elliptic-oblongate, narrowly lanceolate, or oblong, 1.4–4 × 0.5–1.2 cm, thinly leathery, abaxially pruinose, midvein obviously raised, lateral veins conspicuous, reticulate veins inconspicuous, adaxially with slightly impressed midvein, lateral veins 2–4 pairs, obviously raised, base attenuate, margin 4–7-spinose-serrate on each side, apex acute. Flowers (2 or) 3- or 4-fascicled. Pedicels 6–10 mm, slender or stout; bractlets ovate, ca. 3 × 2 mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate or suborbicular, 4–4.5 × ca. 4 mm; inner sepals broadly elliptic, ca. 7 × 4.5–5 mm. Petals obovate, 4–4.5 × ca. 2.5 mm, base shortly clawed, with approximate glands, apex emarginate, lobes rounded, obtuse. Stamens ca. 3.5 mm; anther connective truncate. Ovules 2–4. Berry ellipsoid, ca. 9 × 5.5 mm, slightly pruinose; style persistent, short. Fl. Apr–Jun, fr. Jul–Sep.

• Roadsides, rock crevices, sides of rocks, forests, runlet sides; 1500–1800 m. Jiangxi.

- 1a. Leaves elliptic-oblongate or narrowly lanceolate; flowers 3- or 4-fascicled; pedicels slender ..... 87a. var. *jiangxiensis*  
 1b. Leaves oblong; flowers 2- or 3-fascicled; pedicels stout ..... 87b. var. *pulchella*

#### 87a. *Berberis jiangxiensis* var. *jiangxiensis*

江西小檗(原变种) *jiang xi xiao bo* (yuan bian zhong)

Leaves elliptic-oblongate or narrowly lanceolate. Flowers 3- or 4-fascicled. Pedicels slender.

• Roadsides, rock crevices, forests, runlet sides; 1500–1800 m. Jiangxi.

87b. *Berberis jiangxiensis* var. *pulchella* C. M. Hu, Bull. Bot. Res., Harbin 6(2): 10. 1986.

短叶江西小檗 *duan ye jiang xi xiao bo*

Leaves oblong. Flowers 2- or 3-fascicled. Pedicels stout.

• Sides of rocks; ca. 1600 m. Jiangxi.

88. *Berberis weixinensis* S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 13. 1985.

威信小檗 *wei xin xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches blackish gray, angulate; spines 3-fid, 5–7 mm, slender. Leaves subsessile; leaf blade abaxially yellow-green, adaxially olivaceous when dry, lanceolate, 10–17 × 2–2.5 cm, leathery, abaxially not pruinose, midvein raised, adaxially with slightly impressed midvein, lateral veins 14–16 pairs, both surfaces with conspicuous reticulate veins, base cuneate, margin flat, 10–25-spinose-serrate on each side, apex acuminate. Flowers unknown. Inflorescence with 4–8-fascicled berries; fruit stalk 2–2.5 cm glabrous; berry ellipsoid, 5–6 × 4–5 mm, blue pruinose, style not persistent; seeds 2. Fl. unknown, fr. Jun–Aug.

• Mixed forests; 1400–1500 m. Yunnan.

89. *Berberis subacuminata* C. K. Schneider in Sargent, Pl. Wilson. 1: 363. 1913.

亚尖小檗 *ya jian xiao bo*

Shrubs, evergreen, to 2.5 m tall. Branches brownish gray or brownish yellow, terete; shoots pale yellow, sulcate, glabrous; spines simple or 3-fid, pale yellow, 1–2 cm, slender, sometimes absent. Petiole 2–5 mm; leaf blade abaxially yellow-green, adaxially green, lanceolate or elliptic-lanceolate, 4–9 × 1.2–2.2 cm, subleathery, abaxially with raised midvein and lateral veins, adaxially with slightly impressed or flat midvein, lateral veins conspicuous, both surfaces with inconspicuous reticulate veins, base broadly cuneate, margin 8–15-spinose-serrate on each side, apex acuminate. Flowers 2–6-fascicled. Pedicels 1.8–2.2 cm; bractlets ca. 2 × 1.5 mm. Sepals in 2 whorls; outer sepals obovate, ca. 4 × 2 mm; inner sepals broadly obovate, ca. 7 × 5 mm. Petals obovate, ca. 5 × 2.5 mm, base clawed, with approximate glands, apex emarginate. Stamens ca. 4.5 mm; anther connective truncate. Ovules 2 or 3, sessile. Berry subglobose or ellipsoid, 6–7 × ca. 5 mm, slightly pruinose, style not persistent. Fl. Mar–Apr, fr. May–Nov.

• Dry slopes, thickets, mixed forests; 1400–2500 m. Guizhou, Hunan, Yunnan.

90. *Berberis dongchuanensis* T. S. Ying, Acta Phytotax. Sin. 37: 312. 1999.

东川小檗 *dong chuan xiao bo*

Shrubs, evergreen, 0.6–1 m tall. Branches dark gray, terete, not verruculose; spines 3-fid, pale yellow, to 1 cm. Leaves subsessile; leaf blade adaxially yellow-green, narrowly elliptic, 3.5–8 × 1–2 cm, thickly leathery, abaxially thickly pruinose, midvein raised, lateral and reticulate veins indistinct, adaxially with obviously impressed midvein, lateral veins slightly conspicuous, base cuneate, margin slightly revolute, coarsely 1–4-aristate-dentate on each side, apex acute. Flowers 3–5-fascicled. Pedicels to 3.5 cm, slender, glabrous. Sepals in 3 whorls; outer sepals triangular-ovate, ca. 2 × 1.5 mm, apex acuminate; median sepals ovate-elliptic, ca. 5.1 × 3 mm; inner sepals broadly elliptic, ca. 6 × 5 mm. Petals obovate, ca. 5 × 4 mm, base clawed, with separate glands, apex rounded, entire. Stamens ca. 3.5 mm; anther connective rounded, obtuse. Ovules 4, shortly funiculate. Fruit unknown. Fl. Apr–May, fr. unknown.

• Rocky cliffs; ca. 2600 m. Yunnan.

91. *Berberis parapruinosa* T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 145. 1985.

拟粉叶小檗 *ni fen ye xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches pale gray; shoots pale yellow, terete; spines 3-fid, concolorous, 1.4–2.7 cm, stout. Leaves subsessile; leaf blade abaxially pale green, adaxially shiny, green, elliptic or oblong-elliptic, 3–8 × 1–2.5 cm, thickly leathery, abaxially not pruinose, midvein and lateral veins raised, adaxially with conspicuous midvein and lateral veins, both surfaces with indistinct reticulate veins, base cuneate, margin sometimes revolute, coarsely 2–6-aristate-dentate on each side, apex acute, aristate. Flowers 2–6-fascicled. Pedicels 1–2 cm, glabrous; bractlets triangular-ovate, ca. 3 × 1.5 mm. Sepals in 3 whorls; outer sepals obovate or ovate-elliptic, ca. 5.1 × 3.8 mm; median sepals elliptic, ca. 8 × 5 mm; inner sepals obovate,

ca.  $7 \times 5$  mm, apex obtuse. Petals obovate, ca.  $5.2 \times 4$  mm, base clawed, with approximate glands, apex entire. Stamens ca. 4 mm; anther connective prolonged, truncate. Ovules 3 or 4, shortly funiculate. Berry green (immature), ellipsoid,  $7-9 \times$  ca. 5 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

● *Tsuga* forests; 2600–2900 m. Xizang.

**92. *Berberis jinshajiangensis*** X. H. Li, J. Trop. Subtrop. Bot. 15: 553. 2007.

小瓣小檗 *xiao ban xiao bo*

*Berberis micropetala* T. S. Ying, Acta Phytotax. Sin. 37: 313. 1999, not C. K. Schneider (1939).

Shrubs, evergreen, to 1 m tall. Shoots gray, sulcate, not verruculose; spines 3-fid, pale yellow, 1–1.2 cm, terete. Petiole 2–3 mm; leaf blade abaxially brown, adaxially dark green, elliptic or narrowly elliptic,  $1.5-4.5 \times 0.6-1.2$  cm, leathery, both surfaces not pruinose, abaxially papillose, midvein conspicuously raised, adaxially with impressed midvein, both surfaces with indistinct lateral and reticulate veins, base attenuate, cuneate, margin slightly revolute, 12–16-spinose-serrate on each side, apex acute or obtuse. Flowers 5-fascicled. Pedicels stout, 1.2–1.4 mm, but one to 3–4 mm; bractlets rose-pink, ovate, apex acuminate. Sepals in 3 whorls; outer sepals lanceolate,  $2.1-3 \times 1-1.1$  mm, upper part rose-pink; median sepals ovate-elliptic, ca.  $4.1 \times 2$  mm, margin membranous, hyaline, apex rose-pink; inner sepals obovate-elliptic, ca.  $4.3 \times 2$  mm. Petals obovate,  $2.2-2.5 \times 1-1.1$  mm, base clawed, with separate oblong glands, apex entire. Stamens ca. 1.5 mm; anther connective prolonged, truncate. Ovules solitary, shortly funiculate. Fruit unknown. Fl. Apr, fr. unknown.

● Sunny slopes, mixed forests; 2800–3200 m. Yunnan.

**93. *Berberis kawakamii*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 24. 1911.

台湾小檗 *tai wan xiao bo*

*Berberis brevisepala* Hayata; *B. chingshuiensis* T. Shimizu; *B. densifolia* Bijhouwer (1928), not Rusby (1920); *B. formosana* Ahrendt (1941), not H. L. Li (1952); *B. kawakamii* var. *formosana* Ahrendt; *B. nantoensis* C. K. Schneider.

Shrubs, evergreen, 1–2 m tall. Branches dark gray, terete; shoots pale yellow, sulcate, verruculose; spines 3-fid, concolorous, 1.5–2 cm, not sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially dark green, elliptic, ovate-oblong, or oblong-lanceolate to obovate-oblong or oblanceolate,  $2.5-4.5 \times 1-1.5$  cm, leathery, both surfaces not pruinose, abaxially with obviously raised midvein, lateral veins impressed, adaxially with obviously impressed midvein, lateral veins visible, both surfaces with conspicuous reticulate veins, base cuneate, margin 3–8-spinose-serrate on each side, sometimes coarsely 1- or 2-aristate-dentate on each side, apex acute, aristate. Flowers 7–15-fascicled. Pedicels 7–15 mm; bractlets lanceolate, ca.  $2.5 \times 1$  mm, apex acuminate. Sepals in 2 whorls; outer sepals lanceolate or ovate, ca.  $3.5 \times 2$  mm, apex acuminate; inner sepals lanceolate or oblong-elliptic,  $8-9 \times$  ca. 3.5 mm, apex acuminate or obtuse. Petals oblong or oblong-obo-

vate,  $4-5 \times$  ca. 3.2 mm, base cuneate, with separate glands, apex entire or slightly incised. Anther connective slightly prolonged, truncate. Ovules 2 or 3, shortly funiculate. Berry ovoid, ca.  $9 \times 5$  mm, slightly pruinose, style persistent. Fl. Mar–May, fr. Aug–Oct.

● Thickets, forests; 2500–3500 m. Taiwan.

**94. *Berberis bicolor*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 454. 1911.

二色小檗 *er se xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches pale yellow-brown or slightly gray, terete, glabrous; spines 3-fid, concolorous, 1–1.5 cm. Leaves shortly petiolate; leaf blade abaxially pale green, adaxially deep green, narrowly elliptic or elliptic-lanceolate,  $6-10 \times 1.7-2.2$  cm, thinly leathery, abaxially pruinose, midvein obviously raised, lateral veins slightly raised, adaxially with obviously impressed midvein, lateral veins slightly raised, both surfaces with indistinct reticulate veins, base cuneate, margin 10–25-spinose-serrate on each side, apex acuminate. Flowers 3–6-fascicled, reddish yellow. Pedicels 1–1.2 cm, slender; bractlets triangular-ovate,  $2-2.5 \times 1-1.5$  mm, apex acute. Sepals in 2 whorls; outer sepals elliptic, ca.  $5 \times 3$  mm, apex acute; inner sepals obovate, ca.  $6.2 \times 4$  mm. Petals obovate, ca.  $5 \times 3$  mm, base clawed, with approximate glands, apex emarginate or subentire. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 2. Berry (immature) green, ellipsoid, slightly pruinose, style not persistent. Fl. Apr–May, fr. Jun–Aug.

● Forests, shaded places on slopes; 1400–1500 m. Guizhou.

**95. *Berberis chunanensis*** T. S. Ying in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl. II), 52. 2007.

淳安小檗 *chun an xiao bo*

Shrubs, evergreen, ca. 1 m tall. Branches dark gray, terete; shoots pale yellow; spines 3-fid, pale yellow, 1.2–1.7 cm. Leaves subsessile; leaf blade abaxially pale yellow, adaxially dark green, ovate-elliptic,  $1.5-3.5 \times 0.5-1.3$  cm, leathery, both surfaces not pruinose, abaxially with raised midvein, adaxially with slightly impressed midvein, lateral veins conspicuous, reticulate veins indistinct, base broadly cuneate, margin 3–7-spinose-serrate on each side, apex acuminate, aristate. Flowers 4–8-fascicled. Pedicels pale brownish yellow, 1.2–2 cm, glabrous. Sepals in 2 whorls; outer sepals ovate or ovate-elliptic,  $2.1-3.2 \times 1.1-2.2$  mm; inner sepals elliptic,  $6.5-7.2 \times 4.2-5$  mm. Petals obovate,  $6-6.5 \times 3-3.5$  mm, base broadly cuneate, with separate glands, apex entire, sometimes slightly emarginate. Stamens ca. 5 mm; anther connective prolonged, rounded. Ovules 2 or 3, funiculate. Fruit stalk reddish brown; berry ellipsoid,  $8-12 \times 5-6$  mm, pruinose, style ca. 1 mm. Fl. Apr–May, fr. Jul–Oct.

● Forests, rocky crevices; ca. 500 m. Zhejiang (Chun'an).

**96. *Berberis jinfoshanensis*** T. S. Ying, Acta Phytotax. Sin. 37: 316. 1999.

金佛山小檗 *jin fo shan xiao bo*

Shrubs, evergreen, 1.5–2 m tall. Branches dark gray,

terete, not verruculose; shoots stramineous, glabrous; spines 3-fid, concolorous, 1–3.5 cm, adaxially slightly sulcate. Petiole 2–4 mm; leaf blade abaxially grayish white or yellow-green, adaxially dark green, elliptic, 3–7 × 1.3–2.5 cm, leathery, abaxially slightly pruinose, midvein and lateral veins raised, adaxially with impressed midvein, lateral veins 5–7 pairs, slightly raised, both surfaces with indistinct reticulate veins, base cuneate, margin 3–10-spinose-serrate on each side, apex acute. Flowers 5–8-fascicled; bracts ovate-triangular, ca. 2 × 1 mm. Pedicels 1.5–2 cm, glabrous; bractlets ovate, ca. 2 × 2 mm. Sepals in 2 whorls; outer sepals obovate, ca. 5 × 3.5 mm; inner sepals oblong, ca. 5.5 × 4 mm. Petals obovate, 5–6 × 4–5.5 mm, base clawed, with approximate ovate glands, apex entire. Stamens 4.2–5 mm; anther connective slightly prolonged, obtuse. Ovules (2 or) 3. Berry (immature) black, ellipsoid, 7–8 × 5–6 mm, densely white pruinose, style persistent. Fl. Mar–Apr, fr. May–Aug.

- Mixed forests, weedy slopes; ca. 1600 m. Chongqing.

**97. *Berberis hayatana*** Mizushima, Misc. Rep. Res. Inst. Nat. Resources 35: 31. 1954.

南湖小檗 *nan hu xiao bo*

*Berberis formosana* H. L. Li (1952), not Ahrendt (1941).

Shrubs, evergreen, low. Branches pale gray, slender, sulcate, glabrous; spines 3-fid, weak, 1–1.5 cm, adaxially sulcate. Leaves shortly petiolate; leaf blade abaxially shiny, green, oblong, oblong-lanceolate, or elliptic, 1.5–3 × 0.6–1.2 cm, leathery, abaxially not pruinose, midvein obviously raised, lateral veins 5–7 pairs, adaxially glaucous, midvein slightly impressed, base broadly cuneate, margin flat, 3–7-spinose-serrate on each side, apex acute, aristate. Flowers 2–6-fascicled. Pedicels 8–10 mm, slender, glabrous; bractlets triangular-ovate, ca. 1.5 mm, apex acute. Sepals in 2 whorls; outer sepals broadly ovate or obovate-elliptic, ca. 5 mm, apex acute; inner sepals obovate-elliptic or obovate, ca. 5 mm, apex rounded. Petals obovate, ca. 4 mm, base attenuate, with separate glands, apex emarginate. Stamens ca. 2.5 mm; anther connective slightly prolonged, truncate. Ovules solitary, funiculate. Berry black, ellipsoid or ovoid, 4–6 × ca. 2 mm, pruinose, style not persistent. Fl. and fr. unknown.

- Slopes. Taiwan.

**98. *Berberis cavaleriei*** H. Lévêillé, Repert. Spec. Nov. Regni Veg. 9: 454. 1911.

贵州小檗 *gui zhou xiao bo*

*Berberis dolichostemon* Ahrendt; *B. emilii* C. K. Schneider; *B. liophylla* C. K. Schneider var. *conglobata* Ahrendt; *B. praecipua* C. K. Schneider var. *major* Ahrendt.

Shrubs, evergreen, ca. 2 m tall. Branches brownish gray; shoots brownish yellow, very sulcate, sparsely black verruculose; spines 3-fid, 1–2.5 cm, adaxially slightly sulcate or flat. Petiole 1–2.5 mm; leaf blade abaxially yellow-green, adaxially dark green, elliptic or oblong-elliptic, 2.5–6 × 1–1.5 cm, leathery, both surfaces not pruinose, abaxially with conspicuously raised midvein, adaxially with obviously impressed midvein,

both surfaces with slightly prominent lateral veins, reticulate veins indistinct, base cuneate, margin slightly revolute, 6–15-spinose-serrate on each side, apex obtuse or subacute. Flowers 5–20-fascicled. Pedicels 8–20 mm, slender; bractlets ovate, ca. 2.5 mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate or narrowly ovate, ca. 3 × 1 mm, apex obtuse or acute; inner sepals obovate or narrowly obovate, 2–4.5 × 1–1.5 mm, apex subacute. Petals ovate or obovate, ca. 5.5 × 2.8 mm, base with separate glands, apex incised. Stamens 2.5–4 mm; anther connective truncate. Ovules solitary, shortly funiculate. Berry black, oblong, 7–8 × ca. 4 mm, not pruinose, style persistent. Fl. Apr–May, fr. Jul–Oct.

- Thickets, roadsides, forests; 900–1800 m. Guizhou, Yunnan.

**99. *Berberis aristatoserrulata*** Hayata, Icon. Pl. Formosan. 3: 13. 1913 [*“aristato-serrulata”*].

密齿小檗 *mi chi xiao bo*

*Berberis mingetsensis* Hayata.

Shrubs, evergreen, ca. 1 m tall. Branches slender, sulcate; spines 3-fid, 2–4 mm, slender. Petiole 2–4 mm; leaf blade adaxially shiny, green, oblong-lanceolate, 5–7 × 1–1.5 cm, thinly leathery, abaxially glaucous, reticulate veins obviously raised, adaxially with indistinct reticulate veins, base cuneate, margin slightly revolute, closely 20–40-spinulose-serrulate on each side, apex obtuse, aristate. Flowers 10–15-fascicled, green-yellow. Pedicels ca. 1 cm; bractlets oblong-ovate, ca. 2.5 mm, apex acuminate. Sepals in 2 whorls, obovate; outer sepals ca. 5 × 4 mm; inner sepals to 5.5 mm. Petals obovate-spatulate, 3–5 × 2–2.5 mm, base with separate glands, apex rounded, incised. Ovules 2, funicles ca. as long as or to 2 × as long as ovules. Berry dark blue-black, ovoid, ca. 7 × 4 mm. Fl. and fr. May–Aug.

- Thickets; 2000–3000 m. Taiwan.

**100. *Berberis silvicola*** C. K. Schneider in Sargent, Pl. Wilson. 3: 438. 1917.

兴山小檗 *xing shan xiao bo*

Shrubs, evergreen, 1–3 m tall. Branches deep gray, angulate, not verruculose; shoots stramineous, glabrous; internodes 3.5–5.5 cm; spines 3-fid, 3–10 mm, slender, sometimes absent. Petiole 1–3 mm; leaf blade abaxially pale green, adaxially deep green, shiny, elliptic or oblong, 2–5 × 1–2 cm, thinly leathery, abaxially not pruinose, midvein obviously raised, lateral and reticulate veins conspicuous, adaxially with obviously impressed midvein, lateral and reticulate veins indistinct, base cuneate or shortly attenuate, margin 12–16-spinose-serrate on each side, apex acute. Flowers 2–5-fascicled. Pedicels 5–12 mm, slender; bractlets ovate, ca. 2.5 × 1 mm, apex acute. Sepals in 2 whorls; outer sepals ovate, ca. 4 × 1.8 mm, apex obtuse; inner sepals obovate, ca. 6 × 3.5 mm, apex rounded. Petals obovate, ca. 5 × 3 mm, base cuneate, with separate glands, apex incised. Stamens 5–8 mm; anther connective slightly prolonged, truncate. Ovules 2. Fruit stalk to 1.5 cm; berry black, oblong, ca. 8 × 4–5 mm, slightly pruinose; style persistent, short. Fl. May–Jun, fr. Jul–Oct.

- Thickets; 1200–2400 m. Hubei.

**101. *Berberis pruinosa*** Franchet, Bull. Soc. Bot. France 33: 387. 1886.

粉叶小檗 *fen ye xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches brownish gray or brownish yellow, terete, black verruculose; spines 3-fid, concolorous, 2–3.3 cm, stout, adaxially sulcate or flat. Leaves subsessile; leaf blade adaxially shiny, yellow-green or grayish green, elliptic to obovate, 2–6 × 1–2.5 cm, rigidly leathery, abaxially pruinose or not, midvein obviously raised, lateral veins indistinct, adaxially with flat midvein, lateral veins slightly raised, both surfaces with indistinct reticulate veins, base cuneate, margin slightly revolute or flat, usually coarsely 1–6-aristate-dentate on each side, occasionally entire or 3–5-spinose-serrate on each side, apex obtuse or shortly acuminate. Flowers (8–)10–20-fascicled. Pedicels 1–2 cm, slender; bractlets lanceolate, ca. 2 mm, apex acuminate. Sepals in 2 whorls; outer sepals oblong-elliptic, ca. 4 × 2 mm, apex obtuse, rounded; inner sepals obovate, ca. 6.5 × 5 mm, apex rounded. Petals obovate, ca. 7 × 4–5 mm, base clawed, with completely basal glands, apex deeply incised or entire. Stamens ca. 6 mm; anther connective not prolonged, rounded-truncate. Ovules 2 or 3. Berry ellipsoid or subglobose, 6–7 × 4–5 mm, densely white pruinose, style not persistent; seeds 2. Fl. Mar–Apr, fr. Jun–Aug.

• Thickets, forests, forest margins, roadsides; 1800–4000 m. Guizhou, Sichuan, Xizang, Yunnan.

- 1a. Petals deeply incised at apex; leaf margin usually coarsely 1–6-aristate-dentate on each side, occasionally entire ..... 101a. var. *pruinosa*  
 1b. Petals entire at apex; leaf margin usually entire, rarely 3–5-spinose-serrate on each side ..... 101b. var. *barresiana*

**101a. *Berberis pruinosa* var. *pruinosa***

粉叶小檗(原变种) *fen ye xiao bo* (yuan bian zhong)

*Berberis hibberdiana* Ahrendt; *B. pruinosa* var. *brevipes* Ahrendt; *B. pruinosa* var. *punctata* Ahrendt; *B. pruinosa* var. *viridifolia* C. K. Schneider, p.p.

Leaf margin usually coarsely 1–6-aristate-dentate on each side, occasionally entire. Petals deeply incised at apex.

• Thickets, forests, forest margins, roadsides; 1800–4000 m. Guizhou, Sichuan, Xizang, Yunnan.

**101b. *Berberis pruinosa* var. *barresiana*** Ahrendt, Bull. Misc. Inform. Kew 1939: 266. 1939.

易门小檗 *yi men xiao bo*

*Berberis pruinosa* var. *tenuipes* Ahrendt.

Leaf margin entire or rarely 3–5-spinose-serrate on each side. Petals entire, rounded at apex.

• Thickets, forests; 1800–2600 m. Yunnan.

**102. *Berberis laojunshanensis*** T. S. Ying, Acta Phytotax. Sin. 37: 318. 1999.

老君山小檗 *lao jun shan xiao bo*

Shrubs, evergreen, 0.5–1 m tall. Branches dark gray, terete; shoots pale yellow, not verruculose; spines 3-fid, pale yellow, ca. 1 cm. Leaves subsessile; leaf blade adaxially dark green, elliptic or narrowly elliptic, 1–2.3 cm × 4–7 mm, abaxially pruinose, midvein indistinct, adaxially veins indistinct, base attenuate, margin slightly revolute, 5–7-spinose-serrate on each side, apex acuminate, aristate. Flowers 3- or 4-fascicled. Pedicels 1–1.5 cm, glabrous. Sepals in 3 whorls; outer sepals triangular-ovate, ca. 2.1 × 1.2 mm; median sepals ovate, ca. 4 × 2 mm, apex acuminate; inner sepals oblong, 4.6–5 × 2.8–3.5 mm. Petals obovate, ca. 4 × 2 mm, base attenuate, with approximate glands, apex slightly retuse. Stamens ca. 3 mm; anther connective truncate. Ovules 4. Fruit unknown. Fl. May–Jun, fr. unknown.

• Thickets on slopes. Hubei.

**103. *Berberis sargentiana*** C. K. Schneider in Sargent, Pl. Wilson. 1: 359. 1913.

刺黑珠 *ci hei zhu*

*Berberis recurvata* Ahrendt; *B. simulans* C. K. Schneider.

Shrubs, evergreen, 1–3 m tall. Stems terete; branches grayish brown; shoots reddish, usually not verruculose, rarely scarcely black verruculose; internodes 3–6 cm; spines 3-fid, 1–4 cm, adaxially sulcate. Leaves subsessile; leaf blade abaxially yellow-green or pale green, adaxially shiny, dark green, oblong-elliptic, 4–15 × 1.5–6.5 cm, thickly leathery, abaxially with conspicuously raised midvein, lateral and reticulate veins prominent, adaxially with impressed midvein, lateral veins slightly raised, reticulate veins indistinct, base cuneate, margin 15–25-spinose-serrate on each side, apex acute. Flowers 4–10-fascicled. Pedicels 1–2 cm; bractlets red, ca. 2 × 2 mm. Sepals in 3 whorls; outer sepals with a red band along middle, ovate, ca. 3.5 × 3 mm, apex subacute; median sepals rhombic-elliptic, ca. 5 × 4.5 mm; inner sepals obovate, ca. 6.5 × 5 mm. Petals obovate, ca. 6 × 4.5 mm, base cuneate, with contiguous, orange glands, apex emarginate with rounded lobes. Stamens ca. 4.5 mm; anther connective truncate. Ovules 1 or 2. Berry black, oblong or oblong-ellipsoid, 6–8 × 4–6 mm, not pruinose, style not persistent. Fl. Apr–May, fr. Jun–Nov.

• Thickets, roadsides, bamboo forests, streamsides of forest understories; 700–2100 m. Hubei, Sichuan.

**104. *Berberis lempergiana*** Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941.

天台小檗 *tian tai xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches deep gray, sparsely black verruculose; shoots pale grayish yellow; spines 3-fid, subterete, 1–3 cm, stout. Petiole 1–5 mm; leaf blade abaxially pale green, brownish yellow when dry, slightly shiny, adaxially shiny, dark green, oblong-elliptic or lanceolate, 3.5–8 × 1–2.5 cm, leathery, abaxially not pruinose, midvein obviously raised, lateral and reticulate veins indistinct, adaxially with impressed midvein, lateral veins slightly visible, reticulate veins indistinct, base cuneate, margin 5–12-spinose-serrate on each

side, apex acuminate. Flowers 3–7-fascicled. Pedicels reddish, 7–15 mm; bractlets red, ovate, ca. 1.3 mm. Sepals in 3 whorls; outer sepals ovate-elliptic, ca.  $2.5 \times 2$  mm; median sepals ovate-elliptic, ca.  $5.5 \times 4$  mm; inner sepals obovate, ca.  $7 \times 6$  mm. Petals oblong-obovate, ca.  $6 \times 4$  mm, base cuneate, with contiguous glands, apex emarginate with rounded lobes. Stamens ca. 5 mm; anther connective obviously prolonged, truncate. Ovules 2 or 3, subsessile. Berry deep purple, oblong-ellipsoid or ellipsoid,  $7-10 \times 5-5.5$  mm, pruinose, style persistent; seeds 2 or 3, obovoid-globose or ellipsoid. Fl. Apr–May, fr. Jul–Oct.

- Forests, thickets, streamsides; ca. 1200 m. Zhejiang.

**105. *Berberis soulieana*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 449. 1905.

假豪猪刺 jia hao zhu ci

*Berberis soulieana* var. *paucinervata* Ahrendt; *B. stenophylla* Hance (1882), not Lindley (1864).

Shrubs, evergreen, 1–2(–3) m tall. Branches dark gray, terete, sometimes sulcate, scarcely verruculose; shoots grayish yellow, terete; spines 3-fid, adaxially flat, 1–2.5 cm, stout. Petiole 1–2 mm; leaf blade abaxially yellow-green, adaxially dark green, oblong, oblong-elliptic, or oblong-obovate,  $3.5-10 \times 1-2.5$  cm, very rigidly leathery, abaxially not pruinose, midvein obviously raised, adaxially with impressed midvein, both surfaces with indistinct lateral and reticulate veins, base cuneate, margin 5–18-spinose-serrate on each side, apex acute, aristate. Flowers 7–20-fascicled. Pedicels 5–11 mm; bractlets 2, reddish, ovate-triangular, ca.  $2.2 \times 1.5$  mm, apex acute. Sepals in 3 whorls; outer sepals ovate, ca.  $3 \times 2.4$  mm; median sepals sub-orbicular, ca.  $5 \times 4$  mm; inner sepals obovate-oblong, ca.  $7 \times 5$  mm. Petals obovate, ca.  $5 \times 3.8-4$  mm, base shortly clawed, with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective slightly prolonged, rounded. Ovules 2 or 3. Berry red when mature, obovoid-oblong,  $7-8 \times$  ca. 5 mm, pruinose, style persistent; seeds 2 or 3. Fl. Mar–Apr, fr. Jun–Sep.

- Thickets, streamsides, forests, slopes; 600–1800 m. Gansu, Hubei, Shaanxi, Sichuan.

**106. *Berberis impedita*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 263. 1939.

南岭小檗 nan ling xiao bo

Shrubs, evergreen, 0.5–1 m tall. Branches dark gray, angulate, not verruculose; shoots pale yellow; spines absent or very weak, 3-fid, pale yellow, ca. 1 cm. Petiole 5–8 mm; leaf blade abaxially grayish green or yellowish green, adaxially dark green, elliptic, oblong, or narrowly elliptic,  $4-9 \times 1.8-3.5$  cm, leathery, abaxially with obviously raised midvein and lateral veins, reticulate veins inconspicuous, adaxially with impressed midvein, lateral veins slightly raised, reticulate veins indistinct, base attenuate, margin 8–12-spinose-serrate on each side, apex obtuse or acute. Flowers 2–4-fascicled. Pedicels 8–18 mm; bractlets ovate, ca. 2.5 mm, apex acute. Sepals in 2 whorls; outer sepals elliptic-oblong,  $3.5-4.5 \times 1.8-2.5$  mm; inner sepals elliptic,  $5-5.5 \times 3-3.5$  mm, apex rounded. Petals obovate, ca.  $4 \times 2.5$  mm, apex emarginate. Stamens ca. 3 mm; anther connective slightly thickened with 2 small teeth. Ovules 4–6. Fruit stalk

often reddish. Berry black, oblong,  $8-9 \times 5-6$  mm, not pruinose, style not persistent. Fl. Apr–May, fr. Jun–Oct.

- Sunny places on mountain summits, forests, thickets, sparse forests, roadsides; 1400–2800 m. Guangdong, Guangxi, Hunan, Jiangxi, Sichuan.

**107. *Berberis hsuyunensis*** P. K. Hsiao & W. C. Sung, Acta Phytotax. Sin. 12: 388. 1974.

叙永小檗 xu yong xiao bo

Shrubs, evergreen, 1–2 m tall. Branches gray; shoots purplish brown, slightly angulate; internodes 5–6 cm; spines 3-fid, to 1 cm, slender. Petiole 2–3 mm; leaf blade abaxially yellow-green, adaxially green, oblong-elliptic, elliptic, or broadly elliptic,  $6-9 \times 3-5$  cm, thickly leathery, abaxially pruinose, midvein and lateral veins conspicuously raised, adaxially with slightly raised midvein and lateral veins, reticulate veins visible, base cuneate, margin 5–9-spinose-serrate on each side, or above middle 3–5-spinose-serrate on each side, apex acute. Flowers 30–50-fascicled. Pedicels 1.5–2 cm; bractlets triangular, ca.  $1 \times 1$  mm. Sepals in 2 whorls; outer sepals triangular-ovate, ca.  $3 \times 2.5$  mm; inner sepals broadly ovate, ca.  $4 \times 4$  mm, apex obtuse. Petals obovate, ca.  $4.5 \times 3.5$  mm, base clawed, with separate glands, apex slightly emarginate to subrounded. Stamens ca. 2 mm; anther connective prolonged, truncate. Ovules 5 or 6, shortly funiculate or subsessile. Berry black, subglobose, ca.  $7 \times 6$  mm, pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

- Forests, streamsides; 1200–1600 m. Sichuan.

**108. *Berberis deinacantha*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 259. 1939.

壮刺小檗 zhuang ci xiao bo

Shrubs, evergreen, 1–2 m tall. Branches brownish gray, angulate, black verruculose, glabrous; shoots brownish yellow; spines 3-fid, 2.5–5 cm, stout, adaxially sulcate. Petiole 2–4 mm; leaf blade abaxially yellow-green, adaxially dark castaneous, oblong-elliptic,  $3-12 \times 1.5-3$  cm, leathery, both surfaces not pruinose, abaxially with obviously raised midvein, lateral veins slightly raised, adaxially with obviously impressed midvein, lateral veins 12–15 pairs, both surfaces with prominent reticulate veins, base cuneate, margin sometimes slightly revolute, 20–30-spinose-serrate on each side, apex obtuse, aristate. Flowers 6–15(–20)-fascicled, deep yellow. Pedicels 12–15(–20) mm. Sepals in 2 whorls; outer sepals ovate, ca.  $4 \times 3.5$  mm, apex rounded, obtuse; inner sepals obovate or obovate-orbicular, ca.  $5.5 \times 5$  mm. Petals oblong-obovate, ca.  $4.5 \times 3$  mm, base not clawed, with separate glands, apex slightly emarginate. Stamens ca. 3 mm; anther connective prolonged, slightly retuse. Ovules solitary. Berry purplish black, ellipsoid,  $6-7 \times$  ca. 4 mm, slightly pruinose, style not persistent. Fl. May, fr. Nov.

- Thickets, forests; 1700–3100 m. Guizhou, Sichuan, Yunnan.

**109. *Berberis valida*** (C. K. Schneider) C. K. Schneider, Mitt. Deutsch. Dendrol. Ges. 55: 40. 1942.

宁远小檗 ning yuan xiao bo

*Berberis deinacantha* C. K. Schneider var. *valida* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 260. 1939.

Shrubs, evergreen, ca. 1.5 m tall. Branches brownish gray, angulate, scarcely black verruculose, glabrous; shoots brownish yellow, glabrous; spines 3-fid, brownish yellow, 1–2 cm, stout, adaxially flat. Petiole 2–3 mm or leaf sessile; leaf blade abaxially yellow-green, adaxially shiny, deep green, elliptic or oblong-elliptic, 4–7 × 1.5–3 cm, leathery, abaxially not pruinose, midvein obviously raised, lateral and reticulate veins conspicuous, adaxially with obviously impressed midvein, lateral and reticulate veins prominent, base cuneate, margin sometimes slightly revolute, 8–16-spinose-serrate on each side, apex acute or rounded, obtuse. Flowers 3–5-fascicled. Pedicels 6–10 mm; bractlets ca. 2 mm. Sepals in 2 whorls; outer sepals ovate, ca. 4 × 3.5 mm; inner sepals obovate-orbicular, ca. 5.5 × 5 mm. Petals oblong-obovate, ca. 4.5 mm, base attenuate, with separate glands, apex emarginate. Ovules solitary. Berry purplish black, ellipsoid, 8–9 × 5–6 mm, not pruinose; style persistent, short. Fl. May–Jun, fr. Nov.

• Thickets; ca. 2000 m. Sichuan, Yunnan.

**110. *Berberis nemorosa*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 246. 1939.

林地小檗 *lin di xiao bo*

Shrubs, evergreen, ca. 1.5 m tall. Branches gray; shoots pale yellow-gray, angulate; internodes 2.5–3 cm; spines yellow-brown, terete, 1–2 cm, slender. Petiole 1–4 mm; leaf blade abaxially ultimately slightly brown, adaxially shiny, green, oblong-elliptic, 2–4 × 1–1.5 cm, leathery, abaxially initially glaucous, pruinose, both surfaces with indistinct reticulate veins, base attenuate, margin slightly revolute, 7–16-spinose-serrate on each side, apex obtuse. Flowers unknown. Ovules solitary, sessile. Inflorescence with 5–7-fascicled berries; fruit stalk reddish, 1.2–1.5 cm; berry ellipsoid, 6–7 mm, white pruinose; style persistent, short. Fl. unknown, fr. Jun.

• Thickets; ca. 1400 m. Guangxi.

**111. *Berberis chingii*** S. S. Cheng, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. 9: 191. 1934.

华东小檗 *hua dong xiao bo*

*Berberis cavaleriei* H. Léveillé var. *pruinosa* Bijhouwer; *B. chingii* subsp. *subdentata* C. M. Hu; *B. chingii* subsp. *wulingensis* C. M. Hu.

Shrubs, evergreen, 1–2 m tall. Branches dark gray; shoots pale yellow, terete or slightly angulate, sparsely black verruculose; spines 3-fid, concolorous, 1–2.5 cm, stout. Petiole 2–4 mm; leaf blade adaxially dark green, sometimes shiny, oblong-oblancoate or narrowly oblong-elliptic, 2–8 × 0.8–2.5 cm, thinly leathery, abaxially pruinose, midvein raised, lateral veins indistinct, adaxially with obviously impressed midvein, lateral veins 5–10 pairs, both surfaces with inconspicuous reticulate veins, base cuneate, margin above middle 2–10-spinose-serrate on each side, occasionally entire, apex acute. Flowers 4–14-fascicled. Pedicels 7–18 mm; bractlets triangular. Sepals in 2 whorls; outer sepals elliptic, 5–5.5 mm, apex obtuse; inner sepals obovate-oblong, ca. 6.5 mm. Petals obovate, ca. 5.5 × 3 mm, base clawed, with approximate glands, apex emarginate. Stamens ca. 4.5 mm; anther connective prolonged, obtuse.

Ovules 2 or 3. Berry ellipsoid or obovoid-ellipsoid, 6–8 × 4–5 mm, pruinose, style persistent. Fl. Apr–May, fr. Jun–Sep.

• Mixed forests, thickets, runlet sides, limestone slopes; 200–2000 m. Fujian, Guangdong, Hunan, Jiangxi.

**112. *Berberis vinifera*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 142. 1985.

可食小檗 *ke shi xiao bo*

Shrubs, evergreen, 1–3 m tall. Branches grayish black, terete; shoots dark gray, angulate, puberulous; spines 3-fid, concolorous, 4–10 mm. Leaves sessile; leaf blade abaxially pale gray-brown, adaxially dark green, elliptic or broadly elliptic, rarely obovate, 1.5–4.5 × 0.6–1.8 cm, leathery, abaxially not pruinose, midvein and lateral veins obviously raised, adaxially with slightly raised midvein and lateral veins, both surfaces with conspicuously raised dense reticulate veins, base broadly cuneate, margin 1–4-spinose-serrate on each side, occasionally entire, apex rounded. Flowers unknown. Inflorescence with 4–20-fascicled berries; fruit stalk 7–18 mm; berry purplish black, ovoid-globose, 8–10 × 5–7 mm, white pruinose, style 1–2 mm; seeds 4 or 5. Fl. unknown, fr. May–Jul.

• Thickets, mixed forests; 2200–2500 m. Xizang.

**113. *Berberis dumicola*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 249. 1939.

丛林小檗 *cong lin xiao bo*

Shrubs, evergreen, 1–2 m tall. Stems terete; branches pale yellow; shoots reddish, glabrous, brownish black verruculose; spines 3-fid, 1–2 cm, adaxially flat or slightly sulcate. Petiole 4–5 mm; leaf blade abaxially brownish yellow, adaxially dark yellow-castaneous, usually elliptic, 5–9.5 × 1.5–2 cm, leathery, abaxially not pruinose, midvein conspicuously raised, adaxially with obviously impressed midvein, both surfaces with indistinct lateral and reticulate veins, base cuneate, margin 20–40-spinose-serrate on each side, apex subacuminate or acute. Flowers 5–20-fascicled. Pedicels reddish, 8–15 mm; bractlets ovate, apex obtuse or subobtuse. Sepals in 2 whorls; outer sepals slightly reddish, oblong-ovate, ca. 3 × 2.5 mm, apex obtuse; inner sepals oblong-obovate, ca. 6 × 5 mm. Petals oblong-obovate, ca. 6.5 × 5 mm, base clawed, with separate ovate glands, apex rounded, incised to emarginate. Stamens ca. 4.5 mm; anther connective prolonged, shortly apiculate. Ovules 1 or 2; funicles ca. as long as ovules. Berry purplish black, ellipsoid or obovoid-ellipsoid, 8–9 × 4–5 mm, pruinose, style persistent. Fl. Apr–May, fr. Oct.

• Thickets, forest margins, roadsides, sunny slopes; 2000–3000 m. Yunnan.

**114. *Berberis fallax*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 260. 1939.

假小檗 *jia xiao bo*

Shrubs, evergreen, 1–2.5 m tall. Branches brownish gray; shoots brownish yellow, very sulcate, not verruculose; spines 3-fid, 6–20 mm, slender, adaxially sulcate. Leaves sessile; leaf blade abaxially pale yellow, adaxially dark green, sometimes shiny, oblong-elliptic to lanceolate or broadly elliptic, 2–6 ×

0.8–1.6(–2.2) cm, thinly leathery, abaxially not pruinose, midvein obviously raised, adaxially with slightly impressed midvein, both surfaces with slightly raised lateral veins, reticulate veins slightly conspicuous, base cuneate, margin 7–15-spinose-serrate on each side, apex obtuse, aristate. Flowers 3–7-fascicled. Pedicels 1–2 cm, glabrous. Sepals in 2 whorls; outer sepals ovate, ca.  $4.5 \times 3$  mm, apex subacute; inner sepals broadly elliptic, ca.  $6 \times 4$  mm. Petals obovate, ca.  $4 \times 2.5$  mm, base clawed, with separate glands, apex obtusely emarginate. Stamens ca. 2.5 mm; anther connective prolonged, slightly concave. Ovules 4 or 5, subsessile. Berry ellipsoid or subglobose, ca.  $8 \times 5$  mm, not or slightly white pruinose; style short and persistent, or not persistent. Fl. Feb–Mar, fr. Sep–Nov.

● Thickets, forests, forest margins; 1800–3200 m. Yunnan.

- 1a. Leaf blade oblong-elliptic to lanceolate,  $2-6 \times 0.8-1.6$  cm; berry ellipsoid, not pruinose, style persistent ..... 114a. var. *fallax*  
 1b. Leaf blade broadly elliptic,  $3-3.5 \times 2-2.2$  cm; berry subglobose, slightly white pruinose, style not persistent ..... 114b. var. *latifolia*

**114a. *Berberis fallax* var. *fallax***

假小檗(原变种) *jia xiao bo* (*yuan bian zhong*)

Leaf blade oblong-elliptic to lanceolate,  $2-6 \times 0.8-1.6$  cm. Berry ellipsoid, not pruinose; style persistent, short.

● Thickets, forests; 1800–3200 m. Yunnan.

**114b. *Berberis fallax* var. *latifolia*** C. Y. Wu & S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 6. 1985.

阔叶假小檗 *kuo ye jia xiao bo*

Leaf blade broadly elliptic,  $3-3.5 \times 2-2.2$  cm. Berry slightly white pruinose, style not persistent.

● Forest margins; ca. 2100 m. Yunnan.

**115. *Berberis guizhouensis*** T. S. Ying, Acta Phytotax. Sin. 37: 320. 1999.

毕节小檗 *bi jie xiao bo*

Shrubs, evergreen, ca. 1.2 m tall. Branches grayish black, terete, not verruculose; shoots pale gray, sulcate, glabrous, usually only shoots with spines; spines 3-fid, pale yellow, ca. 1.2 cm. Petiole 2–3 mm; leaf blade abaxially brown when dry, adaxially dark green, elliptic, narrowly elliptic, or oblong,  $2-6.5 \times 0.8-1.6$  cm, leathery, abaxially not pruinose, midvein and lateral veins obviously raised, reticulate veins slightly prominent, adaxially with impressed midvein, lateral and reticulate veins slightly conspicuous, base cuneate, margin conspicuously revolute, undulate, 13–20-spinose-serrate on each side, apex acute or subacuminate. Flowers unknown. Inflorescence with 3–6-fascicled berries; fruit stalk pale brown, 1–1.5 cm, glabrous; berry ellipsoid,  $7-9 \times 4-4.5$  mm, not pruinose, style not persistent; seeds 3 or 4. Fl. unknown, fr. Aug–Sep.

● Thickets, dry places; 1300–1400 m. Guizhou.

**116. *Berberis lijiangensis*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 9. 1985.

丽江小檗 *li jiang xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches brownish gray, subterete; shoots stramineous, glabrous; spines 3-fid, 1.5–3 cm. Leaves subsessile; leaf blade adaxially olivaceous, oblong-elliptic or narrowly elliptic,  $(1.5-3)3-5 \times (0.8-1.4)1.4-1.8$  cm, leathery, abaxially pruinose, midvein raised, lateral veins 3–6 pairs, slightly visible, reticulate veins indistinct, adaxially with impressed midvein, lateral veins indistinct, base cuneate, margin thickened, sometimes slightly revolute, 3- or 4-spinose-serrate on each side, apex acute. Flowers 3–6-fascicled. Pedicels 1.2–1.5 cm, glabrous; bractlets ovate, ca. 2.5 mm. Sepals in 2 whorls; outer sepals broadly elliptic, ca.  $8 \times 7$  mm, apex rounded; inner sepals oblong-elliptic, ca.  $9 \times 7$  mm. Petals oblong-obovate, ca.  $6 \times 4$  mm, base attenuate, not clawed, with separate linear glands, apex rounded, entire or slightly retuse. Stamens ca. 5 mm; anther connective prolonged, truncate. Ovules 4 or 5, shortly funiculate. Berry black, oblong, ca.  $12 \times 5-7$  mm, pruinose, style not persistent. Fl. Jun, fr. Sep.

● Forests, forest margins, thickets; 2700–3400 m. Yunnan.

**117. *Berberis xanthoclada*** C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 261. 1939.

梵净小檗 *fan jing xiao bo*

Shrubs, evergreen, 1–2.5 m tall. Branches dark gray, angulate, not verruculose; shoots brownish yellow, obviously sulcate, glabrous; spines concolorous, terete, 1–3 cm. Petiole 2–4 mm; leaf blade abaxially yellow-green, adaxially shiny, dark green, elliptic or broadly elliptic, occasionally ovate,  $4-8 \times 1.5-3$  cm, thinly leathery, abaxially pruinose or occasionally slightly so, midvein conspicuously raised, lateral veins slightly raised, adaxially with obviously impressed midvein, lateral veins slightly conspicuous, both surfaces with indistinct reticulate veins, base attenuate, margin 12–25-spinose-serrate on each side, apex acute, mucronate. Flowers 2–6-fascicled. Pedicels reddish, 7–13 mm; bractlets lanceolate,  $4-5 \times 1.5-2$  mm. Sepals in 2 whorls; outer sepals lanceolate,  $5-9 \times 2-3.5$  mm; inner sepals obovate-oblong,  $8-10 \times 4-5$  mm, apex obtuse. Petals obovate, ca.  $5 \times 2.2-3$  mm, base clawed, with separate glands, apex emarginate. Stamens 3–4 mm; anther connective prolonged, truncate. Ovules 3, shortly funiculate. Berry black, ellipsoid, not pruinose; style persistent, short. Fl. Apr–May, fr. Jun–Oct.

● Thickets, forests, bamboo groves; 1300–2600 m. Guizhou.

**118. *Berberis malipoensis*** C. Y. Wu & S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 10. 1985.

麻栗坡小檗 *ma li po xiao bo*

Shrubs, evergreen, to 2.5 m tall. Branches stramineous, terete, scarcely black verruculose; spines 3-fid, weak, less than 1 cm. Leaves shortly petiolate; leaf blade abaxially yellow-green, adaxially dark green, oblong-ovate or oblong-elliptic,  $5-18 \times 2-4.5$  cm, leathery, abaxially not pruinose, midvein, lateral, and reticulate veins obviously raised, adaxially with midvein impressed, lateral veins conspicuous, reticulate veins indistinct, base cuneate, margin remotely spinose-serrate, apex acuminate. Flowers unknown. Inflorescence with (3–)10–17-

fascicled berries; fruit stalk to 3.5 cm; berry black, ellipsoid, 10–11 × 5–6 mm, not pruinose, style not persistent; seeds 2. Fl. unknown, fr. Nov–Jan of following year.

- Forests on limestone slopes, roadsides; 1000–1800 m. Yunnan.

**119. *Berberis weiningensis*** T. S. Ying, Acta Phytotax. Sin. 37: 326. 1999.

威宁小檗 *wei ning xiao bo*

Shrubs, evergreen, ca. 1 m tall. Branches grayish brown; shoots pale yellow, angulate, densely puberulous; spines 3-fid, pale yellow, 5–10 mm, slender. Leaves subsessile; leaf blade adaxially deep green, narrowly obovate-elliptic, narrowly elliptic, or obovate, 0.4–2 cm × 2–5 mm, papery, adaxially not pruinose, midvein and lateral veins raised, reticulate veins inconspicuous, base cuneate, margin thickened, slightly revolute, entire or 1–6-spinose-serrate on each side, apex acute or obtuse, aristate. Inflorescence a subumbel, 4–6-flowered, 2–3 cm including peduncle 1.3–2.3 cm; bracts ovate, apex acuminate. Pedicels 3–4 mm, slender, glabrous; bractlets triangular-ovate, 1–1.7 × 0.8–1.1 mm. Flowers golden-yellow, 4–5 mm in diam. Sepals in 2 whorls; outer sepals elliptic, ca. 3.2 × 2.5 mm; inner sepals broadly obovate, ca. 3.5 × 3.2 mm. Petals obovate, ca. 3.1 × 2 mm, base attenuate, not clawed, with separate lanceolate glands, apex incised, lobes acute. Stamens ca. 2.5 mm; anther connective prolonged, rounded. Ovules 3, subsessile. Berry red, ovoid-oblong, 7–9 × 4–6 mm, not pruinose, style ca. 0.5 mm. Fl. May, fr. Jul–Sep.

- Thickets, weedy places on mountain summits; 2100–2500 m. Guizhou.

**120. *Berberis johannis*** Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941.

腰果小檗 *yao guo xiao bo*

Shrubs, deciduous, 1.5–2 m tall. Branches gray; shoots pale brown, slightly sulcate, glabrous, scarcely black verruculose; spines 3-fid, 0.5–1.5 cm, slender, flat. Leaves subsessile; leaf blade abaxially gray, adaxially dark green, oblanceolate or obovate, 0.8–3 × 0.3–1.2 cm, papery, abaxially slightly pruinose, both surfaces with obviously raised reticulate veins, base cuneate, margin entire, sometimes 2–5-spinose on each side, apex acute or obtuse. Inflorescence an umbel, 3–10-flowered, 2–3 cm including peduncles 3–10 mm, often base with 1 or several fascicled flowers; bracts triangular-ovate, ca. 1 mm. Pedicels 5–12 mm, slender. Sepals in 3 whorls; outer sepals oblong-triangular, ca. 2.5 × 1.5 mm, apex acute; median sepals oblong-ovate, ca. 4 × 2 mm, apex subobtuse; inner sepals elliptic, ca. 5 × 2.5 mm. Petals obovate, ca. 4.5 × 3 mm, base clawed, with approximate obovate glands, apex emarginate, lobes acute. Stamens ca. 2.5 mm; anther connective slightly prolonged, truncate. Ovules 4, funiculate; funicles ca. as long as ovules. Berry shiny, red, oblong-ellipsoid or oblong-ovoid, 11–13 × 3–4.5 mm, contracted at middle, not pruinose, apex usually bent, style not persistent. Fl. May–Jun, fr. Jul–Oct.

- Forests, thickets; 3000–4000 m. Xizang.

**121. *Berberis leboensis*** T. S. Ying, Acta Phytotax. Sin. 37: 328. 1999.

雷波小檗 *lei bo xiao bo*

Shrubs, deciduous, 1.3–2 m tall. Branches gray-brown, angulate, not verruculose; shoots dark purplish brown, glabrous; spines 3-fid, pale yellow, 1–1.5 cm. Leaves subsessile; leaf blade abaxially grayish white, adaxially dark green, narrowly elliptic or narrowly obovate, 1–1.8 cm × 3–5 mm, papery, abaxially with obviously raised midvein, lateral and reticulate veins conspicuous, adaxially with raised midvein and lateral veins, reticulate veins conspicuous, base attenuate, margin entire or 1–4-spinose-serrate on each side, apex acute, aristate. Inflorescence an umbel or subumbel, 3–7-flowered, 4–5 cm including dark brown peduncle 2.5–3.5 cm; bracts leaflike, ca. 7 mm; bractlets ovate-lanceolate, ca. 2.5 mm. Sepals in 2 whorls; outer sepals ovate-elliptic, ca. 2.8 × 1.5 mm; inner sepals broadly elliptic, 4–4.3 × ca. 3 mm. Petals broadly elliptic, 4–4.5 × ca. 3 mm, base clawed, with separate elliptic glands, apex slightly incised. Stamens ca. 3 mm; anther connective prolonged, rounded, obtuse. Ovules 2, subsessile. Berry (immature) green, obovoid-oblong, 9–10 × 5–6 mm, contracted at lower part, not pruinose, style persistent; seeds 2. Fl. Jun–Jul, fr. Jul–Oct.

- Slopes, thickets, roadsides, weedy places on mountain summits; 2700–3500 m. Sichuan.

**122. *Berberis umbratica*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 135. 1985.

阴生小檗 *yin sheng xiao bo*

Shrubs, deciduous, ca. 1.2 m tall. Branches gray; shoots shiny, reddish brown, subsulcate, scarcely black verruculose; spines simple or 3-fid, weak, 6–9 mm. Petiole ca. 1 cm; leaf blade abaxially pale green, adaxially deep green, obovate or obovate-lanceolate, 1.5–5 × 0.6–2.1 cm, papery, both surfaces indistinctly veined, base cuneate, margin entire, apex rounded, obtuse, or acute. Inflorescence an umbel, 3–5-flowered, 2–3 cm including glabrous peduncle 6–12 mm. Pedicels 5–11 mm, slender; bractlets ovate, ca. 1.8 × 1 mm. Sepals in 2 whorls; outer sepals ovate-lanceolate, ca. 5.5 × 3 mm; inner sepals elliptic, ca. 6.2 × 4 mm. Petals obovate, ca. 5 × 3 mm, base slightly clawed, with separate glands, apex slightly emarginate or entire. Stamens ca. 3.2 mm; anther connective prolonged, rounded. Ovules 4, shortly funiculate. Fruit unknown. Fl. Jun, fr. unknown.

- *Abies* forests; ca. 3300 m. SE Xizang.

**123. *Berberis gilungensis*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 134. 1985.

吉隆小檗 *ji long xiao bo*

Shrubs, deciduous, 1–2 m tall. Branches pale purplish red, subterete, not verruculose, glabrous; spines simple or 3-fid, 0.2–2 cm. Leaves subsessile; leaf blade abaxially grayish green, adaxially dark green, oblong or elliptic, 1.5–5 × 1–2.2 cm, papery, abaxially not pruinose, midvein and lateral veins raised, adaxially with flat midvein, lateral veins conspicuous, both surfaces with inconspicuous reticulate veins, base cuneate, margin entire, apex obtuse. Inflorescence a subumbel, 4- or 5-flowered, 2–3.5 cm (including peduncle). Pedicels 5–9 mm, glabrous;

bractlets oblong, ca.  $3.2 \times 1.2$  mm. Sepals in 2 whorls, oblong-elliptic; outer sepals ca.  $5.5 \times 3$  mm; inner sepals ca.  $8 \times 6$  mm. Petals obovate, ca.  $5.2 \times 4$  mm, base with separate glands, apex entire. Stamens ca. 3 mm; anther connective slightly prolonged. Ovules 4. Berry red, oblong, not pruinose, style not persistent. Fl. Jun, fr. Aug–Sep.

• Forests, forest margins; 3200–3400 m. Xizang.

**124. *Berberis multiserrata*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 139. 1985.

粗齿小檗 *cu chi xiao bo*

Shrubs, deciduous, 1–2 m tall. Branches purplish black, subterete, pruinose; spines weak, orange-yellow, flat, 5–7 mm. Leaves subsessile; leaf blade abaxially grayish white, adaxially dark green, broadly obovate, occasionally orbicular,  $1.7\text{--}5.5 \times 1.5\text{--}3.5$  cm, thickly papery, abaxially pruinose, midvein and lateral veins raised, adaxially with raised midvein and lateral veins, reticulate veins conspicuous or slightly raised, base cuneate, margin coarsely 2–7-aristate-dentate on each side, rarely entire, apex rounded, sometimes emarginate. Inflorescence a subumbel, 4–8-flowered, ca. 2 cm including purplish black peduncles 3–5 mm. Pedicels 1–1.7 cm, stout, slightly pruinose; bractlets ovate, ca. 2 mm, pruinose, obtuse. Sepals in 2 whorls; outer sepals oblong-elliptic, ca.  $8 \times 4$  mm; inner sepals broadly obovate, ca.  $6 \times 4.1$  mm. Petals obovate, ca.  $6 \times 3.2$  mm, base with separate glands, apex emarginate. Stamens ca. 3.1 mm; anther connective prolonged, rounded, obtuse. Ovules 4. Berry oblong, ca.  $14 \times 5$  mm, pruinose, style not persistent. Fl. Jun, fr. Aug–Sep.

• Forests; 3100–3900 m. Xizang.

**125. *Berberis pulangensis*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 133. 1985.

普兰小檗 *pu lan xiao bo*

Shrubs, evergreen, ca. 1.2 m tall. Branches pale yellow, terete, glabrous; internodes 5–10 mm; spines 3-fid, concolorous, 1–1.5 cm. Leaves sessile; leaf blade abaxially grayish green, adaxially dark green, obovate,  $1\text{--}1.2 \times 5\text{--}10$  mm, thinly leathery, abaxially not pruinose, both surfaces with veins obviously raised, base cuneate, margin flat, 1–4-spinose-serrate on each side, occasionally entire, apex mucronate. Inflorescence a subumbel, 2–4-flowered, 1.5–2.5 cm, sometimes with few fascicled flowers at base of peduncle; bracts ovate, apex acuminate. Flowers unknown. Fruit stalk 6–10 mm, glabrous; berry red, oblong-ellipsoid,  $8\text{--}9 \times$  ca. 4 mm, not pruinose, style not persistent; seeds 4 or 5. Fl. unknown, fr. Jul.

• Mountain slopes; ca. 3700 m. Xizang.

**126. *Berberis thunbergii*** Candolle, Syst. Nat. 2: 9. 1821.

日本小檗 *ri ben xiao bo*

Shrubs, deciduous, compact, usually ca. 1 m tall. Branches angulate, dark red, not verruculose; shoots reddish green, glabrous; spines simple, occasionally 3-fid, 5–15 mm; internodes 1–1.5 cm. Petiole 2–8 mm; leaf blade abaxially grayish green, adaxially green, obovate, spatulate, or rhombic-ovate,  $1\text{--}2 \times 0.5\text{--}1.2$  cm, thinly papery, abaxially with slightly raised mid-

vein, both surfaces glabrous, with indistinct reticulate veins, base attenuate, cuneate, margin entire, apex mucronate or obtuse. Inflorescence an umbel with subfascicled flowers, (1 or) 2–5-flowered, 1–2 cm. Pedicels 5–10 mm, glabrous; bractlets reddish, ovate-lanceolate, ca. 2 mm. Sepals in 2 whorls; outer sepals reddish, ovate-elliptic,  $4\text{--}4.5 \times 2.5\text{--}3$  mm, apex obtuse; inner sepals broadly elliptic,  $5\text{--}5.5 \times 3.3\text{--}3.5$  mm, apex obtuse. Petals oblong-obovate,  $5.5\text{--}6 \times 3\text{--}4$  mm, base clawed, with approximate glands, apex obtusely emarginate. Stamens 3–3.5 mm; anther connective not prolonged, truncate. Ovules 1 or 2, sessile. Berry shiny, red, ellipsoid, ca.  $8 \times 4$  mm, style not persistent; seeds 1 or 2, brown. Fl. Apr–Jun, fr. Jul–Oct.

Commonly cultivated for ornament in China, especially in large cities [native to Japan].

This is one of the most widely cultivated species of *Berberis*.

**127. *Berberis brachypoda*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 23: 308. 1877.

短柄小檗 *duan bing xiao bo*

Shrubs, deciduous, 1–3 m tall. Branches yellowish gray, glabrous or sparsely pubescent; shoots pale brown, angulate, glabrous or pubescent, sparsely black verruculose; spines 3-fid, rarely simple, concolorous, 1–3 cm, adaxially sulcate. Petiole 3–10 mm, pubescent; leaf blade abaxially yellow-green, adaxially dark green, elliptic, obovate, or oblong-elliptic,  $3\text{--}8(14) \times 1.5\text{--}3.5(5)$  cm, thickly papery, abaxially densely villous on veins, adaxially rugose, sparsely puberulous, base cuneate, margin flat, 20–40-spinose-serrate on each side, apex acute or obtuse. Inflorescence a spikelike raceme, 20–50-flowered, 5–12 cm including peduncle 1.5–4 cm. Pedicels ca. 2 mm, pubescent; bractlets red, lanceolate; flowers yellow. Sepals in 3 whorls, margin puberulous; outer sepals reddish, ovate, ca.  $2 \times 1.5$  mm, apex acute; median sepals oblong-obovate, ca.  $3 \times 2.5$  cm; inner sepals obovate-elliptic, ca.  $4.5 \times 3$  mm, apex obtuse. Petals elliptic, ca.  $5 \times 3$  mm, base clawed, with separate glands, apex emarginate or entire, lobes acute. Stamens ca. 2 mm; anther connective not prolonged, truncate. Ovules 1 or 2. Berry shiny, scarlet, oblong,  $6\text{--}9 \times$  ca. 5 mm, not pruinose, style persistent. Fl. May–Jun, fr. Jul–Sep.

• Thickets, forests, forest margins, roadsides, wet places; 800–2500 m. Gansu, Henan, Hubei, Qinghai, Shaanxi, Shanxi, Sichuan.

**128. *Berberis salicaria*** Fedde, Bot. Jahrb. Syst. 36(Beibl. 82): 42. 1905.

柳叶小檗 *liu ye xiao bo*

*Berberis brachypoda* Maximowicz var. *salicaria* (Fedde) C. K. Schneider; *B. giraldii* Hesse; *B. mitifolia* Stapf.

Shrubs, deciduous, 1–2.5 m tall. Branches yellow-gray, angulate, sparsely pubescent; shoots pale yellow, glabrous, not verruculose; spines 3-fid, rarely simple, concolorous, 1–5 cm. Petiole 1–3 cm; leaf blade abaxially shiny, pale green, adaxially dark green, lanceolate,  $6\text{--}12 \times 1\text{--}4$  cm, papery, abaxially puberulous, veins raised, adaxially glabrous, midvein flat, lateral and reticulate veins conspicuous, base attenuate, margin 15–40-spinose-serrate on each side, apex acute or subacuminate. Inflorescence a spikelike raceme, 25–50-flowered, 7–17 cm;

rachises reddish, sometimes pedunculate; bracts lanceolate, 3–4 mm. Pedicels ca. 2 mm, stout, glabrous; bractlets ovate, apex acute. Sepals in 3 whorls; outer sepals oblong-ovate, ca.  $2.5 \times 1.5$  mm; median sepals oblong-elliptic, ca.  $3 \times 2$  mm; inner sepals obovate, ca.  $5 \times 4$  mm. Petals oblong-obovate,  $5-6 \times 2.5-3$  mm, base clawed, with separate glands, apex emarginate. Stamens 4–4.5 mm; anther connective not prolonged, truncate. Ovules 2. Berry red, obovoid-ellipsoid,  $9-10 \times$  ca. 6 mm, slightly pruinose, style not persistent; seeds 1 or 2, brown, oblong, ca.  $6 \times 2-2.5$  mm. Fl. Apr–Jun, fr. Aug–Sep.

• Sparse forests, forest margins; ca. 1200 m. Gansu, Hubei, Shaanxi.

**129. *Berberis gilgiana*** Fedde, Bot. Jahrb. Syst. 36(Beibl. 82): 43. 1905.

涝峪小檗 lao yu xiao bo

Shrubs, deciduous, 1–2 m tall. Branches gray-brown, terete; shoots purplish red, sometimes slightly pubescent; spines simple or 3-fid, concolorous, 5–15 mm. Petiole 1–2 mm; leaf blade abaxially pale green, adaxially dark green, obovate-lanceolate or obovate,  $1.5-4 \times 0.4-1.5$  cm, papery, abaxially densely pubescent, midvein obviously raised, lateral veins slightly raised, adaxially sparsely puberulous, midvein slightly impressed, lateral veins conspicuous, both surfaces with conspicuous reticulate veins, base attenuate, margin entire or 2–9-spinulose-serrulate on each side, apex acute. Inflorescence a spikelike raceme, 10–25-flowered, 3–6 cm including pubescent peduncle 1–3 cm; bracts lanceolate, 1–2 mm. Pedicels 3–5 mm, slender, glabrous; bractlets ovate, apex acute. Sepals in 2 whorls; outer sepals obovate-orbicular,  $2-2.3 \times$  ca. 1.5 mm; inner sepals obovate, ca.  $2.5 \times 2$  mm. Petals elliptic, ca.  $3 \times 2$  mm, base clawed, with separate glands, apex emarginate or entire. Stamens ca. 2 mm; anther connective rounded, obtuse. Ovules 1 or 2. Berry red, oblong,  $8-9 \times 5-6$  mm, slightly pruinose, style not persistent; seeds 1 or 2, purplish brown. Fl. Apr–May, fr. Aug–Oct.

• Slopes, valleys; 800–2000 m. Hubei, Shaanxi.

**130. *Berberis stenostachya*** Ahrendt, J. Linn. Soc., Bot. 57: 197. 1961.

短梗小檗 duan geng xiao bo

Shrubs, deciduous, ca. 2 m tall. Branches pale yellow, sulcate, glabrous; young shoots pale red, angulate, puberulous, glabrous when mature; spines 3-fid, 1–3 cm, adaxially sulcate. Petiole 4–10 mm; leaf blade abaxially pale green, adaxially dark green, obovate or obovate-oblong,  $2-8 \times 0.8-3.5$  cm, papery, abaxially densely puberulous and mixed tomentulose, midvein and lateral veins obviously raised, adaxially sparsely puberulous, midvein flat, lateral veins slightly raised, both surfaces with conspicuous reticulate veins, margin very sinuate, 10–20-spinose-serrate on each side, apex obtuse or acute. Inflorescence a spikelike raceme, nutant, 4–6 cm, 20–35-flowered; rachis puberulous. Pedicels 1–2 cm, puberulous; bracts 2–3 mm, puberulous; bractlets red, ovate, ca. 1 mm, apex acute. Sepals in 2 whorls; outer sepals ovate, ca.  $2 \times 1$  mm; inner sepals obovate-elliptic, ca.  $3.5 \times 1.5$  mm. Petals elliptic, ca.  $3 \times 1.3$  mm, base cuneate, with separate elliptic glands, apex emar-

ginate. Stamens ca. 2 mm; anther connective not prolonged, truncate. Ovules 2. Berry red, ellipsoid, ca.  $6 \times 3.5$  mm, not pruinose, style not persistent; seeds brown. Fl. May–Jun, fr. Aug–Oct.

• Thickets; ca. 1500 m. Gansu.

**131. *Berberis purdomii*** C. K. Schneider in Sargent, Pl. Wilson. 1: 372. 1913.

延安小檗 yan an xiao bo

Shrubs, deciduous, ca. 1 m tall. Branches dark gray or purplish red, subterete, sometimes sulcate; shoots often purplish brown, glabrous, not verruculose; spines simple, sometimes 3-fid, pale yellow, 1–2(–5) cm. Petiole 2–3 mm, or leaf subsessile; leaf blade adaxially green, narrowly obovate to oblanceolate,  $1-4 \times 0.4-0.8$  cm, papery, both surfaces glabrous, adaxially with slightly raised midvein, both surfaces with conspicuous lateral and reticulate veins, base attenuate, margin entire or 2–15-spinose-serrate on each side, apex acute. Inflorescence a spikelike raceme, 15–25-flowered, 3–5 cm including peduncle 1–2 cm, glabrous; bracts lanceolate, ca. 2 mm. Pedicels 4–5 mm, glabrous; bractlets reddish, subulate-lanceolate, apex caudate. Sepals in 2 whorls; outer sepals obovate-orbicular or ovate-elliptic, ca.  $2.2 \times 1.5$  mm; inner sepals oblong,  $3.2-4 \times$  ca. 2.6 mm. Petals obovate-oblong,  $3-3.2 \times 1.6-2$  mm, base clawed, with separate glands, apex emarginate. Stamens ca. 2.2 mm; anther connective not prolonged, truncate. Ovules 1 or 2. Berry black, oblong,  $5-6 \times 3-4$  mm, slightly pruinose, style not persistent; seeds usually 1. Fl. Jun, fr. Jul–Aug.

• Slopes, thickets, hills; 1100–2500 m. Gansu, Qinghai, Shaanxi, Shanxi.

**132. *Berberis vernae*** C. K. Schneider in Sargent, Pl. Wilson. 1: 372. 1913.

匙叶小檗 chi ye xiao bo

*Berberis caroli* C. K. Schneider var. *hoanghensis* C. K. Schneider.

Shrubs, deciduous, 0.5–1.5 m tall. Branches dark gray, slender, angulate, glabrous, black verruculose; shoots reddish purple; spines simple, pale yellow, 1–3 cm, stout. Petiole 2–6 mm; leaf blade abaxially pale green, adaxially shiny, dark green, oblanceolate or spatulate-oblanceolate,  $1-5 \text{ cm} \times 3-10$  mm, papery, both surfaces glabrous, not pruinose, not papillose, abaxially with slightly raised midvein and reticulate veins, adaxially with flat midvein, lateral veins slightly conspicuous, both surfaces with conspicuous reticulate veins, base attenuate, margin entire, occasionally 1–3-spinose-serrate on each side, apex rounded, obtuse. Inflorescence a spikelike raceme, 15–35-flowered, 2–4 cm including peduncle 5–10 mm, glabrous; bracts ca. 1.3 mm. Pedicels 1.5–4 mm, glabrous; bractlets reddish, lanceolate, ca. 1 mm. Sepals in 2 whorls; outer sepals ovate,  $1.5-2.1 \times$  ca. 1 mm, apex acute; inner sepals obovate,  $2.5-3 \times 1.5-2$  mm. Petals obovate-elliptic,  $1.8-2 \times$  ca. 1.2 mm, base clawed, with separate glands, apex subacute, entire. Stamens ca. 1.5 mm; anther connective not prolonged, truncate. Ovules 1 or 2, sessile. Berry pale red, oblong, 4–5 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Aug–Sep.

● Floodlands, thickets on slopes; 2200–3900 m. Gansu, Qinghai, Sichuan.

**133. *Berberis poiretii*** C. K. Schneider, Mitt. Deutsch. Dendrol. Ges. 15: 180. 1906 [*"poireti"*].

细叶小檗 xi ye xiao bo

*Berberis poiretii* var. *bisemilis* P. Y. Li.

Shrubs, deciduous, 1–2 m tall. Branches grayish yellow; shoots purplish brown, angulate, black verruculose; spines absent or simple, sometimes 3-fid, 4–9 mm. Leaves subsessile; leaf blade abaxially pale green or grayish green, adaxially deep green, oblanceolate to narrowly oblanceolate, occasionally lanceolate-spatulate, 1.5–4 cm × 5–10 mm, papery, both surfaces glabrous, abaxially with raised midvein, lateral and reticulate veins conspicuous, adaxially with impressed midvein, base attenuate, margin entire, occasionally few spinulose-serrulate on each side, apex acuminate or acute, mucronulate. Inflorescence a spikelike raceme, 8–15-flowered, 3–6 cm including peduncle 1–2 cm; bracts linear, 2–3 mm. Pedicels 3–6 mm, glabrous; bractlets lanceolate, 1.8–2 mm. Sepals in 2 whorls; outer sepals elliptic or oblong-ovate, ca. 2 × 1.3–1.5 mm; inner sepals oblong-elliptic, ca. 3 × 2 mm. Petals obovate or elliptic, ca. 3 × 1.5 mm, base clawed, with separate glands, apex incised. Stamens ca. 2 mm; anther connective not prolonged, truncate. Ovules 1 (or 2). Berry red, oblong, ca. 9 × 4–5 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.  $2n = 28$ .

Thickets, forests, deserts, riverbanks in valleys, talus places; 600–2300 m. Hebei, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi [Korea, Mongolia, Russia (Far East)].

**134. *Berberis pallens*** Franchet, Pl. Delavay. 36. 1889.

淡色小檗 dan se xiao bo

Shrubs, deciduous, 1–1.2 m tall. Branches dark reddish, angulate, sometimes slightly pruinose; spines 3-fid, weak, concolorous, 1–2 cm, adaxially flat or sulcate. Leaves subsessile; leaf blade abaxially grayish white, adaxially green, oblanceolate or oblong-ovate, 1.5–3.5 × 0.7–1 cm, thickly papery, abaxially pruinose, midvein conspicuously raised, adaxially with slightly impressed midvein, both surfaces with conspicuous reticulate veins, base cuneate, margin entire, apex rounded, obtuse, aristate. Inflorescence an umbellate raceme, 3–8-flowered, 3–5 cm, not pedunculate. Pedicels 1–1.5 cm, pruinose. Sepals in 3 whorls; outer sepals ovate-lanceolate, 4–4.5 × ca. 1.5 mm; median and inner sepals broadly ovate, both equal in size, 6–6.5 × ca. 5 mm. Petals obovate, ca. 5.5 × 4.5 mm, base attenuate, with separate glands, apex obtusely emarginate. Stamens ca. 3 mm; anther connective prolonged, shortly apiculate. Ovules 1 or 2. Berry red, oblong-ellipsoid, ca. 10 × 4–5 mm, pruinose; style persistent, short. Fl. and fr. May–Aug.

● Thickets; 3000–3500 m. Yunnan.

**135. *Berberis reticulata*** Bihouwer, J. Arnold Arbor. 9: 132. 1928.

网脉小檗 wang mai xiao bo

Shrubs, deciduous, 1–2.5 m tall. Branches brownish gray or purplish red, terete, angulate, not verruculose; shoots often

purplish red, glabrous; spines simple or 3-fid, weak, to 1 cm. Petiole 2–12 mm; leaf blade abaxially grayish white, adaxially dark green, obovate, 2–5 × 1–2.5 cm, papery, both surfaces glabrous, abaxially not pruinose, midvein obviously raised, adaxially with impressed midvein, both surfaces with conspicuously raised reticulate veins, base cuneate, margin flat, 10–20-spinose-serrate on each side, apex rounded, obtuse. Inflorescence a subumbellate raceme, 5–10-flowered, 1.5–3 cm, not pedunculate; rachis reddish; bracts ca. 1 mm. Pedicels reddish, 4–7 mm, glabrous. Sepals in 2 whorls; outer sepals elliptic, ca. 6 × 3 mm; inner sepals oblong, 7–7.5 × 4–4.5 mm. Petals obovate, ca. 6 × 3 mm, base clawed, with separate glands, apex obtusely emarginate. Stamens ca. 3.5 mm; anther connective apiculate. Ovules 5 or 6, sessile. Berry scarlet, ovoid, 7–8 × 5–6 mm, not pruinose, style not persistent. Fl. Jun–Jul, fr. Aug–Sep.

● Thickets, forests, slopes; 1400–3000 m. Shaanxi.

**136. *Berberis pruinocarpa*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 16. 1985.

粉果小檗 fen guo xiao bo

Shrubs, deciduous, ca. 1 m tall. Branches brownish gray, angulate, black verruculose; spines usually simple, occasionally 3-fid, weak, concolorous, 8–10 mm. Petiole 1–3 mm; leaf blade abaxially pale green, adaxially dark green, oblong-ovate, ca. 1.2 × 0.4 cm, thickly papery, abaxially not pruinose, midvein and lateral veins conspicuously raised, adaxially with flat midvein, lateral veins 2 or 3 pairs, slightly raised, base cuneate, margin slightly thickened, entire, or 1- or 2-spinose-serrate on each side, apex rounded, apiculate. Flowers unknown. Inflorescence an umbellate raceme, with 3–5 fruit; fruit stalk 5–6 mm, slender, glabrous; berry oblong, 6–7 × 3–4 mm, slightly pruinose, style not persistent; seeds 1. Fl. unknown, fr. Aug.

● Sparse forests; ca. 2700 m. Yunnan.

**137. *Berberis hemsleyana*** Ahrendt, J. Linn. Soc., Bot. 57: 213. 1961.

拉萨小檗 la sa xiao bo

Shrubs, deciduous, to 2 m tall. Branches dark gray, angulate, black verruculose; shoots pale red, sometimes puberulous, sulcate; spines 3-fid, usually orange, 1–3 cm, stout, adaxially sulcate. Leaves subsessile; leaf blade abaxially grayish or pale green, shiny, adaxially dark green, ultimately both surfaces pale green, oblanceolate, 1–2.5 cm × 5–7 mm, papery, both surfaces initially slightly pruinose, often ultimately not pruinose, abaxially with slightly raised midvein and lateral veins, adaxially with flat midvein, lateral veins slightly impressed, both surfaces with inconspicuous reticulate veins, margin entire, sometimes 1–3-spinulose-serrulate on each side, apex obtuse or acuminate. Inflorescence a subumbellate raceme, 4–8-flowered, 1–2.5 cm. Pedicels 8–15 mm, stout, glabrous; bractlets lanceolate, ca. 3.5 × 1 mm. Sepals in 2 whorls; outer sepals elliptic, ca. 5.1 × 2.8 mm; inner sepals obovate, ca. 5.5 × 4 mm, apex obtuse. Petals narrowly obovate, ca. 4.8 × 2 mm, base clawed, with separate glands, apex entire. Stamens ca. 3 mm; anther connective prolonged, truncate. Ovules 2 or 3. Berry oblong, ca. 10 × 5 mm, slightly pruinose, style not persistent. Fl. May, fr. Sep.

• Thickets, grassy slopes on mountains, rock fractures; 3600–4400 m. Xizang.

**138. *Berberis platyphylla*** (Ahrendt) Ahrendt, J. Linn. Soc., Bot. 57: 145. 1961.

阔叶小檗 *kuo ye xiao bo*

*Berberis yunnanensis* Franchet var. *platyphylla* Ahrendt, J. Bot. 79(Suppl.): 61. 1941.

Shrubs, deciduous, 1–1.5 m tall. Branches brownish gray, angulate, sparsely black verruculose; shoots dark purple, glabrous; spines 3-fid, weak, ca. 1 cm, adaxially sulcate. Petiole 2–5 mm, or leaf sessile; leaf blade abaxially pale green, adaxially deep green, broadly obovate or elliptic, 2–5 × 1–1.4 cm, papery, abaxially sometimes slightly pruinose, midvein obviously raised, adaxially with flat midvein, both surfaces with conspicuous lateral and reticulate veins, base cuneate, margin entire or 2–4-spinose-serrate on each side, apex rounded, aristate. Inflorescence an umbellate raceme, 3–7-flowered, 3–5 cm, including peduncle 2–10 mm, sometimes with few fascicled flowers at base of peduncle. Pedicels 1.2–2 cm, glabrous; bractlets purplish red, lanceolate, ca. 3 mm. Sepals in 2 whorls; outer sepals ovate, ca. 6 × 3 mm; inner sepals oblong-obovate, 6–7 × 3.5–4 mm. Petals obovate, ca. 6 × 3 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 5 mm; anther connective obviously prolonged, apiculate. Ovules 3–5. Berry oblong, ca. 10 × 7 mm, not pruinose, style not persistent. Fl. Jun, fr. Aug–Oct.

• Thickets, forests, forest margins; 3100–3500 m. Sichuan, Xizang, Yunnan.

**139. *Berberis sichuanica*** T. S. Ying, Acta Phytotax. Sin. 37: 329. 1999.

四川小檗 *si chuan xiao bo*

Shrubs, evergreen, 1–1.5 m tall. Branches purplish red or gray, angular; shoots pale yellow, glabrous, not verruculose; spines simple or 3-fid, pale yellow, 1–1.5 cm. Leaves sessile; leaf blade abaxially grayish white, adaxially shiny, green, obovate or obovate-elliptic, 0.8–2 × 0.5–1.1 cm, thinly leathery, abaxially with obviously raised midvein and lateral veins, adaxially with slightly raised midvein and lateral veins, base attenuate, margin entire or 1–5-spinose-serrate on each side, apex rounded, obtuse. Inflorescence an umbellate raceme, 6–15-flowered, 3–4.5 cm including peduncle 4–12 mm, sometimes with few fascicled flowers at base; bracts leaflike, obovate, apex aristate. Pedicels 4–12 mm, glabrous. Sepals in 3 whorls; outer sepals ovate-lanceolate, 1.6–2 × ca. 1 mm; median sepals obovate-elliptic, 2.8–3.1 × 1.5–1.7 mm; inner sepals elliptic, 4–5 × 3–3.2 mm. Petals obovate-elliptic, 4–4.1 × 2.1–2.2 mm, base clawed, with separate glands, apex entire, rounded, obtuse. Stamens ca. 3 mm; anther connective rounded, obtuse. Ovules 3 or 4, sessile. Berry black, subglobose, 8–10 × 6–8 mm, pruinose, style persistent. Fl. Jun–Jul, fr. Aug–Sep.

• Thickets, slopes; 2600–3600 m. Sichuan, Yunnan.

**140. *Berberis mekongensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 82. 1916.

湄公小檗 *mei gong xiao bo*

Shrubs, deciduous, 1–2 m tall. Branches brownish gray, angulate, sparsely black verruculose; shoots initially puberulous, often ultimately glabrous; spines 3-fid, pale yellow, 1–2.5 cm, adaxially slightly sulcate. Petiole 3–10 mm; leaf blade adaxially deep yellow-green, obovate or broadly obovate, 1.5–4.5 × 1–2 cm, papery, abaxially papillose, not pruinose, midvein and lateral veins obviously raised, adaxially with slightly raised midvein and lateral veins, both surfaces with conspicuous reticulate veins, base cuneate, margin entire or 10–15-spinose-serrate on each side, apex rounded. Inflorescence an umbellate raceme, 6–12-flowered, 3–7 cm; with few fascicled flowers at base; bracts 1–1.5 mm. Pedicels 4–15 mm, glabrous. Sepals in 3 whorls; outer sepals lanceolate, ca. 4 × 1.4 mm; median sepals oblong-elliptic, 5–5.5 × 2–3 mm; inner sepals obovate, 6–6.5 × 3.5–4 mm. Petals obovate, 4–5 × 2.5–3.5 mm, base clawed, with separate glands, apex acute, incised. Stamens ca. 3.5 mm; anther connective prolonged, truncate. Ovules 2–4. Berry red, oblong, 8–10 × 4–6 mm, not pruinose, style not persistent. Fl. Jun–Jul, fr. Oct–Nov.

• Alpine thickets, *Abies* or *Picea* forests, sunny places; 3000–4000 m. Sichuan, Xizang, Yunnan.

**141. *Berberis pseudoamoena*** T. S. Ying in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl. II), 55. 2007.

假美丽小檗 *jia mei li xiao bo*

Shrubs, deciduous, 0.4–2 m tall. Branches dark gray or dark purplish red, sulcate, black verruculose; spines 3-fid, yellow-brown, 5–10 mm. Leaves sessile; leaf blade abaxially pale gray, adaxially green, oblanceolate or narrowly elliptic, 1–2 × 0.3–0.4 cm, papery, abaxially not pruinose, midvein conspicuously raised, lateral veins distinct, adaxially with slightly raised midvein and lateral veins, both surfaces with conspicuous reticulate veins, base cuneate, margin slightly thickened, entire or 1–5-spinose-serrate on each side, apex acute or acuminate, occasionally rounded, obtuse. Inflorescence an umbellate raceme, 3–6-flowered, 2.5–5 cm including peduncle 1.5–3 cm; bracts leaflike, ca. 1.3 cm. Pedicels 4–8 mm, glabrous; bractlets lanceolate, ca. 3 mm. Sepals in 3 whorls; outer sepals lanceolate, 3–3.1 × 1–1.2 mm; median sepals obovate, 4.5–4.9 × 3.1–3.5 mm; inner sepals elliptic, 5–5.5 × 3.2–4 mm. Petals obovate, 4–4.2 × 3–3.2 mm, base attenuate, not clawed, with separate glands, apex emarginate or entire, rounded, obtuse. Stamens ca. 2 mm; anther connective apiculate. Ovules 1–3. Fruit stalk to 1.2 cm; berry oblong, 10–12 × 3–5 mm, contracted below middle, not pruinose, style not persistent; seeds 2 or 3. Fl. Jun–Jul, fr. Aug–Sep.

• Alpine thickets, roadsides, weedy places on mountain summits; 2900–3500 m. Sichuan.

**142. *Berberis lepidifolia*** Ahrendt, Bull. Misc. Inform. Kew 1939: 269. 1939.

鳞叶小檗 *lin ye xiao bo*

Shrubs, deciduous, 1–1.5 m tall. Branches dark gray, slender, angulate, black verruculose; shoots pale purplish brown, sulcate, sparsely black verruculose, sometimes puberulous;

spines simple, weak, 3–6(–15) mm, occasionally absent. Leaves subsessile; leaf blade abaxially gray-green, adaxially dark green, narrowly oblanceolate, 1.7–4.5 cm × 1.5–5 mm, papery, abaxially not pruinose, midvein obviously raised, lateral veins slightly raised, reticulate veins indistinct, adaxially with slightly raised midvein and lateral veins, reticulate veins indistinct, base attenuate, margin slightly revolute, entire, apex obtuse or acute. Inflorescence an umbellate raceme, 5–8-flowered, 2–4.5 cm including peduncle 1–2 cm; bracts lanceolate, ca. 1.5 mm. Pedicels 5–10 mm, slender, glabrous. Flowers ca. 4 mm in diam. Sepals in 1 whorl of 3, center red with a yellow margin, ovate, 2–2.5 × 1.3–1.5 mm, subacute. Petals oblong-elliptic, ca. 2.5 × 1.5 mm, base cuneate, with separate ovate-elliptic glands, apex emarginate with acute lobes. Stamens ca. 2 mm; anther connective truncate. Ovules 2, shortly funiculate. Berry black, ovoid-oblong, 8–11 × 5–7 mm, slightly blue pruinose; style persistent, short. Fl. May, fr. Aug.

● Thickets, *Pinus* forests; 3000–3700 m. Sichuan, Yunnan.

**143. *Berberis calcipratorum*** Ahrendt, J. Linn. Soc., Bot. 57: 130. 1961.

钙原小檗 *gai yuan xiao bo*

Shrubs, deciduous, 1–3 m tall. Branches dark red, sulcate, white pruinose; spines simple or 3-fid, orange-yellow, shiny, 8–15 mm, stout. Leaves subsessile; leaf blade abaxially brown, adaxially dark green, narrowly obovate, 1–2.5 × 0.4–1.1 cm, thinly papery, abaxially white pruinose, occasionally not pruinose, midvein and reticulate veins raised, adaxially sometimes with slightly raised reticulate veins, base cuneate, margin slightly thickened, entire, apex obtuse, mucronate. Inflorescence an umbellate raceme or subumbel, 2–5-flowered, 2–3 cm, sometimes with few fascicled flowers at base; rachis pruinose; bracts lanceolate, ca. 2 mm, pruinose, apex acuminate. Pedicels 5–10 mm, white pruinose; bractlets ovate, ca. 3 mm, apex acuminate. Flowers orange. Sepals in 2 whorls; outer sepals elliptic, ca. 5.5 × 4 mm; inner sepals obovate, ca. 7.5 × 4 mm. Petals oblong-obovate, ca. 5.5 × 3.5 mm, base clawed, with separate elliptic glands, apex emarginate. Stamens ca. 3.5 mm; anther connective slightly prolonged, apiculate. Ovules 2–4, shortly funiculate. Berry unknown. Fl. May–Jun, fr. unknown.

● Forests, thickets; 3300–3700 m. Yunnan.

**144. *Berberis weisiensis*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 17. 1985.

维西小檗 *wei xi xiao bo*

Shrubs, evergreen, ca. 1 m tall. Branches dark gray, sparsely black verruculose; shoots purplish red, angulate, pruinose; spines 3-fid, weak, concolorous, 1–1.2 cm, adaxially sulcate. Leaves subsessile; leaf blade adaxially green, elliptic or oblong-obovate, 1.5–2 cm × 6–7 mm, leathery, abaxially pruinose, midvein obviously raised, adaxially midvein slightly raised, lateral veins 2 or 3 pairs, both surfaces with conspicuous reticulate veins, base cuneate, margin slightly thickened, entire, apex rounded, mucronate. Flowers unknown. Infructescence an umbellate raceme with 6 or 7 berries, 2.5–3.5 cm, pedunculate; bracts leaflike, ca. 5 mm; fruit stalk purplish red, 5–12 mm,

glabrous; berry subglobose, ca. 7 × 5 mm, not pruinose, style persistent; seeds 3. Fl. unknown, fr. Oct.

● Roadsides, riversides; ca. 2000 m. Yunnan.

**145. *Berberis amoena*** Dunn, J. Linn. Soc., Bot. 39: 422. 1911.

美丽小檗 *mei li xiao bo*

*Berberis amoena* var. *umbelliflora* Ahrendt; *B. elegans* (Franchet) C. K. Schneider (1905), not K. Koch (1869), nor H. Léveillé (1904); *B. leptoclada* Diels; *B. schneideri* Rehder; *B. sinensis* Desfontaines var. *elegans* Franchet.

Shrubs, deciduous, 0.5–1 m tall. Branches grayish black, sparsely black verruculose; shoots dark red, angulate; spines simple or 3-fid, concolorous, 4–12 mm, adaxially sulcate. Leaves subsessile; leaf blade adaxially dark green, narrowly obovate-elliptic or narrowly elliptic, 10–16 × 3–4 mm, leathery, abaxially pruinose, midvein obviously raised, papillose, lateral veins 2 or 3 pairs, adaxially with conspicuous midvein, base cuneate, margin slightly thickened, entire, occasionally 1- or 2-spinose-serrate on each side, apex obtuse, mucronate. Inflorescence an umbellate raceme, 4–8-flowered, 3–5 cm including peduncle 1–2 cm. Pedicels 4–7 mm, glabrous; bractlets lanceolate, 1.5–2 mm. Sepals in 2 whorls; outer sepals obovate to oblong-elliptic, 2–2.5 × 1–2 mm; inner sepals elliptic, 4–4.5 × 3–3.5 mm. Petals obovate, 3.5–4 × ca. 2.5 mm, base cuneate, with separate glands, apex emarginate, with 2 rounded lobes. Stamens ca. 2.5 mm; anther connective prolonged, apiculate. Ovules 1 or 2. Berry red, oblong, ca. 6 × 3 mm, not pruinose, style persistent; seeds 1. Fl. May–Jun, fr. Jul–Aug.

● Thickets, forests, weedy places; 1600–3100 m. Sichuan, Yunnan.

**146. *Berberis derongensis*** T. S. Ying, Acta Phytotax. Sin. 37: 333. 1999.

得荣小檗 *de rong xiao bo*

Shrubs, evergreen, 1–1.5 m tall. Branches dark gray, black verruculose, angulate; shoots dark purplish red, angulate, not verruculose; internodes 6–12 mm; spines 3(or 5)-fid, pale yellow, 6–12 mm. Leaves subsessile; leaf blade abaxially pale green, adaxially deep green, elliptic or subobovate, 5–15 × 3–5 mm, leathery, abaxially not pruinose, midvein conspicuously raised, adaxially with flat midvein, both surfaces with inconspicuous lateral and reticulate veins, base attenuate, margin entire, apex acute or obtuse. Flowers unknown. Infructescence an umbellate raceme with 4–7 berries, 1.5–3 cm including peduncle 0.8–1.5 cm; bracts lanceolate, ca. 3 mm; fruit stalk 2–4 mm, glabrous; berry black, obovoid-oblong, 7–8 × 3–4 mm, slightly pruinose, style 1–2 mm; seeds 2. Fl. unknown, fr. Aug.

● Thickets on slopes; ca. 3200 m. Sichuan.

**147. *Berberis papillifera*** (Franchet) Koehne, Gartenflora 48: 21. 1899.

乳突小檗 *ru tu xiao bo*

*Berberis thunbergii* Candolle var. *papillifera* Franchet, Pl. Delavay. 36. 1889; *B. finetii* C. K. Schneider.

Shrubs, deciduous, 1.5–2 m tall. Branches brownish gray, puberulous, sparsely verruculose; shoots pale yellow, pubescent; spines simple or 3-fid, weak, 5–12 mm, sometimes absent. Petiole 2–4 mm; leaf blade abaxially grayish white, adaxially deep green, narrowly oblong-obovate, 1–3 cm × 3–8 mm, papery, abaxially papillose, not pruinose, midvein slightly raised, adaxially with flat midvein, lateral veins 2 or 3 pairs, both surfaces with conspicuous reticulate veins, base attenuate, margin entire, apex acute or obtuse. Inflorescence an umbellate raceme, 3–9-flowered, 1.5–3 cm including peduncle 4–8 mm. Pedicels 6–12 mm, slender; bractlets yellow, lanceolate, ca. 3 mm, apex acuminate. Sepals in 2 whorls; outer sepals obovate, ca. 6 × 3 mm; inner sepals obovate, ca. 6 × 4 mm. Petals elliptic, ca. 4.5 × 2.5 mm, apex acute, incised, lobes acute. Stamens ca. 2.5 mm; anther connective not prolonged, truncate. Ovules 1 or 2, sessile. Berry red, oblong-elliptic, 8–8.5 × 4.5–5.5 mm, slightly pruinose, style persistent. Fl. Jun–Jul, fr. Oct–Nov.

● Thickets; 2900–3000 m. Sichuan, SE Xizang, Yunnan.

**148. *Berberis virescens*** J. D. Hooker, Bot. Mag. 116: t. 7116. 1890.

变绿小檗 *bian lü xiao bo*

*Berberis spraguei* Ahrendt var. *pedunculata* Ahrendt.

Shrubs, deciduous, 1–1.5 m tall. Branches dark purplish red or dark gray, terete, scarcely verruculose; shoots pale red, angulate; spines simple or 3-fid, 7–17 mm. Leaves subsessile; leaf blade abaxially pale yellow-green, adaxially dark green, oblong-obovate, 1.5–2.7 cm × 6–10 mm, papery, midvein flat, lateral veins 2 or 3 pairs, abaxially not pruinose, midvein inconspicuous, base cuneate, margin entire, apex obtuse or mucronate. Inflorescence a subumbel or umbellate raceme, 4–6-flowered, 1.5–2.7 cm including peduncle 6–8 mm, sometimes with 1 or 2 fascicled flowers at base. Pedicels 6–11 mm; bractlets oblong-lanceolate, ca. 4 × 2 mm. Flowers pale yellowish green. Sepals in 2 whorls; outer sepals obovate, ca. 6 × 4 mm; inner sepals broadly obovate, ca. 6 × 5 mm. Petals obovate, ca. 5 × 3 mm, base clawed, with separate glands, apex entire. Stamens ca. 3.5 mm; anther connective prolonged, conical-apiculate. Ovules 4 or 5. Berry red, ovoid, 8–10 × 3.5–4.5 mm, not pruinose; style persistent, short. Fl. May–Jun, fr. Jul–Sep.

Thickets on slopes; 3600–4100 m. Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

**149. *Berberis integripetala*** T. S. Ying, Acta Phytotax. Sin. 37: 334. 1999.

甘南小檗 *gan nan xiao bo*

Shrubs, deciduous, ca. 1.5 m tall. Branches purplish black, terete, glabrous, scarcely black verruculose; spines simple, concolorous, 1–2 cm, adaxially sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially green, elliptic or obovate-elliptic, 8–20 × 4–10 mm, papery, abaxially not pruinose, midvein and lateral veins obviously raised, reticulate veins slightly conspicuous, adaxially with slightly raised midvein and lateral veins, reticulate veins inconspicuous, base cuneate, margin entire, apex rounded, obtuse. Inflorescence an umbellate raceme, 3–7-flowered, 3–4 cm including peduncle 1–1.6 cm, glabrous.

Pedicels ca. 1 cm, glabrous. Sepals in 2 whorls; outer sepals elliptic, 3.8–4 × 2–2.1 mm; inner sepals broadly elliptic, 4–4.2 × 3–3.2 mm. Petals elliptic, 5–5.5 × 3–3.4 mm, base cuneate, with separate elliptic glands, apex entire. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 3, shortly funiculate. Fruit unknown. Fl. May, fr. unknown.

● Forests; ca. 1800 m. Gansu.

**150. *Berberis tomentulosa*** Ahrendt, J. Bot. 80(Suppl.): 112. 1942.

微毛小檗 *wei mao xiao bo*

Shrubs, deciduous, 0.5–1 m tall. Branches dark gray, obviously angulate, not verruculose, puberulous; shoots pale yellow, sulcate, puberulous; spines 3-fid, but simple on shoots, weak, pale yellow, 3–10 mm. Leaves subsessile; leaf blade abaxially pale yellow-green, adaxially shiny, deep green, obovate, 5–14 × 2–5.5 mm, papery, abaxially not pruinose, midvein obviously raised, lateral veins 2 or 3 pairs, slightly raised, reticulate veins conspicuous, adaxially with flat or slightly impressed midvein, reticulate veins conspicuous, base cuneate, margin 5–8-spinose-serrate on each side, but mostly entire on shoots, apex rounded. Inflorescence a subumbellate raceme, 5–10-flowered, 1.5–2 cm including peduncle ca. 5 mm; bracts ovate, 1–1.5 mm, apex acuminate. Pedicels 2–4 mm, slightly puberulous, becoming subglabrous; bractlets oblong, ca. 2 × 1 mm. Flowers pale yellow, 5–6 mm in diam. Sepals in 2 whorls; outer sepals broadly oblong, ca. 2.5 × 1.5 mm; inner sepals obovate-oblong, ca. 4 × 2.1 mm. Petals obovate, ca. 3 × 1.5 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 2 mm; anther connective slightly prolonged, rounded, obtuse. Ovules 2. Fruit unknown. Fl. May, fr. unknown.

● Mountain slopes, rocky slopes; ca. 2500 m. Yunnan.

**151. *Berberis tischleri*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 8: 201. 1908.

川西小檗 *chuan xi xiao bo*

*Berberis diaphana* Maximowicz var. *tachiensis* Ahrendt, p.p.; *B. elliotii* Ahrendt; *B. tischleri* var. *abbreviata* Ahrendt.

Shrubs, deciduous, 2–3 m tall. Branches blackish gray; shoots grayish yellow, sulcate, not verruculose; spines 3-fid, pale yellow, 1–2.5 cm, adaxially sulcate. Petiole 2–3 mm; leaf blade abaxially gray-green, adaxially dark green, oblong-obovate or obovate, 1.5–4.5 × 0.8–2.4 cm, thinly papery, abaxially sometimes slightly pruinose, midvein slightly raised, lateral and reticulate veins conspicuous, adaxially with flat midvein, sometimes slightly impressed, lateral and reticulate veins slightly conspicuous, base cuneate, margin entire or 2–8-spinulose-serrulate on each side, apex rounded, obtuse. Inflorescence an umbellate raceme, 4–15-flowered, 4–10 cm including peduncle 1–3 cm, glabrous; bracts lanceolate, 2–3 mm. Sepals in 2 whorls; outer sepals narrowly ovate, ca. 5 × 2 mm, apex acute; inner sepals narrowly oblong-obovate, ca. 6.3 × 3.3 mm, apex acute. Petals obovate, ca. 4 × 2 mm, base cuneate, with separate glands, apex emarginate. Stamens ca. 3.5 mm; anther connective slightly prolonged, apiculate. Ovules 3 or 4. Berry red, ovoid-oblong, 1–1.6 cm × 5–6 mm, not pruinose, apex atten-

uate, slightly bent; style persistent, short. Fl. May–Jun, fr. Jul–Sep.

- Thickets, forests; 1500–3800 m. Sichuan, Xizang.

**152. *Berberis silva-taroucana*** C. K. Schneider in Sargent, Pl. Wilson. 1: 370. 1913.

华西小檗 *hua xi xiao bo*

Shrubs, deciduous, 1–3 m tall. Branches dark gray, angulate, scarcely verruculose; shoots purplish brown or pale yellow, glabrous; spines simple or absent, occasionally 3-fid, 3–7 mm. Petiole 0.5–2.5 cm, sometimes leaf subsessile, glabrous; leaf blade adaxially deep green, obovate, oblong-obovate, or sub-orbicular, 2–6 × 0.7–3.5 cm, papery, abaxially glaucous, not pruinose, midvein and lateral veins raised, both surfaces with conspicuous reticulate veins, adaxially with slightly raised or flat midvein and lateral veins, base narrowly cuneate or abruptly contracted, margin entire or inconspicuously few spinulose-serrulate on each side, apex rounded, obtuse, mucronate. Inflorescence an umbellate raceme, loosely 6–12-flowered, 3–8 cm including peduncle 3–10 mm, glabrous, sometimes with few fascicled flowers at base; pedicels 0.5–2 cm, pedicels of fascicled flowers to 3 cm. Sepals in 2 whorls; outer sepals obovate, ca. 4 × 3.5 mm; inner sepals obovate, ca. 6 × 4.5 mm. Petals obovate, ca. 4.5 × 3.5 mm, base with separate glands, apex subentire. Stamens ca. 3.5 mm; anther connective apiculate. Ovules 2, sessile. Berry red, oblong, 9–10 × 4–5 mm, not pruinose, style not persistent. Fl. Apr–Jun, fr. Jul–Oct.

- Thickets, forests, forest margins, riversides, roadsides; 1600–3800 m. Fujian, Gansu, Sichuan, Xizang, Yunnan.

**153. *Berberis tsarongensis*** Stapf, Bot. Mag. 156: t. 9332. 1933.

察瓦龙小檗 *cha wa long xiao bo*

*Berberis tsarongensis* var. *megacarpa* Ahrendt, p.p.

Shrubs, deciduous, ca. 1.5 m tall. Branches brownish gray; shoots purplish red, angulate, sparsely black verruculose; spines simple or 3-fid, weak, 1–1.7 cm. Leaves subsessile; leaf blade abaxially grayish green, adaxially green, obovate or oblong-elliptic, 1.2–3.5 × 0.6–1.2 cm, thinly papery, abaxially papillose, not pruinose, midvein slightly raised, lateral veins 2 or 3 pairs, conspicuous, adaxially with flat midvein, both surfaces with inconspicuous reticulate veins, margin entire or 1–4-spinose-serrate on each side, apex rounded, obtuse. Inflorescence an umbellate raceme, 4–6-flowered, 1.5–3.5 cm including peduncle 5–9 mm. Pedicels weak, 8–20 mm, glabrous; bractlets ca. 2 mm, apex acute. Sepals in 2 whorls; outer sepals oblong-elliptic, 3–4 × ca. 2 mm; inner sepals obovate, ca. 5 × 4 mm. Petals oblong-obovate, ca. 5.5 × 3.5 mm, base cuneate with separate ovate glands, apex emarginate, lobes rounded, obtuse. Stamens ca. 3.5 mm; anther connective rounded, apiculate. Ovules 2. Berry red, oblong-ellipsoid, 8–15 × 4–7 mm, not pruinose, style not persistent; seeds 2. Fl. Apr–May, fr. Jun–Oct.

- Thicket-meadows, slopes, forest margins, mixed forests; 2900–3900 m. Xizang, Yunnan.

**154. *Berberis atroviridiana*** T. S. Ying, Acta Phytotax. Sin. 37: 336. 1999.

那觉小檗 *na jue xiao bo*

Shrubs, deciduous, ca. 1 m tall. Branches purplish red, terete, black verruculose; spines 3-fid, weak, pale brown, 5–10 mm. Petiole 1–2 mm; leaf blade abaxially brown, adaxially deep green, obovate, 1–2.3 × 0.6–1.1 cm, papery, abaxially not pruinose, midvein obviously raised, lateral and reticulate veins conspicuous, adaxially with slightly raised midvein, lateral veins 3 or 4 pairs, reticulate veins inconspicuous, base cuneate, margin slightly revolute, entire, or 1–5-spinulose-serrulate on each side, apex rounded, obtuse. Inflorescence an umbellate raceme, 4–10-flowered, 3–5 cm including peduncle 1.7–3 cm, glabrous; bracts ovate, apex acuminate. Flowers unknown. Fruit stalk 2–3 mm, stout, glabrous; berry oblong-ellipsoid, 7–8 × 3–4 mm, not pruinose, style not persistent; seeds 2. Fl. unknown, fr. Sep.

- *Quercus* forests; ca. 3200 m. SE Xizang.

**155. *Berberis daochengensis*** T. S. Ying, Acta Phytotax. Sin. 37: 336. 1999.

稻城小檗 *dao cheng xiao bo*

Shrubs, deciduous, ca. 1.5 m tall. Branches dark gray, terete, angulate, black verruculose; spines absent. Petiole 3–4 mm; leaf blade abaxially pale green, adaxially green, obovate or narrowly obovate, 1.5–3 × 0.6–1.2 cm, papery, both surfaces puberulous, abaxially with obviously raised midvein and lateral veins, adaxially with slightly raised midvein and lateral veins, both surfaces with obviously raised reticulate veins, base cuneate, margin entire or occasionally 1- or 2-spinulose-serrulate on each side, apex rounded, apiculate. Inflorescence a raceme, 7–12-flowered, 2.5–4.5 cm including peduncle 1–1.5 cm; rachis and peduncle puberulous; bracts purplish red, ovate, 1–1.5 mm, apex acuminate. Flowers unknown. Fruit stalk 4–5 mm, puberulous; berry pale green (immature), oblong, 8–9 × 3–4 mm, not pruinose, style not persistent; seeds 1. Fl. unknown, fr. Jul–Sep.

- Field margins, streamsides, roadsides; ca. 3400 m. Sichuan.

**156. *Berberis pubescens*** Pampanini, Nuovo Giorn. Bot. Ital., n.s., 17: 273. 1910.

柔毛小檗 *rou mao xiao bo*

Shrubs, deciduous, ca. 1 m tall. Branches grayish yellow, glabrous; shoots reddish, pubescent; internodes 1–2 cm; spines simple, 1–2.5 cm, adaxially sulcate. Petiole 7–10 mm; leaf blade abaxially pale green, adaxially deep green, obovate, 2–4 × 0.5–1 cm, papery, both surfaces pubescent, abaxially with raised midvein and lateral veins, reticulate veins prominent, adaxially with slightly impressed midvein and lateral veins, reticulate veins inconspicuous, base attenuate to decurrent petiole, margin revolute, mostly entire, rarely few spinulose on each side, apex mucronate. Inflorescence a raceme, 2–4 cm including peduncle 1–1.5 cm, glabrous; bracts ca. 1 mm. Pedicels 4–6 mm, glabrous. Flowers unknown. Berry oblong, 4–7 × 3–4 mm, not pruinose, style not persistent; seeds 1. Fl. unknown, fr. Aug.

- Mountain slopes. Hubei, Shaanxi.

**157. *Berberis kongboensis*** Ahrendt, J. Bot. 80(Suppl.): 97. 1942.

工布小檗 gong bu xiao bo

*Berberis amoena* Dunn var. *moloensis* Ahrendt.

Shrubs, deciduous, ca. 2 m tall. Branches dark purplish red, shiny, not verruculose; shoots shiny, red, glabrous; spines 3-fid, pale yellow, 1–2.5 cm, adaxially sulcate. Petiole 2–5 mm; leaf blade adaxially deep green, oblanceolate, 1–5 × 0.5–1.5 cm, papery, adaxially with conspicuous midvein and lateral veins, reticulate veins conspicuous, base narrowly cuneate, margin entire, apex acute, mucronate. Inflorescence a raceme, loosely 7–25-flowered, 3–8 cm including peduncle 1–2 cm; bracts 3–5 mm, apex acuminate. Pedicels 1–2 cm, slender, glabrous. Sepals in 2 whorls; outer sepals oblong-ovate, ca. 6.5 × 2.5 mm; inner sepals oblong-elliptic, ca. 8.5 × 4 mm. Petals obovate, ca. 4.5 × 3 mm, base cuneate, with separate lanceolate glands, apex retuse with 2 rounded lobes. Stamens ca. 3 mm; anther connective slightly prolonged, apiculate. Ovules 3, one of these sessile. Berry ?red, oblong, not pruinose, style not persistent. Fl. May, fr. Jun–Aug.

• Forests; 2700–3200 m. Xizang.

**158. *Berberis agricola*** Ahrendt, J. Linn. Soc., Bot. 57: 192. 1961.

暗红小檗 an hong xiao bo

Shrubs, deciduous, 0.8–2 m tall. Branches dark gray, terete; shoots dark red, sparsely black verruculose, glabrous; internodes 1.5–3 cm; spines 3-fid, pale yellow, 1–1.5 cm, adaxially sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially deep green, obovate, 1.2–2.5 × 0.7–1.5 cm, papery, abaxially not pruinose, midvein and lateral veins markedly raised, adaxially with raised midvein and lateral veins, both surfaces with conspicuous reticulate veins, base cuneate, margin entire or occasionally 1–3-spinose-serrate on each side, apex rounded, obtuse. Inflorescence a raceme, 15–30-flowered, often verticillate, rarely compound below, 4–7.5 cm, sometimes pendulous; peduncle 1–2 cm, slender, glabrous; bracts ca. 1.5 mm. Pedicels 5–7 mm, weak, glabrous; bractlets ovate, ca. 2.2 × 1.2 mm. Flowers ca. 1 cm in diam. Sepals in 2 whorls; outer sepals elliptic, 3–3.2 × 1.5–2 mm; inner sepals elliptic-obovate, ca. 5.5 × 3.2 mm. Petals elliptic, ca. 4.5 × 3 mm, base clawed, with separate glands, apex entire. Stamens ca. 3 mm; anther connective slightly prolonged, rounded, obtuse, or truncate. Ovules 2, shortly funiculate. Fruit unknown. Fl. Jun, fr. unknown.

• Thickets on mountain slopes, roadsides; 3200–3600 m. Xizang.

**159. *Berberis forrestii*** Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941.

金江小檗 jin jiang xiao bo

Shrubs, deciduous, 1–2 m tall. Branches pale yellow, angulate, sparsely black verruculose; shoots shiny, red, often ultimately becoming brownish yellow; spines 3-fid, concolorous, 1–2 cm. Petiole 3–8 mm; leaf blade abaxially grayish green, adaxially dark green, oblong-obovate, 2–6 × 1–1.8 cm,

papery, abaxially sometimes slightly pruinose, lateral veins slightly raised, reticulate veins conspicuous, adaxially with flat or slightly raised midvein, lateral veins 3–5 pairs, base cuneate, margin entire or 3- or 4-spinose-serrate on each side, apex rounded. Inflorescence a raceme, 10–20-flowered, 6–12 cm including peduncle 1–4 cm; bracts 2–2.5 mm, apex acuminate. Pedicels 7–20 mm, slender; bractlets red, triangular, ca. 3 × 1 mm. Flowers 8–10 mm in diam. Sepals in 3 whorls; outer sepals lanceolate, 4–4.5 × ca. 1.5 mm; median and inner sepals oblong-obovate, 5–6 × 3–4 mm. Petals obovate-elliptic, 4–5 × 2–3 mm, base cuneate, with approximate but not contiguous glands, apex distinctly emarginate, lobes acute. Stamens 2.5–3 mm; anther connective prolonged, shortly apiculate. Ovules 1 or 2. Berry shiny, red, oblong-ovoid, 9–11 × 7–8 mm, not pruinose, style not persistent. Fl. Jun, fr. Jul–Oct.

• Roadsides, thickets, *Pinus* forests; 2700–3600 m. Yunnan.

**160. *Berberis racemulosa*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 129. 1985.

短序小檗 duan xu xiao bo

Shrubs, deciduous, 0.6–1.5 m tall. Branches gray; shoots pale yellow, sometimes puberulous; spines 3-fid, pale yellow, 0.7–2.2 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially green, obovate or elliptic-obovate, 1–2.8 × 0.5–1.4 cm, papery, abaxially not pruinose, midvein and lateral veins raised, both surfaces with inconspicuous reticulate veins, base cuneate, margin thickened, entire, apex acute, aristate. Inflorescence a raceme, 9–15-flowered, 1–2.8 cm, sometimes compound at base; peduncle 3–7 cm, glabrous. Pedicels 3–5 mm, slender. Sepals in 3 whorls; outer sepals ovate, 1.5–2 × 1–1.5 mm; median sepals elliptic-ovate, 3–3.2 × 1.5–2 mm; inner sepals broadly elliptic, 4.2–5 × 3–3.5 mm. Petals elliptic-obovate, 3–3.5 × 1.5–1.8 mm, base cuneate, with separate elliptic glands, apex emarginate, lobes acute. Stamens ca. 3 mm; anther connective not prolonged, apiculate. Ovules 2(–5). Berry ellipsoid, 5–7 × 3–4 mm, pruinose, style persistent. Fl. May–Jun, fr. Jul–Aug.

• Field margins, floodlands, weedy places in valleys, beside houses; 3200–3600 m. Xizang.

**161. *Berberis retusa*** T. S. Ying, Acta Phytotax. Sin. 37: 338. 1999.

心叶小檗 xin ye xiao bo

Shrubs, deciduous, 2–3 m tall. Branches black gray; shoots grayish brown, sparsely verruculose, angulate, glabrous; spines simple or absent, dark gray, ca. 1 cm. Petiole 1–2 mm; leaf blade abaxially pale green, adaxially green, obcordate or sub-cuneate, 8–14 × 6–9 mm, papery, both surfaces glabrous, abaxially with obviously raised midvein, lateral veins slightly raised, adaxially with slightly raised midvein and lateral veins, both surfaces with raised reticulate veins, base cuneate, margin entire, apex slightly retuse or truncate. Inflorescence a raceme, 6–12-flowered, sometimes subverticillate on upper rachis, 1.6–2.2 cm; peduncle 0.5–1 cm, glabrous; bracts lanceolate, ca. 1.5 mm. Flowers unknown. Fruit stalk ca. 6 mm, glabrous; berry ellipsoid, 8–9 × 5–6 mm, pruinose, style persistent; seeds 2. Fl. unknown, fr. Aug.

- Sunny dry valleys; ca. 3000 m. Sichuan, Yunnan.

**162. *Berberis virgetorum*** C. K. Schneider in Sargent, Pl. Wilson. 3: 440. 1917.

庐山小檗 *lu shan xiao bo*

*Berberis chekiangensis* Ahrendt; *B. pingjiangensis* Q. L. Chen & B. M. Yang.

Shrubs, deciduous, 1.5–2 m tall. Branches grayish yellow, angulate, not verruculose; shoots purplish brown; spines simple, occasionally 3-fid, 1–4 cm, adaxially sulcate. Petiole 1–2 cm; leaf blade abaxially grayish white, adaxially dark yellow-green, oblong-rhombic, 3.5–8 × 1.5–3.5(–7) cm, thin papery, abaxially with obviously raised midvein and lateral veins, adaxially with slightly raised midvein, lateral veins conspicuous, base cuneate, attenuate to petiole, margin completely entire, sometimes slightly undulate, apex acute. Inflorescence a raceme, 3–15-flowered, 2–5 cm including peduncle 1–2 cm; bracts lanceolate, 1–1.5 mm, apex acuminate. Pedicels 4–8 mm, slender, glabrous. Sepals in 2 whorls; outer sepals oblong-ovate, 1.5–2 × 1–1.2 mm; inner sepals oblong-obovate, ca. 4 × 1–1.8 mm, apex obtuse. Petals elliptic-obovate, 3–3.5 × 1–1.8(–2.5) mm, base clawed, with separate oblong glands, apex obtuse, entire. Stamens ca. 3 mm; anther connective not prolonged, obtuse. Ovules solitary, sessile. Berry red, oblong-ellipsoid, 8–12 × 3–4.5 mm, not pruinose, style not persistent. Fl. Apr–May, fr. Jun–Oct.

- Montane thickets, forests, riversides, beside houses; 200–1800 m. Anhui, Fujian, Jiangxi, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Zhejiang.

**163. *Berberis humidoubrosa*** Ahrendt, J. Bot. 80(Suppl.): 115. 1942 [*"humido-umbrosa"*].

阴湿小檗 *yin shi xiao bo*

Shrubs, deciduous, 1.5–2.5 m tall. Branches grayish black; shoots purplish red, angulate, sparsely black verruculose; spines simple or 3-fid, 1–2 cm. Petiole 1–2 mm; leaf blade abaxially pale gray, adaxially dark green, oblong-obovate, 1–2 cm × 4–6 mm, papery, abaxially sparsely papillose, midvein obviously raised, both surfaces with raised reticulate veins, base cuneate, attenuate to decurrent petiole, margin entire, apex rounded. Inflorescence a raceme, 4–8-flowered, 2–3 cm including peduncle 0.3–1.5 cm, glabrous; bracts 1–1.5 mm. Pedicels 4–9 mm, glabrous. Sepals in 2 whorls; outer sepals ovate, ca. 2.8 × 1.8 mm, apex obtuse; inner sepals obovate, ca. 3 × 2.5 mm. Petals obovate, ca. 3.3 × 2.5 mm, base with separate elliptic glands, apex entire. Stamens ca. 2.3 mm; anther connective prolonged, truncate. Ovules 2. Berry red, obovoid, 7–8 × 4.5–5 mm, densely blue or violet pruinose, style persistent and conspicuous. Fl. May–Jul, fr. Aug–Oct.

- Rainforests, thickets in arid valleys, shaded wet places; 2800–4000 m. Xizang.

**164. *Berberis sabulicola*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 133. 1985.

砂生小檗 *sha sheng xiao bo*

Shrubs, semi-evergreen, ca. 1 m tall. Shoots pale yellow;

branches gray, slightly sulcate; internodes 0.5–1 cm; spines 3-fid, sometimes simple, pale yellow, 8–14 mm. Leaves subsessile; leaf blade abaxially shiny, green, adaxially dark green, obovate, 8–11 × 3–6 mm, papery, abaxially with raised midvein, lateral veins slightly raised, reticulate veins conspicuous, adaxially with slightly raised midvein and lateral veins, reticulate veins inconspicuous, base cuneate, margin entire, apex rounded. Inflorescence a raceme, 3–5-flowered, 1.5–2 cm including peduncle 3–7 mm. Pedicels 4–6 mm, glabrous. Sepals in 2 whorls; outer sepals elliptic, ca. 3 × 1.5 mm; inner sepals obovate-suborbicular, ca. 3.5 × 3 mm. Petals obovate, ca. 3.2 × 2 mm, base very clawed, with separate glands, apex entire. Stamens ca. 3 mm; anther connective prolonged, apiculate. Ovules 3. Berry pale yellow (immature), oblong, slightly pruinose, style not persistent. Fl. May, fr. Jun–Aug.

- Rock fractures, talus deposits; ca. 3800 m. Xizang.

**165. *Berberis feddeana*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 665. 1905.

异长穗小檗 *yi chang sui xiao bo*

Shrubs, deciduous, 1–2 m tall. Branches pale grayish yellow, terete, not verruculose; shoots reddish, glabrous; spines simple, weak, 2–8 mm, sometimes absent. Petiole 6–15 mm; leaf blade abaxially pale green, adaxially dark green, obovate or oblong-obovate, 2–8 × 2.2–5 cm, papery, both surfaces glabrous, abaxially with obviously raised midvein, reticulate veins conspicuous, adaxially with flat or slightly impressed midvein, lateral and reticulate veins conspicuous, base cuneate, margin entire, or inconspicuously many spinulose-serrulate, apex rounded, obtuse or acute. Inflorescence a raceme, 18–60-flowered, 7–18 cm including peduncle 1–3 cm, glabrous; bracts triangular-lanceolate, 1–2 mm. Pedicels 4–8 mm; bractlets reddish, lanceolate, 1.5–2 mm. Sepals in 2 whorls; outer sepals oblong, 2.5–3 × 1.3–1.5 mm; inner sepals obovate-oblong, 4–4.5 × 2–2.5 mm. Petals elliptic, 3–3.5 × 1.5–1.8 mm, base shortly clawed, with separate glands, apex emarginate. Ovules 2. Berry red, oblong, 8–10 × 4–6 mm, not pruinose, style not persistent. Fl. Apr–May, fr. Jun–Sep.

- Thickets, forest margins, streamsides on mountains; 800–3000 m. Hubei, Qinghai, Shaanxi, Sichuan.

**166. *Berberis haoi*** T. S. Ying, Acta Phytotax. Sin. 37: 339. 1999.

洮河小檗 *tao he xiao bo*

Shrubs, deciduous, ca. 1 m tall. Branches purplish brown, angulate, glabrous, sparsely black verruculose; spines simple or 3-fid, pale yellow, 1–1.5 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially green, narrowly obovate-lanceolate or narrowly elliptic, 1–2.2 cm × 3–6 mm, papery, abaxially not pruinose, glabrous, midvein obviously raised, lateral veins 2 or 3 pairs, raised, reticulate veins conspicuous, adaxially with flat midvein, reticulate veins inconspicuous, base cuneate, margin slightly thickened, entire, apex acute, aristate. Inflorescence a raceme, 6–10-flowered, 2.5–3.5 cm including peduncle 7–12 mm, occasionally with 1 or 2 fascicled flowers at base, glabrous. Flowers unknown. Fruit stalk 4–5 mm; bracts ovate, ca. 1 mm, apex acute. Berry oblong-ellipsoid, 5–6 × 2–2.5 mm,

slightly pruinose, style not persistent; seeds 2. Fl. unknown, fr. Jun.

• Riverbanks; ca. 1800 m. Gansu.

**167. *Berberis jamesiana*** Forrest & W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 81. 1916.

川滇小檗 chuan dian xiao bo

*Berberis integerrima* Franchet, Bull. Soc. Bot. France 33: 386. 1886, not Bunge (1843), nor K. Koch (1869); *B. jamesiana* var. *leucocarpa* (W. W. Smith) Ahrendt; *B. jamesiana* var. *sepium* Ahrendt; *B. leucocarpa* W. W. Smith; *B. nummularia* Bunge var. *sinica* C. K. Schneider.

Shrubs, deciduous, 1–3 m tall. Branches dark gray or purplish black, terete; shoots purple, not verruculose; spines simple or 3-fid, 1.5–3.5 cm, stout, adaxially slightly sulcate. Petiole 1–3 mm; leaf blade adaxially shiny, green, elliptic or oblong-obovate, 2.5–8 × 1–4 cm, subleathery, adaxially with obviously raised midvein, both surfaces not papillose, lateral and reticulate veins conspicuous, base cuneate, margin entire or closely spinulose, apex rounded or retuse. Inflorescence a raceme, 9–20-flowered, sometimes to 40-flowered and compound below, 7–10 cm; peduncles 0.5–3 cm. Pedicels 7–10 mm, slender, glabrous; bractlets ovate, 2–2.5 × ca. 1.5 mm, apex acute. Sepals in 2 whorls; outer sepals oblong-obovate, ca. 3 × 2 mm; inner sepals narrowly obovate, ca. 4.5 × 2.5 mm. Petals obovate or narrowly oblong-elliptic, ca. 4.5 × 2 mm, base clawed, with separate glands, apex emarginate, lobes acute. Stamens ca. 3 mm; anther connective prolonged, slightly apiculate. Ovules 2. Berry initially creamy white, finally light red, subglobose, ca. 10 × 7–8 mm, translucent, not pruinose, style not persistent. Fl. Apr–May, fr. Jun–Sep.

• Thickets, forests, forest margins, riversides, mountain slopes; 2100–3600 m. Sichuan, Xizang, Yunnan.

**168. *Berberis iliensis*** Popov, Ind. Sem. Hort. Bot. Almaat. Acad. Sci. URSS 3: 3. 1936.

伊犁小檗 yi li xiao bo

*Berberis nummularia* Bunge var. *schrenkiana* C. K. Schneider.

Shrubs, deciduous, 1–2.5 m tall. Branches dark gray or purplish red, terete; shoots pale purplish red, shiny, not verruculose, glabrous; spines simple or 3-fid, concolorous, 1–3 cm, adaxially sulcate. Petiole 3–15 mm; leaf blade abaxially grayish green, adaxially green, oblong-elliptic or cuneate, papery, abaxially with obviously raised midvein, adaxially with flat midvein, both surfaces with raised reticulate veins, margin entire. Inflorescence a raceme, 10–25-flowered, 3–5 cm including peduncle ca. 5 mm; bracts 1–1.5 mm. Pedicels 5–10 mm, glabrous; bractlets ovate, ca. 1.5 × 1 mm. Sepals in 2 whorls; outer sepals elliptic, ca. 2.8 × 1.8 mm; inner sepals obovate, 3.8–4 × ca. 2.5 mm. Petals obovate, ca. 3.5 × 2 mm, base clawed, with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 2, with funicles ca. as long as ovules. Berry shiny, red, ovoid-ellipsoid, 5.5–6 × 3.5–4 mm, not pruinose. Fl. May–Jun, fr. Jul–Sep.

Dry regions, sandy places on river beaches, grassy slopes, roadsides, field margins; 600–2000 m. Xinjiang [Kazakhstan].

**169. *Berberis farreri*** Ahrendt, J. Linn. Soc., Bot. 57: 192. 1961.

陇西小檗 long xi xiao bo

Shrubs, deciduous, 1–3 m tall. Branches dark gray, angulate, not verruculose; shoots pale purplish red, glabrous; internodes 2–3 cm; spines absent, sometimes spines simple or 3-fid, concolorous, 3–25 mm, adaxially sulcate. Petiole 3–15 mm; leaf blade abaxially green, adaxially dark green, elliptic-obovate, 1.3–4.5 × 0.3–1.5 cm, papery, abaxially not pruinose, midvein and lateral veins obviously raised, adaxially with slightly impressed or flat midvein, lateral veins slightly raised, both surfaces with conspicuous reticulate veins, base abruptly contracted to decurrent petiole, margin 10–20-spinose-serrate on each side, but entire on shoots, apex obtuse. Inflorescence a raceme, 15–20-flowered, 3–4 cm. Pedicels 5–11 mm, slender, glabrous. Flowers ca. 8 mm in diam. Sepals in 2 whorls; outer sepals broadly obovate, ca. 3 × 2.5 mm, apex rounded; inner sepals narrowly obovate, ca. 5.3 × 2.3 mm, apex rounded. Petals narrowly obovate, ca. 4 × 1.8 mm, base clawed, with separate oblong glands, apex obtuse, subtire. Stamens ca. 2.5 mm; anther connective not prolonged, obtuse. Ovules 2. Berry red, ellipsoid, ca. 9 × 6 mm, not pruinose; style persistent, short. Fl. May–Jun, fr. Jul–Sep.

• Mountain slopes, thickets; 1600–3100 m. Gansu.

**170. *Berberis honanensis*** Ahrendt, Gard. Ill. 64: 426. 1944.

河南小檗 he nan xiao bo

Shrubs, deciduous, 1.5–3 m tall. Branches gray, terete, sometimes sulcate, glabrous; shoots pale yellow, sometimes pale purplish yellow, sparsely black verruculose; spines absent, occasionally simple, less than 1 cm, slender. Petiole to 1.5 cm; leaf blade abaxially pale green, adaxially deep green, elliptic or oblong-elliptic, rarely obovate, 2.5–8 × 0.5–3 cm, thinly papery or papery, abaxially not pruinose, midvein obviously raised, lateral and reticulate veins slightly raised, adaxially with flat or slightly impressed midvein, lateral and reticulate veins conspicuous, base cuneate, margin 20–40-spinose-serrate on each side, apex acute or rounded, obtuse. Inflorescence a raceme, 8–14-flowered, 4–6 cm including peduncle 1.5–2.5 cm, glabrous; bracts lanceolate, ca. 2 mm. Pedicels 4–9 mm, slender, glabrous; bractlets lanceolate, ca. 3 × 1 mm. Sepals in 3 whorls; outer sepals elliptic, ca. 3 × 2.5 mm; median sepals broadly elliptic, ca. 4.2 × 3 mm; inner sepals obovate-elliptic, ca. 5.5 × 3.2 mm. Petals elliptic, ca. 5 × 3 mm, base clawed, with separate glands, apex entire. Stamens ca. 3.3 mm; anther connective prolonged, apiculate. Ovules 2. Berry red, oblong, 8–11 × 6–8 mm, not pruinose, style not persistent. Fl. Apr–May, fr. Jul–Sep.

• Thickets, forests, slopes, sides of rocks; 1100–1600 m. Henan.

**171. *Berberis pingwuensis*** T. S. Ying, Acta Phytotax. Sin. 37: 339. 1999.

平武小檗 ping wu xiao bo

Shrubs, deciduous, 2–2.5 m tall. Branches dark gray, ter-

ete, sparsely black verruculose; shoots dark purple; spines absent or 3-fid, 0.6–2 cm. Petiole ca. 1 cm; leaf blade abaxially pale green, becoming brown when dry, shiny, adaxially deep green, broadly elliptic or oblong-elliptic, 4–9 × 1.5–3.5 cm, few leaves 1.5–2 cm × 6–8 mm, thickly papery, abaxially glabrous, not pruinose, lateral and reticulate veins obviously raised, adaxially with slightly impressed midvein, lateral and reticulate veins conspicuous, base cuneate, margin 20–35-spinose-serrate on each side, apex acute or rounded, obtuse. Inflorescence a raceme, 20–35-flowered, 5–14 cm including peduncle 1–2 cm, glabrous. Pedicels 2–3 mm; bractlets ovate-lanceolate, 2–3 mm. Sepals in 4 whorls; outer sepals ovate, ca. 1.1 × 0.7 mm, apex acuminate; median outer sepals broadly lanceolate, ca. 2 × 1 mm; median inner sepals ovate-elliptic, ca. 3 × 2 mm; innermost sepals elliptic, ca. 5 × 3.2 mm. Petals in 2 whorls, base subclawed, with separate glands; outer petals obovate-oblong, ca. 4 × 2 mm, apex slightly emarginate; inner petals elliptic, ca. 4.2 × 2.2 mm, apex entire. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 2, shortly funiculate. Berry red, ovoid-ellipsoid, 10–12 × 5–7 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

- Forests, forest margins; ca. 1800 m. Sichuan.

**172. *Berberis tianshuiensis*** T. S. Ying, Acta Phytotax. Sin. 37: 341. 1999.

天水小檗 *tian shui xiao bo*

Shrubs, deciduous, ca. 2 m tall. Branches pale brown or dark gray, angulate, sparsely black verruculose; shoots pale yellowish brown, angulate, not verruculose; spines simple or 3-fid, 1–3 cm, adaxially sulcate. Petiole to 1.7 cm, sometimes leaf subsessile; leaf blade abaxially pale green or gray, adaxially green, elliptic or obovate, occasionally oblong-elliptic, (0.7–)2–6 × (0.4–)1–2.7 cm, thinly papery, abaxially glabrous, not pruinose, veins obviously raised, adaxially with flat or slightly impressed midvein, lateral and reticulate veins conspicuous, base abruptly contracted to petiole, margin 12–25-spinose-serrate on each side, leaves on shoots usually entire, apex rounded, obtuse. Inflorescence a raceme, 5–8-flowered, 3–4 cm, sometimes compound below; bracts lanceolate, ca. 1.5 mm. Pedicels ca. 1 cm, glabrous. Sepals in 2 whorls; outer sepals suborbicular or ovate-orbicular, ca. 3.5 × 3.1 mm; inner sepals suborbicular, ca. 4.8 × 4.6 mm. Petals elliptic, ca. 5 × 3.5 mm, base clawed, with separate glands, apex emarginate, lobes acute. Stamens ca. 2.5 mm; anther connective not prolonged, truncate. Ovules 3, sessile. Berry red, oblong, 10–12 × 5–6 mm, not pruinose, style ca. 1 mm. Fl. May, fr. Jun–Sep.

- Forests, streamsides; 1700–2100 m. Gansu.

**173. *Berberis henryana*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 664. 1905.

川鄂小檗 *chuan e xiao bo*

Shrubs, deciduous, 2–3 m tall. Branches grayish yellow or dark brown; shoots reddish, subterete, inconspicuously angulate; spines simple or 3-fid, concolorous, 1–3 cm, sometimes absent. Petiole 4–15 mm; leaf blade abaxially gray-green, adaxially dark green, elliptic or obovate-elliptic, 1.5–3(–6) × 0.8–1.8(–3) cm, papery, both surfaces glabrous, abaxially often

slightly pruinose, midvein raised, lateral and reticulate veins conspicuous, adaxially with slightly impressed midvein, lateral and reticulate veins slightly conspicuous, base cuneate, margin inconspicuously 10–20-spinulose-serrulate on each side, apex rounded, obtuse. Inflorescence a raceme, 10–20-flowered, 2–6 cm including peduncle 1–2 cm; bracts 1–1.5 mm. Pedicels 5–10 mm, glabrous; bractlets lanceolate, 1–1.5 mm, apex acuminate. Sepals in 2 whorls; outer sepals oblong-obovate, 2.5–3.5 × 1.5–2 mm; inner sepals obovate, 5–6 × 4–5 mm. Petals oblong-obovate, 5–6 × 4–5 mm, base with separate glands, apex incised. Stamens 3.5–4.5 mm; anther connective not prolonged, truncate. Ovules 2. Berry red, ellipsoid, ca. 9 × 6 mm, not pruinose; style persistent, short. Fl. May–Jun, fr. Jul–Sep.

- Thickets, forests, forest margins, weedy places; 1000–2500 m. Gansu, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan.

**174. *Berberis kansuensis*** C. K. Schneider, Oesterr. Bot. Z. 67: 288. 1918.

甘肃小檗 *gan su xiao bo*

Shrubs, deciduous, to 3 m tall. Branches pale brown; shoots reddish, angulate; spines weak, simple or 3-fid, concolorous, 1–2.4 cm, adaxially sulcate. Petiole 1–2 cm; leaf blade abaxially gray, adaxially dark green, suborbicular or broadly elliptic, 2.5–5 × 2–3 cm, papery, abaxially slightly pruinose, midvein obviously raised, adaxially with slightly impressed midvein, both surfaces with raised lateral and reticulate veins, base attenuate to decurrent petiole, margin 15–30-spinose-serrate on each side, apex rounded. Inflorescence a raceme, 10–30-flowered, 2.5–7 cm including peduncle 0.5–3 cm; bracts 1–1.5 mm. Pedicels 4–8 mm, often verticillate; bractlets reddish, ca. 1.4 mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate, ca. 2.5 × 1.5 mm, apex acute; inner sepals oblong-elliptic, ca. 4.5 × 2.5 mm. Petals oblong-elliptic, ca. 4.5 × 2 mm, base shortly clawed, with separate obovate glands, apex emarginate, lobes acute. Stamens ca. 3 mm; anther connective slightly prolonged, rounded or truncate. Ovules 2, funiculate. Berry red, oblong-obovoid, 7–8 × 5–6 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Jul–Aug.

- Thickets, mixed forests; 1400–2800 m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan.

**175. *Berberis anhweiensis*** Ahrendt, J. Linn. Soc., Bot. 57: 185. 1961.

安徽小檗 *an hui xiao bo*

Shrubs, deciduous, 1–2 m tall. Branches grayish yellow or pale yellow, angulate, sparsely black verruculose; shoots dark purple; internodes 2–4 cm; spines simple or 3-fid, 1–1.5 cm. Petiole 5–15 mm; leaf blade abaxially pale green, adaxially deep green, suborbicular or broadly elliptic, 2–6 × 1.5–3 cm, thinly papery, both surfaces glabrous, abaxially slightly pruinose, midvein and lateral veins obviously raised, adaxially with raised midvein and lateral veins, both surfaces with conspicuous reticulate veins, base contracted to petiole, margin 15–40-spinose-serrate on each side, apex rounded, obtuse. Inflorescence a raceme, 10–27-flowered, 3–7.5 cm including peduncle 1–1.5 cm, glabrous; bracts ca. 1 mm. Pedicels 4–7 mm, glabrous; bractlets ovate, ca. 1 mm. Sepals in 2 whorls; outer

sepals oblong, 2.5–3 × 1.3–1.5 mm; inner sepals obovate, ca. 4.5 × 3 mm. Petals elliptic, 4.8–5 × ca. 2.5 mm, base cuneate, with separate glands, apex entire. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 2. Berry red, ellipsoid or obovoid, ca. 9 × 6 mm, not pruinose, style not persistent. Fl. Apr–Jun, fr. Jul–Oct.  $2n = 28^*$ .

• Thickets, forests, roadsides; 400–1800 m. Anhui, Hubei, Zhejiang.

**176. *Berberis dasystachya*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 23: 308. 1877.

直穗小檗 zhi sui xiao bo

*Berberis dolichobotrys* Fedde; *B. kansuensis* C. K. Schneider var. *procera* Ahrendt.

Shrubs, deciduous, 2–3 m tall. Branches yellow-brown, terete, very sparsely verruculose; shoots purplish red; spines simple, 5–15 mm, sometimes absent or occasionally 3-fid, to 4 cm. Petiole 1–4 cm; leaf blade abaxially yellow-green, adaxially dark yellow-green, oblong-elliptic, broadly elliptic, or sub-orbicular, 3–6 × 2.5–4 cm, papery, abaxially glabrous, not pruinose, midvein obviously raised, adaxially with slightly raised midvein and lateral veins, base cuneate, rounded, or cordate, margin 25–50-spinulose-serrulate on each side, apex rounded, obtuse. Inflorescence a raceme, erect, 15–30-flowered, 4–7 cm including peduncle 1–2 cm, glabrous. Pedicels 4–7 mm; bractlets lanceolate, ca. 2 × 0.5 mm. Sepals in 2 whorls; outer sepals lanceolate, ca. 3.5 × 2 mm; inner sepals obovate, ca. 5 × 3 mm, base slightly clawed. Petals obovate, ca. 4 × 2.5 mm, base clawed, with separate oblong-elliptic glands, apex entire. Stamens ca. 2.5 mm; anther connective not prolonged, truncate. Ovules 1 or 2. Berry red, ellipsoid, 6–7 × 5–5.5 mm, not pruinose, style not persistent. Fl. Apr–Jun, fr. Jun–Sep.

• Thickets, forests, forest margins, streamsides, grasslands; 800–3400 m. Gansu, Hebei, Henan, Hubei, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan.

**177. *Berberis amurensis*** Ruprecht, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 260. 1857.

黄芦木 huang lu mu

*Berberis vulgaris* Linnaeus var. *amurensis* (Ruprecht) Regel.

Shrubs, deciduous, 2–3.5 m tall. Branches pale yellow or gray, slightly sulcate, not verruculose; internodes 2.5–7 cm; spines 3-fid, rarely simple, 1–2 cm. Petiole 5–10 mm; leaf blade abaxially pale green, adaxially dark green, obovate-elliptic, elliptic, or ovate, 5–10 × 2.5–5 cm, papery, abaxially with slightly raised midvein and lateral veins, reticulate veins slightly conspicuous, adaxially with impressed midvein and lateral veins, reticulate veins inconspicuous, base cuneate, margin 40–60-spinulose-serrulate on each side, apex acute or rounded. Inflorescence a raceme, 10–25-flowered, 4–10 cm including peduncle 1–3 cm. Pedicels 5–10 mm. Sepals in 2 whorls; outer sepals obovate, ca. 3 × 2 mm; inner sepals obovate, 5.5–6 × 3–3.4 mm. Petals elliptic, 4.5–5 × 2.5–3 mm, base slightly clawed, with separate glands, apex emarginate. Stamens ca. 2.5 mm; anther connective not prolonged, truncate. Ovules 2. Berry red,

oblong, ca. 10 × 6 mm, not or slightly blue pruinose at base, style not persistent. Fl. Apr–May, fr. Aug–Sep.  $2n = 28$ , 42.

Thickets, sparse forests, valleys, forest margins, streamsides, sides of rocks; 1100–2900 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi [Japan, Korea, Russia (Siberia)].

**178. *Berberis shensiana*** Ahrendt, Gard. Chron., ser. 3, 112: 155. 1942.

陕西小檗 shan xi xiao bo

Shrubs, deciduous, ca. 1.5 m tall. Branches dark gray, angulate, glabrous; shoots stramineous or pale purplish red, sparsely black verruculose; spines 3-fid or simple, pale yellow, 1–2 cm, adaxially slightly sulcate. Petiole ca. 1 cm; leaf blade abaxially pale green, adaxially green, elliptic or obovate, 1.5–4.5 × 0.5–1.7 cm, papery, abaxially glabrous, not pruinose, midvein obviously raised, lateral and reticulate veins conspicuous, adaxially with slightly impressed midvein, lateral and reticulate veins inconspicuous, sometimes conspicuous, base cuneate, margin 10–20-spinulose-serrulate on each side, apex acute or rounded, obtuse. Inflorescence a raceme, 4–8-flowered, 1.5–3.5 cm including peduncle ca. 5 mm, sometimes compound below; bracts ovate, ca. 1.3 mm. Pedicels 5–8 mm, slender, glabrous; bractlets lanceolate, ca. 3 × 1 mm. Sepals in 2 whorls; outer sepals elliptic, 4.5–5 × 2.5–3 mm; inner sepals oblong-elliptic, ca. 6 × 4 mm. Petals obovate-elliptic, 5–5.5 × 3–3.5 mm, base clawed, with separate glands, apex entire. Stamens ca. 3 mm; anther connective slightly prolonged, apiculate. Ovules 5 or 6. Berry red, oblong, 7–8 × 4–5 mm, not pruinose; style persistent and very short, or not persistent. Fl. May–Jun, fr. Jul–Sep.

• Thickets, slopes, woodlands, roadsides; 1200–3000 m. Shaanxi.

**179. *Berberis hersii*** Ahrendt, Gard. Ill. 64: 426. 1944.

南阳小檗 nan yang xiao bo

*Berberis amurensis* Ruprecht var. *licentii* Ahrendt.

Shrubs, deciduous, 1–3 m tall. Branches grayish black, terete; shoots grayish yellow, angulate, sparsely black verruculose; spines absent or simple, occasionally 3-fid, weak, concolorous, 3–6 mm. Petiole 6–15 mm; leaf blade abaxially grayish brown, adaxially green, obovate, obovate-elliptic, or elliptic, 2.5–5 × 1–1.8 cm, thinly papery, abaxially with obviously raised midvein and lateral veins, adaxially with slightly raised midvein and lateral veins, both surfaces with conspicuously raised reticulate veins, base cuneate, margin 15–30-spinulose-subserulate on each side, apex acute. Inflorescence a raceme, 15–30-flowered, 3–5 cm, sometimes compound below; peduncles 5–15 mm; bracts 1–1.5 mm. Pedicels dark red, 2–8 mm, slender; bractlets red, ca. 2 × 1 mm, apex acute. Sepals in 2 whorls; outer sepals ovate, 3–3.5 × 2–2.5 mm, apex obtuse; inner sepals obovate, 4.5–5 × 3–3.5 mm. Petals elliptic, 4–4.5 × 2.5–3 mm, base slightly clawed, with separate oblong glands, apex slightly emarginate. Stamens ca. 2.5 mm; anther connective not prolonged, truncate, or retuse. Ovules 2. Berry red, ellipsoid, ca. 9 × 5.5 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Aug–Oct.

• Thickets, forests, forest margins, roadsides; 700–2100 m. Hebei, Shandong, Shanxi.

**180. *Berberis pseudotibetica*** C. Y. Wu ex S. Y. Bao, *Acta Phytotax. Sin.* 25: 159. 1987.

假藏小檗 *jia zang xiao bo*

Shrubs, deciduous, ca. 1 m tall. Branches grayish black, sparsely black verruculose; spines simple or 3-fid, concolorous, 5–25 mm. Petiole 1–3 mm; leaf blade abaxially pallid, adaxially deep green, narrowly oblong-obovate, 2.5–3 cm × 6–10 mm, thinly leathery, abaxially with conspicuously raised midvein and lateral veins, reticulate veins prominent, adaxially with slightly raised midvein and lateral veins, reticulate veins inconspicuous, base cuneate, margin flat, 2–5-spinose-serrate on each side, apex obtuse, aristate. Flowers unknown. Infructescence with 3–10 berries, 3–4 cm; berry deep red, oblong-ellipsoid, 7–10 × 4–5 mm, not pruinose; style persistent, short; seeds 2. Fl. unknown, fr. Jul.

• Streamsides in thickets, *Pinus* forests; 800–3200 m. Yunnan.

**181. *Berberis dubia*** C. K. Schneider, *Bull. Herb. Boissier, sér.* 2, 5: 663. 1905.

置疑小檗 *zhi yi xiao bo*

Shrubs, deciduous, 1–3 m tall. Branches grayish black, slightly sulcate, sparsely black verruculose; shoots purplish red, shiny, conspicuously sulcate; spines simple or 3-fid, concolorous, 0.7–2 cm. Petiole 1–3 mm; leaf blade abaxially pale yellow, adaxially deep green, narrowly obovate, 1.5–3 × 0.5–1.8 cm, papery, both surfaces glabrous, not pruinose, abaxially with conspicuously raised midvein and lateral veins, adaxially with obviously raised midvein and lateral veins, both surfaces with markedly raised reticulate veins, base attenuate, margin 6–14-spinulose-serrulate on each side, apex subacuminate. Inflorescence a raceme, 5–10-flowered, 1–3 cm; peduncle 5–10 mm. Pedicels weak, 3–6 mm, glabrous; bractlets lanceolate, 1.5 × 1 mm, apex acute. Sepals in 2 whorls; outer sepals ovate, ca. 2.5 × 1.5 mm; inner sepals broadly obovate, ca. 4.5 × 3.5 mm. Petals elliptic, ca. 3.5 × 2.5 mm, base cuneate, with separate glands, apex shortly emarginate. Stamens ca. 2.5 mm; anther connective prolonged, shortly apiculate. Ovules 2. Berry red, obovoid-ellipsoid, ca. 8 × 4 mm, not pruinose, style not persistent. Fl. May–Jun, Aug–Sep.

• Thickets, forests, stony slopes, river beaches; 1400–3900 m. Gansu, Nei Mongol, Ningxia, Qinghai.

**182. *Berberis potaninii*** Maximowicz, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 11: 41. 1891 [*“potanini”*].

少齿小檗 *shao chi xiao bo*

*Berberis leichtensteinii* C. K. Schneider.

Shrubs, evergreen, 1–2 m tall. Branches dark purplish red or dark gray, glabrous; shoots grayish yellow, sometimes, angulate, sparsely black verruculose; spines 3-fid, (1.5–)2–6 cm, stout, adaxially slightly sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially deep green, shiny, lanceolate, obovate, or narrowly obovate, 2–4 × 0.3–1.8 cm, leathery, abaxially sometimes densely papillose, midvein obviously raised,

lateral and reticulate veins inconspicuous, adaxially veins inconspicuous, base attenuate or cuneate, margin often thickened, 1–4-spinose-serrate on each side, rarely entire, apex acute, mucronate. Inflorescence a raceme, 4–12-flowered, 2–4 cm. Pedicels 5–15 mm, glabrous. Sepals in 2 whorls; outer sepals elliptic to obovate, 4–5 × 3–4 mm, apex obtuse; inner sepals obovate, 5–7 × 4–5 mm. Petals obovate, 4.3–5 × 3–3.5 mm, base truncate, with separate lanceolate glands, apex entire. Stamens 4–5 mm; anther connective obtuse. Ovules 1 or 2, sessile. Berry red, oblong or oblong-globose, 7–8 × 5–6 mm, not pruinose, sometimes slightly so, style persistent and conspicuous. Fl. Apr–May, fr. Aug–Oct.

• Sunny slopes, roadsides, streamsides, valleys; 400–2100 m. Gansu, Shaanxi, Sichuan.

**183. *Berberis centiflora*** Diels, *Notes Roy. Bot. Gard. Edinburgh* 5: 167. 1912.

多花大黄连刺 *duo hua da huang lian ci*

*Berberis pruinosa* Franchet var. *centiflora* (Diels) Handel-Mazzetti.

Shrubs, evergreen, 1–2 m tall. Branches brownish gray or brownish yellow, terete, glabrous, not verruculose; spines 3-fid, concolorous, ca. 1.5 cm, slender. Petiole 1–4 mm; leaf blade abaxially pale green, adaxially shiny, yellow-green, oblong-obovate or oblanceolate, 3–9 × 1–3 cm, leathery, abaxially with obviously raised midvein, lateral veins 8–12 pairs, conspicuous, adaxially with slightly impressed midvein, both surfaces with inconspicuous reticulate veins, base cuneate, margin sometimes slightly revolute, 10–20-spinose-serrate on each side, apex obtuse, apiculate. Inflorescence a fascicle of 15–30 flowers or 2–4-flowered raceme 5–6 cm. Pedicels 1.5–4 cm, glabrous, not pruinose; bractlets ca. 2 × 1.5 mm. Sepals in 2 whorls; outer and inner sepals obovate, equal in size, ca. 5.5 × 4 mm. Petals obovate, ca. 6.5 × 5 mm, base clawed, with separate lanceolate glands, apex slightly retuse. Stamens ca. 5 mm; anther connective prolonged, shortly apiculate. Ovules 4–6. Berry oblong-ellipsoid, ca. 7 × 6 mm, not pruinose; style persistent, short. Fl. Mar–Apr, fr. Jun–Oct.

• Roadsides in valleys; 1800–2700 m. Yunnan.

**184. *Berberis tenuipedicellata*** T. S. Ying, *Acta Phytotax. Sin.* 37: 343. 1999.

细梗小檗 *xi geng xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches dark gray or dark purplish red, terete, sparsely black verruculose, glabrous; shoots dark purplish red, angulate; spines simple or 3-fid, 0.6–1.5 cm. Petiole 2–3 mm, sometimes leaf subsessile; leaf blade abaxially shiny, brown, adaxially green, obovate or obovate-elliptic, 0.8–2(–3.5) × 0.5–1.2 cm, thinly leathery, abaxially not pruinose, midvein and lateral veins obviously raised, adaxially with slightly raised midvein and lateral veins, both surfaces with conspicuously raised reticulate veins, base attenuate, margin 10–25-spinose-serrate on each side, apex rounded, obtuse, or acute. Inflorescence a raceme, 3–10-flowered, 1–3.5 cm, often with 1–3 fascicled flowers at base. Pedicels 5–12 mm, very slender, glabrous. Flowers unknown. Berry red, subglobose, 9–

10 × 8–9 mm, not pruinose, style not persistent, apex cavity-like; seeds 2 or 3. Fl. unknown, fr. May–Jun.

• Thickets, field margins, streamsides, roadsides; 2300–3100 m. Sichuan.

**185. *Berberis mouillacana*** C. K. Schneider in Sargent, Pl. Wilson. 1: 371. 1913.

变刺小檗 *bian ci xiao bo*

*Berberis boschanii* C. K. Schneider.

Shrubs, deciduous, 1.5–3 m tall. Branches dark gray, sulcate; shoots sometimes reddish, not verruculose; spines simple, sometimes 3-fid or absent, pale yellow, terete, 3–18 mm. Petiole 2–5 mm, or leaf subsessile; leaf blade abaxially green, adaxially shiny, green, obovate or oblong-obovate, 1–6 × 0.5–3.5 cm, papery, abaxially not pruinose, not papillose, midvein slightly raised, lateral and reticulate veins conspicuous, adaxially with flat or slightly impressed midvein, lateral and reticulate veins inconspicuous, base cuneate, margin entire, occasionally inconspicuously 1–8-spinulose-serrate on each side, apex rounded, obtuse. Inflorescence usually a raceme with few fascicled flowers at base, or occasionally a subumbellate raceme with 4–12 flowers, 2–5 cm. Pedicels 3–15 mm, glabrous; bractlets lanceolate, ca. 3 × 1 mm, apex acuminate. Sepals in 2 whorls; outer sepals narrowly elliptic, 4–4.5 × 2–2.2 mm; inner sepals elliptic, 6–6.5 × 3–3.5 mm. Petals broadly elliptic, ca. 4.5 × 3 mm, base with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective truncate. Ovules 2–4. Berry ovoid-ellipsoid, 9–10 × 5–6 mm, not pruinose, style persistent. Fl. Apr–May, fr. Jul–Sep.

• Floodlands, forests, forest margins, roadsides on slopes; 2000–3500 m. Qinghai, Sichuan.

**186. *Berberis franchetiana*** C. K. Schneider, Oesterr. Bot. Z. 67: 223. 1918.

滇西北小檗 *dian xi bei xiao bo*

*Berberis franchetiana* var. *glabripes* Ahrendt.

Shrubs, deciduous, 1–2 m tall. Branches brownish gray, obviously sulcate, glabrous, rarely black verruculose; spines 3-fid, weak, 1–1.5 cm, adaxially slightly sulcate. Petiole 2–4 mm; leaf blade abaxially pale gray, adaxially deep green, narrowly obovate, 2–3.5 cm × 6–10 mm, papery, both surfaces not pruinose, abaxially with slightly raised midvein, adaxially with flat midvein, lateral veins 2 or 3 pairs, branched, both surfaces with inconspicuous reticulate veins, margin entire, apex obtuse or acute. Inflorescence a raceme, 3–8-flowered, 2–4 cm, often with few fascicled flowers at base. Pedicels 7–18 mm; bractlets lanceolate, ca. 2.8 mm. Sepals in 3 whorls; outer sepals lanceolate, ca. 4.5 × 1.1 mm; median sepals oblong-obovate, ca. 6 × 3.5 mm; inner sepals obovate, ca. 7 × 5.5 mm. Petals elliptic, ca. 5 × 3.5 mm, base clawed, with separate lanceolate glands, apex acute, emarginate. Stamens ca. 3.8 mm; anther connective not prolonged. Ovules 2. Berry red, oblong-ovoid, 9–10 × 4.5–6 mm, not pruinose, upper part sometimes bent; style persistent, short. Fl. Jun, fr. Aug–Oct.

• Montane thickets, forest margins; 3000–4100 m. Sichuan, Yunnan.

**187. *Berberis lecomtei*** C. K. Schneider in Sargent, Pl. Wilson. 1: 373. 1913.

光叶小檗 *guang ye xiao bo*

*Berberis franchetiana* C. K. Schneider var. *macrobotrys* Ahrendt; *B. humidobrosa* Ahrendt var. *inornata* Ahrendt; *B. thunbergii* Candolle var. *glabra* Franchet; *B. tsarongensis* Stapf var. *megacarpa* Ahrendt, p.p.

Shrubs, deciduous, 1–2 m tall. Branches brownish yellow, angulate, glabrous, sparsely black verruculose; shoots brownish red; spines simple or 3-fid, 2–15 mm, slender, sometimes absent. Petiole 2–5 mm; leaf blade abaxially grayish green, adaxially dark green, narrowly obovate, 1.2–3.5 × 0.5–1.4 cm, papery, abaxially not pruinose, midvein and lateral veins slightly raised, reticulate veins conspicuous, adaxially with conspicuous midvein and lateral veins, reticulate veins indistinct, margin flat, entire. Inflorescence a raceme, 4–16-flowered, 1.5–4 cm, with few fascicled flowers at base, glabrous. Pedicels 4–10 mm, glabrous; bractlets red, 1.5–2 × ca. 1 mm. Sepals in 2 whorls; outer sepals broadly ovate, 2.5–3 × ca. 2.5 mm, apex acute; inner sepals elliptic, 3–4 × 2.5–3.5 mm. Petals obovate, 4–5 × 2–3 mm, base clawed, with separate to subapproximate oblong glands, apex emarginate, lobes acute. Stamens ca. 2.5 mm; anther connective slightly prolonged, truncate or obtusely subconical. Ovules 2, sessile. Berry deep red, shiny, oblong or oblong-obovoid, 8–10 × 4.5–5 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Aug–Oct.

• Montane forests, forest margins, weedy slopes, thickets, roadsides, streamsides; 2500–4200 m. Sichuan, Xizang, Yunnan.

**188. *Berberis microtricha*** C. K. Schneider, Oesterr. Bot. Z. 67: 223. 1918.

小毛小檗 *xiao mao xiao bo*

Shrubs, deciduous, 1–1.5 m tall. Branches brownish gray, puberulous, not verruculose; shoots reddish, densely puberulous; spines absent, simple, or 3-fid, weak, concolorous, 4–8 mm. Leaves subsessile; leaf blade abaxially pale gray, adaxially dark green, narrowly obovate, 1–2 cm × 4–8 mm, papery, abaxially papillose, not pruinose, midvein slightly raised, lateral veins 2 or 3 pairs, branched, both surfaces with inconspicuous reticulate veins, base cuneate, margin slightly revolute, entire, apex rounded or acute. Inflorescence a raceme, 2–7-flowered, 1.5–2.5 cm, glabrous, with few fascicled flowers at base; bracts ca. 1.5 mm. Pedicels weak, 5–12 mm, glabrous. Sepals in 2 whorls; outer sepals oblong, ca. 3.5 × 2 mm; inner sepals elliptic, ca. 5 × 2.5 mm. Petals oblong-elliptic, ca. 5 × 2.8 mm, base with separate oblong-obovate glands, apex rounded, entire. Stamens ca. 3 mm; anther connective prolonged, truncate. Ovules 2. Berry red, ellipsoid, 6–7 × ca. 4 mm, not pruinose, style not persistent. Fl. May–Jun, fr. Jul–Sep.

• Thickets; 2500–3000 m. Sichuan, Yunnan.

**189. *Berberis dawoensis*** K. Meyer, Repert. Spec. Nov. Regni Veg. Beih. 12: 379. 1922.

道孚小檗 *dao fu xiao bo*

Shrubs, deciduous, 1–2 m tall. Branches brownish gray or

brownish black, sulcate, sparsely black verruculose; shoots pale yellow or purplish red; spines 3-fid, weak, 6–25 mm, adaxially slightly sulcate. Petiole 1–4 mm; leaf blade abaxially ultimately pale green, adaxially deep green, oblong-obovate, 1–3 × 0.7–1.3 cm, papery, both surfaces glabrous, abaxially initially pruinose, ultimately not pruinose, midvein slightly raised, adaxially with flat or slightly impressed midvein, both surfaces with conspicuous reticulate veins, base cuneate, margin 6–10-spinose-serrate on each side, occasionally entire, apex rounded, obtuse. Inflorescence a raceme, 5–10-flowered, 2–4 cm, sometimes with few fascicled flowers at base. Pedicels 7–12 mm, slender, but pedicels of fascicled flowers to 1.8 cm, glabrous. Sepals in 2 whorls; outer sepals obovate, 6–8 × ca. 4.5 mm; inner sepals obovate, 6.5–8.5 × 4–6 mm. Petals broadly elliptic, 5–7 × 3–5 mm, base cuneate, with approximate obovate glands, apex emarginate, lobes acute. Stamens 3–4 mm; anther connective prolonged, obtuse. Ovules 2. Berry red, oblong-ovoid, ca. 10 × 5 mm, slightly pruinose; style persistent, short; seeds 2. Fl. Apr–May, fr. Sep–Oct.

• Thickets, forests, forest margins; 3000–3900 m. Sichuan, Yunnan.

**190. *Berberis heteropoda*** Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 102. 1841.

异果小檗 *yi guo xiao bo*

Shrubs, deciduous, 2–3 m tall. Branches dark red, terete, not verruculose; spines simple or 3-fid, pale purplish red, subterete, 5–30 mm. Petiole 3–10 mm; leaf blade abaxially pale green, slightly shiny, adaxially green, obovate-elliptic, 2–6 × 1–4 cm, thickly papery, both surfaces glabrous, not pruinose, abaxially with slightly raised midvein, lateral veins 2–4 pairs, conspicuous, adaxially with flat or slightly raised midvein, lateral veins raised, both surfaces with raised reticulate veins, base broadly cuneate, margin entire or indistinctly spinose-serrate, apex rounded. Inflorescence a raceme or umbellate raceme, 4–9-flowered, 2–5 cm, with few fascicled flowers at base, glabrous; bracts ovate-lanceolate, 1.5–3 mm. Pedicels 9–17 mm. Sepals in 2 whorls; outer sepals elliptic, ca. 5 × 4 mm, apex rounded; inner sepals obovate, ca. 7 × 5 mm. Petals obovate-spatulate, ca. 6 × 4 mm, base cuneate, with separate glands, apex rounded, entire. Stamens ca. 4.5 mm; anther connective prolonged, apiculate. Ovules 4–6, funiculate. Berry black, subglobose, 10–12 × 9–10 mm, slightly pruinose, style not persistent. Fl. May–Jun, fr. Jul–Oct.

Forests, sparse forests, thickets, floodlands, stony slopes, arid steppe lands; 900–3200 m. Xinjiang [Russia].

**191. *Berberis kaschgarica*** Ruprecht, Sert. Tiansch. 38. 1869.

喀什小檗 *ka shi xiao bo*

Shrubs, deciduous, ca. 1 m tall. Branches purplish red, shiny, terete, glabrous; internodes ca. 1 cm; spines 3-fid, pale yellow, 1–2.5 cm, adaxially slightly sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially green, oblanceolate, 1–2.5 cm × 2–5 mm, papery, both surfaces not pruinose, abaxially with raised midvein, adaxially with slightly raised midvein, lateral veins 2 or 3 pairs, inconspicuous, both surfaces with inconspicuous reticulate veins, base cuneate, margin en-

tire, occasionally 1- or 2-spinose-serrate on each side, apex acute, aristate. Inflorescence a raceme, 5–9-flowered, 1.5–3 cm, often with 1 or more fascicled flowers at base, glabrous; bracts ovate-triangular, ca. 2 mm. Pedicels 4–10 mm, but pedicels of fascicled flowers to 1.3 cm; bractlets lanceolate, ca. 1.5 mm. Sepals in 2 whorls; outer sepals elliptic, ca. 3 × 1.5 mm; inner sepals obovate, ca. 4.5 × 3 mm. Petals oblong, ca. 4 × 2 mm, base cuneate, with separate glands, apex emarginate. Stamens ca. 2.5 mm; anther connective not prolonged, truncate. Ovules 5. Berry black, ovoid-globose, ca. 8 × 6 mm, not pruinose, style persistent. Fl. May–Jun, fr. Jun–Aug.

• Valley floors, steppe lands, slopes, forest margins, thickets; 1900–2800 m. Xinjiang.

The specific epithet was spelled "*kaschgarica*" in the protologue, although "*kasgarica*" has been commonly used.

**192. *Berberis dielsiana*** Fedde, Bot. Jahrb. Syst. 36(Beibl. 82): 41. 1905.

首阳小檗 *shou yang xiao bo*

Shrubs, deciduous, 1–3 m tall. Branches grayish brown, sulcate, sparsely verruculose; shoots purplish red; spines simple, terete, 3–15 mm, but spines on shoots to 2.5 cm. Petiole ca. 1 cm; leaf blade abaxially initially gray, ultimately green, adaxially dark green, elliptic or elliptic-lanceolate, 4–9 × 1–2 cm, thinly papery, both surfaces glabrous, abaxially initially slightly pruinose, midvein slightly raised, lateral veins visible, adaxially with flat midvein, lateral veins inconspicuous, both surfaces not reticulate, base attenuate, margin 8–20-spinose-serrate on each side, but on shoots margin entire, apex acuminate or acute. Inflorescence a raceme, 6–20-flowered, 5–6 cm including peduncle 0.4–1.5 cm, sometimes compound below, glabrous. Pedicels 3–5 mm, glabrous; bractlets red, lanceolate, 2–2.5 × ca. 0.7 mm. Sepals in 2 whorls; outer sepals oblong-ovate, 2–2.5 × 0.8–1 mm, apex acute; inner sepals obovate, 4–4.5 × ca. 3 mm. Petals elliptic, 5–5.5 × ca. 3 mm, base with separate glands, apex emarginate. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 2. Berry red, oblong, 8–9 × 4–5 mm, not pruinose, style not persistent. Fl. Apr–May, fr. Aug–Sep.

• Slopes, forests, thickets, streamsides; 600–2300 m. Gansu, Hebei, Henan, Hubei, Shaanxi, Shandong, Shanxi.

**193. *Berberis dictyoneura*** C. K. Schneider in Sargent, Pl. Wilson. 1: 374. 1913.

松潘小檗 *song pan xiao bo*

*Berberis brachystachys* T. S. Ying.

Shrubs, deciduous, 1–2 m tall. Branches dark gray, sulcate, sparsely verruculose; shoots pale purplish red; spines 3-fid or simple, concolorous, 1–2 cm, adaxially slightly sulcate. Petiole 2–8 mm; leaf blade abaxially yellow-green, adaxially dark grayish green, elliptic or elliptic-obovate, 1–3.5 × 0.4–1.5 cm, papery, both surfaces glabrous, not pruinose, abaxially with conspicuously raised midvein, adaxially with slightly impressed midvein, both surfaces with dense, obviously raised reticulate veins, base cuneate, margin closely 5–7-spinose-serrate on each side, apex rounded or obtuse. Inflorescence a raceme, 7–14-

flowered, 2–3 cm, sometimes with few fascicled flowers at base; bracts ovate, ca. 1 mm. Pedicels 4–6 mm, glabrous; bractlets ca.  $2.5 \times 1.3$  mm, apex acute. Sepals in 2 whorls; outer sepals oblong,  $4.4\text{--}4.8 \times 2.3\text{--}2.8$  mm; inner sepals obovate,  $5.5\text{--}6.5 \times 3.5\text{--}4$  mm. Petals obovate,  $5\text{--}5.8 \times 3\text{--}3.5$  mm, base clawed, with separate ovate glands, apex entire. Stamens ca. 3.5 mm; anther connective prolonged, apiculate. Ovules 1 or 2. Berry pink or pale red, obovoid-oblong,  $8\text{--}10 \times 5\text{--}6$  mm, not pruinose, style not persistent. Fl. Apr–Jun, fr. Jul–Sep.

• Thickets, forests, weedy slopes, roadsides; 1700–4200 m. Gansu, Qinghai, Shanxi, Sichuan, Xizang.

**194. *Berberis nutanticarpa*** C. Y. Wu ex S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 15. 1985.

垂果小檗 *chui guo xiao bo*

Shrubs, deciduous, ca. 1 m tall. Branches brownish gray, sulcate, sparsely verruculose, glabrous; spines 3-fid or simple, pale yellow, 1–2.5 cm. Petiole 2–3 mm; leaf blade abaxially pale green, sometimes grayish white, adaxially deep green, obovate or elliptic-obovate,  $2.5\text{--}5 \times 1\text{--}2$  cm, papery or thickly so, abaxially with obviously raised midvein and lateral veins, adaxially with flat or slightly raised midvein, lateral veins 5–7 pairs, base cuneate, margin remotely 10–14-spinose-serrate on each side, occasionally entire, apex rounded or acute. Flowers unknown. Inflorescence a raceme with 5–8 berries, 4.5–6 cm including peduncle 1.5–2 cm, nutant; bracts lanceolate, 4–5 mm; fruit stalk 1.5–3.5 cm, glabrous; berry red, ellipsoid,  $9\text{--}12 \times 4\text{--}5$  mm, slightly pruinose, style not persistent; seeds 2. Fl. unknown, fr. Oct.

• Weedy slopes, alpine meadows; 3000–3700 m. Sichuan, Xizang, Yunnan.

**195. *Berberis bracteata*** (Ahrendt) Ahrendt, J. Linn. Soc., Bot. 57: 163. 1961.

长苞小檗 *chang bao xiao bo*

*Berberis dictyoneura* C. K. Schneider var. *bracteata* Ahrendt, J. Bot. 80(Suppl.): 111. 1942.

Shrubs, deciduous, less than 1 m tall. Branches dark gray, obviously sulcate, not verruculose; shoots pale yellow, sometimes dark purplish red; spines weak, 3-fid, concolorous, 1–1.5 cm. Petiole 1–3 mm; leaf blade adaxially shiny, green, obovate or elliptic-obovate,  $1.7\text{--}4 \times 0.7\text{--}1.7$  cm, papery, both surfaces glabrous, not pruinose, adaxially with slightly raised midvein and lateral veins, both surfaces with conspicuously raised reticulate veins, base cuneate, margin coarsely 10–12-aristate-dentate on each side, apex rounded, obtuse. Inflorescence a raceme, 5–8-flowered, compound below, 2–3 cm, glabrous; bracts lanceolate, 4–5 mm, apex acuminate. Pedicels 5–6(–9) mm, glabrous. Flowers ca. 7 mm in diam. Sepals in 2 whorls; outer sepals oblong,  $4\text{--}4.5 \times 2\text{--}2.5$  mm; inner sepals obovate,  $5.5\text{--}6.5 \times 3.5\text{--}4$  mm. Petals obovate,  $5\text{--}5.5 \times 3\text{--}3.5$  mm, base clawed, with separate glands, apex entire. Stamens ca. 3 mm; anther connective prolonged, subapiculate. Ovules 1 or 2. Fruit unknown. Fl. Jul–Aug, fr. unknown.

• Sunny rocky slopes, weedy places within *Abies* forests; 3200–3300 m. Yunnan.

**196. *Berberis batangensis*** T. S. Ying, Acta Phytotax. Sin. 37: 344. 1999.

巴塘小檗 *ba tang xiao bo*

Shrubs, deciduous, 0.5–1.5 m tall. Branches dark gray, terete; shoots dark purplish, sulcate, glabrous; spines 3-fid, concolorous, 1–1.5 cm. Leaves subsessile; leaf blade abaxially gray, adaxially pale green, obovate or narrowly obovate,  $0.4\text{--}2 \text{ cm} \times 2\text{--}7$  mm, papery, abaxially glabrous, not pruinose, midvein obviously raised, adaxially with slightly raised midvein, both surfaces with conspicuously raised reticulate veins, base cuneate, margin thickened, entire, apex rounded or retuse. Inflorescence a raceme, 5–10-flowered, 1–1.5 cm, often with few fascicled flowers at base. Pedicels ca. 3 mm, glabrous, sometimes slightly pruinose; bractlets ovate, ca. 1 mm, apex acuminate. Sepals in 3 whorls; outer sepals ovate,  $1.2\text{--}1.5 \times \text{ca. } 1$  mm; median sepals ovate-orbicular,  $\text{ca. } 3 \times 2$  mm; inner sepals elliptic,  $4\text{--}4.2 \times 3\text{--}3.2$  mm. Petals obovate,  $2.8\text{--}3.1 \times 1.8\text{--}2$  mm, base clawed, with approximate glands, apex emarginate, lobes acute. Stamens ca. 1.2 mm; anther connective not prolonged, truncate. Ovules 4. Fruit unknown. Fl. Jun–Jul, fr. unknown.

• Thickets, field margins; 2600–3000 m. Sichuan.

**197. *Berberis ignorata*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 661. 1905.

烦果小檗 *fan guo xiao bo*

*Berberis virescens* J. D. Hooker var. *ignorata* (C. K. Schneider) Ahrendt.

Shrubs, deciduous, 1–3 m tall. Branches gray, terete, sparsely verruculose; shoots shiny, purplish black; spines simple, sometimes 3-fid, 5–15 mm. Petiole 2–3 mm, or leaf subsessile; leaf blade abaxially gray, adaxially dark green, narrowly obovate,  $1\text{--}3.5 \times 0.4\text{--}1.5$  cm, papery, abaxially slightly pruinose, midvein slightly raised, adaxially with flat or slightly raised midvein, lateral veins 4 or 5 pairs, reticulate veins inconspicuous, base cuneate, margin entire, sometimes 1–5-spinose-serrate on each side, apex rounded or acute. Inflorescence a raceme or subumbellate raceme, 3–9-flowered, 2–3.5 cm, often with few fascicled flowers at base; bracts ca. 1.5 mm. Pedicels 5–10 mm, slender, glabrous; bractlets broadly lanceolate,  $\text{ca. } 3 \times 1$  mm. Sepals in 3 whorls; outer sepals oblong-ovate,  $4\text{--}4.5 \times 2\text{--}2.5$  mm; median sepals elliptic,  $\text{ca. } 5 \times 2.5$  mm, apex obtuse; inner sepals elliptic-obovate,  $5.2\text{--}6 \times 3.7\text{--}4$  mm. Petals obovate,  $4.5\text{--}5 \times \text{ca. } 3$  mm, base with separate glands, apex emarginate, lobes rounded. Stamens ca. 4 mm; anther connective prolonged, obtuse. Ovules 3 or 4,  $\pm$  not funiculate. Berry red, oblong,  $10\text{--}13 \times 5\text{--}7$  mm, not pruinose, style not persistent. Fl. May, fr. Aug–Sep.

Forests, thickets, mixed forests; 2700–3800 m. Xizang [Bhutan, India (Sikkim)].

**198. *Berberis jiulongensis*** T. S. Ying in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl. II), 54. 2007.

九龙小檗 *jiu long xiao bo*

Shrubs, evergreen, 1–2 m tall. Branches dark gray, angulate; shoots purplish red, sparsely black verruculose. Spines

simple, purplish red, 5–10 mm. Leaves shortly petiolate; leaf blade abaxially pale green, adaxially green, obovate-lanceolate or narrowly obovate, 1.5–3.5 cm × 5–8 mm, thinly leathery, abaxially not pruinose, midvein obviously raised, lateral veins conspicuous, adaxially with inconspicuous midvein and lateral veins, both surfaces with markedly raised reticulate veins, base attenuate, margin entire, apex rounded, obtuse, aristate. Inflorescence a corymbose panicle, 20–30-flowered, 4–10 cm, often with 1–3 racemes fascicled at base, sometimes flowers verticillate at apex of inflorescence; bracts leaflike, ca. 1 cm. Pedicels ca. 2 mm. Sepals in 3 whorls; outer sepals triangular-ovate or ovate, 2–2.5 × 1.6–2 mm; median sepals broadly elliptic or suborbicular, ca. 3.2 × 2.8–3 mm; inner sepals broadly obovate, 4.5–5 × 4.1–4.5 mm. Petals obovate or obovate-elliptic, 4–4.5 × 3–3.5 mm, base clawed, with separate glands, apex emarginate. Stamens 3.5–4 mm; anther connective prolonged, obtuse or truncate. Ovules 3 or 4, shortly funiculate. Fruit unknown. Fl. Jun, fr. unknown.

- Thickets, slopes, floodlands, valleys; 2300–2500 m. Sichuan.

**199. *Berberis contracta*** T. S. Ying, Acta Phytotax. Sin. 37: 322. 1999.

德钦小檗 *de qin xiao bo*

Shrubs, deciduous, to 2 m tall. Branches gray, terete, sparsely black verruculose; spines simple or 3-fid, pale yellow, 1–2 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially green, narrowly elliptic, 1–3.5 cm × 5–10 mm, papery, abaxially not pruinose, glabrous, midvein and lateral veins raised, adaxially with flat midvein, lateral veins 3–5 pairs, both surfaces with obviously raised reticulate veins, base cuneate, margin 1–4-spinose-serrate on each side, occasionally entire, apex acute or obtuse. Inflorescence a corymbose panicle, 15–20-flowered, 1.5–5 cm including peduncle 3–12 mm, sometimes with 1 or 2 racemes fascicled at base; bracts triangular-ovate, ca. 1 mm, apex acuminate. Pedicels 2–5 mm, slender; bractlets lanceolate, ca. 1.3 mm. Sepals in 2 whorls; outer sepals ovate-lanceolate, ca. 2 × 1 mm; inner sepals oblong, 3 × 2 mm, translucent. Petals obovate-elliptic, ca. 2.5 × 1.3 mm, translucent, base clawed, with separate inconspicuous glands, apex entire or emarginate. Stamens ca. 2 mm; anther connective slightly prolonged, rounded, obtuse. Ovules 2, shortly funiculate. Berry oblong, 7–8 × 2.5–3 mm, slightly pruinose, style persistent; seeds 1. Fl. Jul, fr. Jul–Sep.

- Thickets; 2500–3000 m. Yunnan.

**200. *Berberis aggregata*** C. K. Schneider, Bull. Herb. Boissier, sér. 2, 8: 203. 1908.

堆花小檗 *dui hua xiao bo*

*Berberis aggregata* var. *integrifolia* Ahrendt; *B. brevipaniculata* C. K. Schneider.

Shrubs, semi-evergreen or deciduous, 2–3 m tall. Branches dark brown, sulcate, glabrous; shoots pale brown, slightly puberulous, sparsely black verruculose; spines 3-fid, pale yellow, 8–15 mm. Leaves subsessile or shortly petiolate; leaf blade abaxially pale yellow-green or grayish white, adaxially dark

yellow-green, obovate-oblong or obovate, 8–25 × 4–15 mm, subleathery, abaxially with raised midvein, adaxially with slightly impressed midvein, both surfaces with conspicuous reticulate veins, base cuneate, margin 2–8-spinose-serrate on each side, sometimes entire, apex rounded, obtuse, aristate. Inflorescence a congested panicle, 10–30-flowered, 1–2.5 cm, subsessile; bracts slightly longer than pedicels, 1.5–3 mm. Pedicels 1–3 mm; bractlets ovate, ca. 1 mm, apex acute. Sepals in 2 whorls, elliptic; outer sepals ca. 2.5 × 1.8 mm; inner sepals ca. 3.5 × 2.5 mm. Petals obovate, ca. 3.5 × 2 mm, base clawed, with oblong glands, apex emarginate. Stamens 2–2.5 mm; anther connective prolonged, obtuse. Ovules 2, subsessile. Berry red, subglobose or ovoid-globose, 6–7 mm, not pruinose, style persistent. Fl. May–Jun, fr. Jul–Sep.

- Thickets, forests, roadsides, floodlands; 1000–3500 m. Gansu, Hubei, Qinghai, Shanxi, Sichuan.

**201. *Berberis luhuoensis*** T. S. Ying, Acta Phytotax. Sin. 37: 323. 1999.

炉霍小檗 *lu huo xiao bo*

Shrubs, deciduous, ca. 1.2 m tall. Branches dark gray, angulate, sparsely black verruculose; spines simple or 3-fid, yellow-brown, ca. 1 cm, sometimes absent. Petiole 2–6 mm; leaf blade abaxially yellow-green, adaxially deep green, obovate or obovate-elliptic, (1.5–)2–4 × 0.8–2 cm, papery, abaxially not pruinose, midvein and lateral veins obviously raised, adaxially with slightly impressed midvein, lateral veins slightly raised, both surfaces with conspicuous reticulate veins, base attenuate, margin 2–16-spinose-serrate on each side, sometimes entire, apex rounded or obtuse. Inflorescence a panicle, 30–60-flowered, to 13 cm including peduncle ca. 4.5 cm, sometimes with few fascicled flowers at base; rachis and peduncle puberulous. Pedicels 2–3 mm, glabrous; bractlets lanceolate, 2.5–3.2 mm. Sepals in 3 whorls; outer sepals narrowly elliptic, 2.8–3.1 × 1.2–1.5 mm; median sepals elliptic, ca. 4 × 2.3 mm; inner sepals suborbicular, ca. 4 × 3.1 mm. Petals elliptic, base clawed, with separate elliptic glands, apex emarginate, lobes acute. Stamens ca. 2.2 mm; anther connective not prolonged, truncate. Ovules 2, shortly funiculate. Berry oblong, 7–8 × 2–2.1 mm, slightly pruinose, style not persistent. Fl. Jul, fr. Aug.

- Slopes of plateaus, valleys; 2100–3100 m. Sichuan.

**202. *Berberis sherriffii*** Ahrendt, J. Bot. 79(Suppl.): 77. 1941.

短苞小檗 *duan bao xiao bo*

Shrubs, deciduous, ca. 2 m tall. Branches gray, terete, sparsely black verruculose; shoots dark pale red; spines simple, weak, concolorous, 1–1.5 cm. Petiole 1–5 mm; leaf blade abaxially yellow-green, adaxially dark green, obovate, 1–3.5 × 0.7–1.5 cm, papery, abaxially not pruinose, midvein obviously raised, adaxially with flat midvein, lateral veins 3 or 4 pairs, both surfaces with conspicuous reticulate veins, base cuneate, margin entire, occasionally 2- or 3-spinose-serrate on each side, apex obtuse. Inflorescence a panicle, 15–20-flowered, 3–5 cm; rachis flexuose, glabrous; bracts 1–1.5 mm. Pedicels 2–4 mm, glabrous; bractlets oblong, ca. 2 mm, apex acute. Sepals in 3 whorls; outer sepals oblong, ca. 3.5 × 2.5 mm, apex acute;

median sepals oblong-elliptic, ca.  $4.3 \times 3.5$  mm; inner sepals obovate, ca.  $6 \times 5$  mm. Petals obovate, ca.  $5 \times 3.8$  mm, base clawed, with remote glands, apex slightly emarginate, lobes acute. Stamens ca. 3 mm; anther connective slightly prolonged, shortly apiculate. Ovules 1 or 2 (or 3). Berry purplish red, oblong or ovoid-oblong,  $6-9 \times 3-4$  mm, slightly blue pruinose, style not persistent. Fl. Jun–Jul, fr. Aug–Oct.

- Forest margins; 2000–3300 m. Xizang.

**203. *Berberis prattii*** C. K. Schneider in Sargent, Pl. Wilson. 1: 376. 1913.

短锥花小檗 duan zhui hua xiao bo

*Berberis aggregata* C. K. Schneider var. *prattii* (C. K. Schneider) C. K. Schneider; *B. oblanceolata* (C. K. Schneider) Ahrendt; *B. polyantha* Hemsley var. *oblanceolata* C. K. Schneider; *B. prattii* var. *laxipendula* Ahrendt; *B. prattii* var. *recurvata* C. K. Schneider.

Shrubs, deciduous, 2–3 m tall. Branches pale yellow, angulate, sparsely verruculose, sometimes puberulous; shoots purplish red, puberulous; spines simple or 3-fid, weak, brownish yellow, terete, 5–15 mm. Petiole 1–3 mm; leaf blade abaxially grayish green, adaxially yellow-green, sometimes shiny, obovate-elliptic or obovate,  $1-3(-4) \times 0.5-1.5$  cm, papery, abaxially initially pruinose, often ultimately not pruinose, closely papillose, midvein slightly raised, adaxially with slightly raised or flat midvein, both surfaces with obviously raised reticulate veins, base cuneate or attenuate, margin entire, apex rounded or obtuse. Inflorescence a panicle, 15–80-flowered, 5–15 cm, narrow, glabrous or puberulous; bracts 1–2.5 mm. Pedicels 2.5–4 mm, glabrous; bractlets absent. Sepals in 3 whorls; outer sepals lanceolate,  $4-5 \times 1.2-2$  mm, apex acuminate; median sepals ovate-lanceolate,  $4-5 \times 1.5-2$  mm, apex subacuminate; inner sepals obovate, ca.  $5.5 \times 4$  mm. Petals narrowly obovate, ca.  $4.5 \times 2.3$  mm, base clawed, with separate oblong glands, apex emarginate, lobes acute. Stamens ca. 2.5 mm; anther connective prolonged, obtuse. Ovules 2, sessile. Berry shiny, pink, ovoid, ca.  $6.5 \times 4.5$  mm, not pruinose, style not persistent. Fl. Jun–Jul, fr. Sep–Oct.

- Thickets; 2100–3400 m. Sichuan, Xizang.

**204. *Berberis beaniana*** C. K. Schneider in Sargent, Pl. Wilson. 3: 439. 1917.

康松小檗 kang song xiao bo

Shrubs, deciduous, 1.5–2.5 m tall. Branches grayish yellow, sulcate, sparsely verruculose, glabrous; shoots green; spines 3-fid, pale yellow, 1–2.5 cm. Petiole 1–3 mm; leaf blade abaxially gray, adaxially shiny, deep green, narrowly elliptic to ovate-elliptic,  $2-5 \times 0.6-1.3$  cm, papery, abaxially pruinose, finely papillose, midvein obviously raised, adaxially with impressed midvein, reticulate veins conspicuous, base cuneate, margin slightly revolute, 5–10-spinose-serrate on each side, apex acute to acuminate. Inflorescence a panicle, loosely 10–20 flowered, 2–4 cm, broad, glabrous; bracts ca. 1.5 mm. Pedicels 6–15 mm. Sepals in 3 whorls; outer sepals yellow, without discoloration, oblong-ovate,  $2-3 \times 1-1.3$  mm; median sepals

oblong-ovate,  $4-5 \times 2.3-3.3$  mm, apex subobtusate; inner sepals obovate,  $6-6.5 \times 3.5-4.5$  mm. Petals obovate, ca.  $5 \times 3-3.5$  mm, base cuneate with separate oblong glands, apex subentire or slightly emarginate. Stamens 3–3.5 mm; anther connective slightly prolonged, rounded. Ovules 3 or 4, sessile. Berry dark red, ovoid-oblong,  $9-10 \times 5-6$  mm, densely mauve pruinose, style not persistent. Fl. Jun, fr. Oct–Nov.

- W Sichuan.

This species is known only from the type gathering (at A and OXF), a cultivated plant grown at the Royal Botanic Gardens, Kew, from seed (*E. H. Wilson Veitch Exped. no. 1930*) collected in 1904 from an unspecified location in W Sichuan.

**205. *Berberis francisci-ferdinandi*** C. K. Schneider in Sargent, Pl. Wilson. 1: 367. 1913.

大黄檗 da huang bo

Shrubs, deciduous, 1–3 m tall. Branches grayish brown or reddish brown, subterete; shoots reddish brown, scarcely verruculose; spines simple, rarely 3-fid, 0.5–2 cm, adaxially sulcate, sometimes absent. Petiole 5–15 mm; leaf blade abaxially pale yellow-green, adaxially green, shiny, ovate to elliptic,  $2-7 \times 1-3$  cm, papery, both surfaces glabrous, abaxially not pruinose, midvein obviously raised, adaxially with slightly impressed midvein, both surfaces with slightly visible reticulate veins, base contracted to decurrent petiole, margin 15–30-spinulose-serrulate on each side, apex acute or subacute. Inflorescence a panicle, 20–40-flowered, 5–14 cm including peduncle 1–3 cm, glabrous; bracts linear-subulate, 3–3.5 mm. Pedicels 4–10 mm, slender; bractlets reddish, 1.5–2 mm, apex acute. Sepals in 3 whorls; outer sepals ovate, ca.  $2.4 \times 1.5$  mm, apex acute; median sepals ovate, ca.  $3 \times 2$  mm; inner sepals obovate,  $3.3-4.3 \times 2-2.5$  mm. Petals oblong,  $3.5-4.5 \times 2.5-3$  mm, base cuneate, with separate oblong glands, apex acute, slightly incised. Stamens 2.5–3.5 mm; anther connective slightly prolonged, rounded. Ovules 2, sessile. Berry scarlet, obovoid-ellipsoid,  $10-12 \times 4-6$  mm, not pruinose, style  $\pm$  persistent. Fl. May–Jun, fr. Jul–Oct.

- Thickets, forests, weedy slopes; 1400–4000 m. Gansu, Shanxi, Sichuan, Xizang.

**206. *Berberis trichiata*** T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 125. 1985.

毛序小檗 mao xu xiao bo

Shrubs, deciduous, 1–2 m tall. Branches pale brown, sparsely black verruculose, sulcate, puberulous, often ultimately glabrous; spines 3-fid, occasionally simple, pale yellow, 1–2 cm, stout. Leaves subsessile; leaf blade abaxially pale green, adaxially green, obovate or obovate-oblong,  $1.2-3.5 \times 0.7-1.5$  cm, herbaceous, abaxially puberulous on veins initially, ultimately glabrous, midvein obviously raised, lateral veins slightly raised, adaxially with flat midvein, lateral veins 4–6 pairs, both surfaces with conspicuous reticulate veins, base cuneate, margin 2–12-spinose-serrate on each side, but sometimes entire on leaves of upper branches, apex rounded. Inflorescence a panicle, 15–40-flowered, 3–5.5 cm, puberulous; peduncles 1–1.7

cm, sometimes compound at base; bracts triangular-lanceolate, 1–2 mm. Pedicels 2–6 mm, slender, puberulous; bractlets narrowly ovate, ca.  $3 \times 1.5$  mm. Sepals in 2 whorls; outer sepals ovate, ca.  $3.6 \times 3$  mm; inner sepals suborbicular or obovate, ca.  $5 \times 3$  mm. Petals ovate-elliptic, ca.  $4 \times 2.2$  mm, base clawed, with separate glands, apex emarginate. Stamens ca. 2.1 mm; anther connective prolonged, subapiculate. Ovules 2, subsessile. Berry unknown. Fl. Jun, fr. unknown.

- Forest margins; ca. 3500 m. Xizang.

**207. *Berberis gyalai*** Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941.

波密小檗 *bo mi xiao bo*

*Berberis gyalai* var. *maximiflora* Ahrendt; *B. gyalai* var. *minuata* Ahrendt; *B. taylorii* Ahrendt.

Shrubs, deciduous, 1.2–3 m tall. Branches deep gray or purplish brown, puberulous, ultimately glabrous; spines simple, occasionally 3-fid, pale yellow, 6–12 mm. Leaves subsessile or very shortly petiolate; leaf blade abaxially grayish green, adaxially dark green, obovate-elliptic,  $1.2\text{--}3.2 \times 0.7\text{--}1.7$  cm, papery, abaxially with obviously raised midvein and lateral veins, adaxially with raised midvein, lateral veins much branched, both surfaces with conspicuous reticulate veins, base cuneate, margin entire, occasionally 2–4-spinose-serrate on each side, apex acute or rounded. Inflorescence a panicle, 10–45-flowered, 4–11 cm including peduncle 1–3 cm, rachises and peduncles puberulous; bracts 1.5–4 mm, usually longer than pedicels. Pedicels 1.5–3 mm, glabrous; bractlets ovate,  $3\text{--}3.2 \times \text{ca. } 2$  mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate, ca.  $3.5 \times 3$  mm, apex acute; inner sepals obovate, ca.  $5.5 \times 4$  mm. Petals obovate, ca.  $4.6 \times 3.5$  mm, base clawed, with separate glands, apex incised, rounded, lobes obtuse. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules (1–)3 or 4(or 5). Berry purplish black, oblong-ovoid,  $9\text{--}10 \times 4\text{--}5$  mm, slightly pruinose, style not persistent. Fl. Jun–Jul, fr. Oct.

- Thickets, forest understories, roadsides; 2000–3200 m. Xizang.

**208. *Berberis kerriana*** Ahrendt, J. Linn. Soc., Bot. 57: 91. 1961.

南方小檗 *nan fang xiao bo*

Shrubs, evergreen, ca. 2 m tall. Stems pale yellow, terete, glabrous; branches deep red, becoming red-brown, and soon yellow-brown; shoots reddish; internodes 1–2 cm; spines discolorous, pale yellow, 2–3.5 cm, slender. Leaves adaxially slightly shiny, oblanceolate,  $2.5\text{--}4.5 \times 0.7\text{--}1.3$  cm, slightly stiffly leathery, abaxially white pruinose, with veins more distinct, adaxially veins branched, scarcely subreticulate, base attenuate, margin entire, sometimes toward apex 3–5-spinose-serrate on each side, apex acute. Inflorescence a panicle, 6–12-flowered, 3–5 cm; bracts ca. 1 mm. Pedicels 7–14 mm. Ovules 2 or 3. Berry black, oblong,  $9\text{--}10 \times 5\text{--}6$  mm, excluding a very short but distinct style, gray pruinose. Fl. May, fr. Oct.

- China (without precise locality).

This species is known only from the type (at BM), a cultivated plant that once grew at the Royal Horticultural Society's garden in Wisley, Surrey, United Kingdom, reputedly from *Kerr* 39, collected in some unspecified part of China in 1935.

**209. *Berberis polyantha*** Hemsley, J. Linn. Soc., Bot. 29: 302. 1892.

刺黄花 *ci huang hua*

Shrubs, semi-evergreen, 1.5–2(–4.5) m tall. Branches grayish brown, sulcate, sparsely verruculose; spines simple, occasionally 3-fid, 1–3 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially shiny, dark green, oblong-obovate or obovate,  $0.8\text{--}4.5 \times 0.5\text{--}1.7$  cm, leathery, abaxially not pruinose, midvein raised, adaxially with flat or impressed midvein, both surfaces with obviously raised close reticulate veins, base cuneate, margin 3–10-spinose-serrate on each side, sometimes entire, apex rounded. Inflorescence a panicle, broad and much branched, 30–100-flowered, 5–15 cm including peduncle 0.3–2 cm, glabrous; bracts 1.5–2.5 mm. Pedicels 2–4 mm, glabrous; bractlets triangular, 1–1.5 mm. Sepals in 2 whorls; outer sepals ovate, ca.  $3.5 \times 2$  mm, apex acute; inner sepals obovate,  $4.5\text{--}6.5 \times 2.5\text{--}3$  mm. Petals obovate,  $3.5\text{--}4 \times \text{ca. } 2$  mm, base clawed, with separate oblong glands, apex incised, lobes acute. Stamens ca. 3 mm; anther connective prolonged, obtuse. Ovules 2, subsessile. Berry dark red or dark reddish brown, narrowly ovoid,  $7\text{--}8 \times 3\text{--}4$  mm, pruinose, style conspicuous, to 1.5 mm; seeds purple. Fl. May–Jul, fr. Aug–Oct.

- Sunny slopes, thickets, forests, forest margins, roadsides, grassy slopes; 2000–3600 m. Sichuan, Xizang.

**210. *Berberis sikkimensis*** (C. K. Schneider) Ahrendt, J. Bot. 80(Suppl.): 85. 1942.

锡金小檗 *xi jin xiao bo*

*Berberis chitria* Buchanan-Hamilton ex Ker Gawler var. *sikkimensis* C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 453. 1905; *B. sikkimensis* var. *baileyi* Ahrendt; *B. sikkimensis* var. *glabramea* Ahrendt.

Shrubs, semi-evergreen, 1.5–2.5 m tall. Branches dark gray, glabrous or scarcely verruculose; shoots pale yellow, glabrous, sulcate; spines 3-fid, pale yellow, 0.5–2 cm, adaxially slightly sulcate. Leaves shortly petiolate; leaf blade abaxially yellow-green, adaxially deep green, obovate or obovate-elliptic,  $1.5\text{--}2.7 \text{ cm} \times 5\text{--}10 \text{ mm}$ , leathery, abaxially pruinose, becoming glabrous, scarcely papillose, midvein slightly raised, lateral veins 2–4 pairs, adaxially slightly shiny, midvein flat, both surfaces with conspicuous reticulate veins, base cuneate, margin entire, sometimes 1–5-spinose-serrate on each side, apex acute or rounded, mucronate. Inflorescence a panicle or raceme, 3–20-flowered, 3–5 cm including peduncle 0.5–2 cm. Pedicels 4–8 mm, glabrous; bractlets yellow, sepeloid, ca.  $2 \times 1.6$  mm, apex acute. Sepals in 2 whorls; outer sepals ovate,  $3.5\text{--}4 \times 2.5\text{--}3$  mm, apex acute; inner sepals broadly elliptic,  $7\text{--}8 \times \text{ca. } 5$  mm. Petals obovate, ca.  $6 \times 4$  mm, base clawed, with separate glands, apex entire or slightly crenulate. Stamens ca. 6 mm; anther connective prolonged, subapiculate. Ovules 4. Berry

dark red, narrowly ovoid, ca.  $15 \times 4.5$  mm, not pruinose, often slightly curved, style ca. 1.5 mm. Fl. May–Jun, fr. Jul–Aug.

Mixed forests, forest margins, thickets; 2000–3000 m. Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

**211. *Berberis coryi*** Veitch, Gard. Chron., ser. 3, 52: 321. 1912.

贡山小檗 gong shan xiao bo

Shrubs, semi-evergreen. Leaves spatulate,  $10\text{--}25 \times 8\text{--}12$  mm, abaxially glaucous, base cuneate, margin entire, apex retuse. Inflorescence a panicle, 7–20-flowered, 3–5 cm, sometimes reduced to a short raceme or subfascicle; bracts shorter than pedicels. Pedicels 4–5 mm. Berry pinkish red, oblong-globose,  $5\text{--}6 \times 4.5\text{--}6$  mm, style ca. 0.5 mm. Fl. Jul, fr. Dec.

• Rocks, cliffs, dry rocky slopes on mountains; 3000–3300 m. Yunnan.

**212. *Berberis metapolyantha*** Ahrendt, J. Bot. 79(Suppl.): 75. 1941.

万源小檗 wan yuan xiao bo

Shrubs, semi-evergreen, 1–2 m tall. Branches puberulous, sulcate; spines 3-fid or simple, 1–1.5 cm. Leaves subsessile; leaf blade abaxially pallid, becoming grayish brown when dry, adaxially dark green, obovate or obovate-oblong,  $1.5\text{--}2.7 \times 0.7\text{--}1.2$  cm, subleathery, both surfaces with conspicuous reticulate veins, base cuneate, margin entire, rarely 1–3-spinose-serrate on each side, apex rounded. Inflorescence a panicle, 10–14-flowered, 3–5 cm, sometimes compound below, apex rounded; bracts 2–3 mm, apex acuminate. Pedicels 3–5 mm, puberulous; flowers ca. 6 mm in diam.; bractlets lanceolate, ca. 1.5 mm, apex acuminate. Sepals in 2 whorls; outer sepals ovate, ca.  $2.5 \times 1.5$  mm, apex acute; inner sepals elliptic, ca.  $4 \times 2$  mm. Petals obovate, ca.  $3.5 \times 2.8$  mm, base with separate glands, apex emarginate, rounded. Stamens ca. 2.5 mm; anther connective slightly prolonged, shortly apiculate. Ovules 3 or 4. Berry red, oblong-globose, ca.  $6.5 \times 6$  mm, not pruinose, style persistent. Fl. Jun, fr. Oct.

• Mountain slopes, roadsides; 1500–2700 m. Sichuan, Yunnan.

**213. *Berberis xanthophlaea*** Ahrendt, J. Bot. 79(Suppl.): 73. 1941.

黄皮小檗 huang pi xiao bo

Shrubs, deciduous, 1–2(–3) m tall. Branches dark gray, terete, not verruculose; shoots pale yellow, slightly shiny; spines simple, sometimes 3-fid, concolorous, terete, 0.5–1.5 cm. Leaves subsessile; leaf blade abaxially initially gray, ultimately shiny, pale green, adaxially green, obovate or oblanceolate,  $1.5\text{--}6.5 \times 0.8\text{--}2$  cm, papery, abaxially slightly pruinose, ultimately not pruinose, both surfaces with midvein and lateral veins conspicuous, reticulate veins inconspicuous, base cuneate, margin entire, apex obtuse or rounded. Inflorescence a panicle, 10–45-flowered, 6–9(–12) cm including peduncle  $1.5\text{--}4(–7)$  cm, glabrous, sometimes rachis with leaflike bracts. Pedicels 5–12 mm; bractlets ovate,  $1.3\text{--}3 \times 1\text{--}2$  mm, apex acute. Sepals in 2 whorls; outer sepals elliptic,  $3\text{--}5 \times 2\text{--}4$  mm; inner sepals ellip-

tic-obovate,  $5\text{--}5.6 \times 3\text{--}3.5$  mm. Petals obovate,  $3.5\text{--}5 \times 2.5\text{--}4$  mm, base obviously clawed, with slightly separate glands, apex emarginate. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovules 2, shortly funiculate. Berry red, oblong-obovoid,  $7\text{--}9 \times 5\text{--}6$  mm, blue pruinose, style persistent. Fl. Jun–Jul, fr. Aug–Oct.

• Thickets, forests, streamsides, valleys; 2800–4000 m. Xizang.

**214. *Berberis concolor*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 199. 1919.

同色小檗 tong se xiao bo

Shrubs, deciduous, 1.5–2 m tall. Branches pale yellow or dark gray, subterete, sometimes very sparsely verruculose; shoots brownish yellow or dark red, slightly sulcate; spines 3-fid, concolorous, 1.5–2.5 cm. Leaves subsessile; leaf blade abaxially pale green, adaxially green, narrowly obovate or obovate,  $1\text{--}2.7 \text{ cm} \times 3\text{--}9$  mm, thickly papery, abaxially not pruinose, midvein obviously raised, adaxially with flat midvein, lateral veins 3–5 pairs, both surfaces with distinctly raised, much-branched lateral veins, reticulate veins conspicuous, base cuneate, margin entire, occasionally 1–3-spinose-serrate on each side, apex obtuse. Inflorescence a panicle, 10–20-flowered, 3–7 cm; bracts lanceolate, 1–2.5 mm. Pedicels 6–7 mm, glabrous. Sepals in 2 whorls; outer sepals broadly ovate,  $2.5\text{--}3 \times 2\text{--}2.5$  mm; inner sepals obovate,  $4\text{--}4.5 \times 3\text{--}3.5$  mm. Petals obovate, ca.  $3.5 \times 2.5$  mm, base shortly clawed, with separate glands, apex slightly incised. Stamens ca. 3 mm; anther connective slightly prolonged, truncate. Ovules 1 or 2. Berry dark red to red-purple, ellipsoid,  $7\text{--}8 \times 5\text{--}6$  mm, slightly blue pruinose, with short style. Fl. May–Jun, fr. Jul–Aug.

• Thickets; 2300–3600 m. Yunnan.

**215. *Berberis beijingsensis*** T. S. Ying, Acta Phytotax. Sin. 37: 324. 1999.

北京小檗 bei jing xiao bo

Shrubs, deciduous, ca. 1 m tall. Branches stramineous or pale brownish stramineous, sulcate, glabrous, sparsely black verruculose; spines simple, occasionally 3-fid, concolorous, 5–8 mm, adaxially slightly sulcate. Leaves subsessile; leaf blade abaxially pale green, adaxially green, narrowly oblanceolate,  $1\text{--}4 \text{ cm} \times 3\text{--}6$  mm, thinly papery, abaxially glabrous, not pruinose, midvein distinctly raised, adaxially with slightly raised midvein, both surfaces with conspicuously raised lateral and reticulate veins, base attenuate, margin entire, apex acute. Inflorescence a panicle, 15–30-flowered, 3–7 cm including peduncle 1–1.5 cm, glabrous; bracts lanceolate, 2–3.5 mm. Pedicels 2–5 mm, glabrous; bractlets lanceolate, ca. 2 mm. Sepals in 2 whorls; outer sepals elliptic,  $2\text{--}2.5 \times 1\text{--}1.3$  mm; inner sepals obovate,  $3\text{--}3.5 \times 1.5\text{--}1.8$  mm. Petals elliptic,  $3\text{--}3.2 \times 1.2\text{--}1.5$  mm, base cuneate, with separate glands, apex emarginate or entire. Stamens ca. 2.1 mm; anther connective not prolonged, truncate. Ovules solitary, funiculate. Fruit unknown. Fl. May–Jun, fr. unknown.

• Thickets on slopes; ca. 100 m. Hebei, Shandong.

## Additional names based on Chinese material

Editors' note. The following names, all based on Chinese material, have not been accounted for in the above treatment by Ying Junsheng (see the comments at the beginning of the genus). This appendix is provided for information only, and no taxonomic opinions are expressed.

- Berberis acuminata* Franchet, Bull. Soc. Bot. France 33: 387. 1887. Described from Yunnan.
- Berberis ambigua* Ahrendt, J. Bot. 79(Suppl.): 60. 1941. Described from cultivated material reputedly grown from seed collected in Yunnan.
- Berberis angulosa* Wallich ex J. D. Hooker & Thomson var. *fasciculata* Ahrendt, J. Bot. 79(Suppl.): 42. 1941. Described from Xizang.
- Berberis approximata* Sprague var. *campylogyna* Ahrendt, J. Bot. 79(Suppl.): 53. 1941 (*B. dictyophylla* Franchet var. *campylogyna* (Ahrendt) Ahrendt, J. Linn. Soc., Bot. 57: 128. 1961). Described from Yunnan.
- Berberis aridocalida* Ahrendt, Bull. Misc. Inform. Kew 1939: 273. 1939 [*"arido-calida"*]. Described from cultivated material reputedly grown from seed collected in Gansu.
- Berberis atropasina* Ahrendt, Gard. Chron., ser. 3, 112: 155. 1942. Described from cultivated material reputedly grown from seed collected in Yunnan.
- Berberis bodinieri* H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 454. 1911, not (Gagnepain) Laferrière (1997). Described from Yunnan.
- Berberis buchananii* C. K. Schneider var. *tawangensis* Ahrendt, J. Bot. 79(Suppl.): 37. 1941. Described from Xizang.
- Berberis calliantha* Mulligan, Gard. Chron., ser. 3, 97: 394. 1935. Described from Xizang.
- Berberis caroli* C. K. Schneider, Bull. Herb. Boissier, sér. 2, 5: 459. 1905. Described from Nei Mongol.
- Berberis chinensis* Poirét, Encycl. 8: 617. 1808. Described from cultivated material in Paris and said to be native to China.
- Berberis consimilis* C. K. Schneider, Oesterr. Bot. Z. 66: 324. 1916. Described from cultivated material reputedly grown from seed collected in Sichuan.
- Berberis dasystachya* Maximowicz var. *pluriflora* P. Y. Li, Acta Phytotax. Sin. 10: 213. 1965. Described from Gansu and Qinghai.
- Berberis faberi* C. K. Schneider, Oesterr. Bot. Z. 67: 215. 1918. Described from Sichuan.
- Berberis faxoniana* C. K. Schneider, Oesterr. Bot. Z. 66: 325. 1916. Described from cultivated material reputedly grown from seed collected in Sichuan or Yunnan.
- Berberis franchetiana* C. K. Schneider var. *gombalana* C. Y. Wu & S. Y. Bao, Bull. Bot. Res., Harbin 5(3): 15. 1985. Described from Yunnan.
- Berberis gagnepainii* C. K. Schneider var. *subovata* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 264. 1939. Described from Sichuan.
- Berberis heteropsis* Ahrendt, J. Linn. Soc., Bot. 57: 213. 1961. Described from Guizhou and Sichuan.
- Berberis hookeri* Lemaire subsp. *longipes* D. F. Chamberlain & C. M. Hu, Notes Roy. Bot. Gard. Edinburgh 42: 533. 1985. Described from Xizang.
- Berberis humidoumbrosa* Ahrendt var. *dispersa* Ahrendt, J. Linn. Soc., Bot. 57: 160. 1961. Described from Xizang.
- Berberis insignis* J. D. Hooker & Thomson var. *zelaica* Ahrendt, J. Bot. 79(Suppl.): 9. 1941. Described from Xizang.
- Berberis integerrima* Bunge var. *stenophylla* Maximowicz, Fl. Tangut. 29. 1889. Described from Gansu.
- Berberis jaeschkeana* C. K. Schneider var. *bimbilaica* Ahrendt, J. Bot. 79(Suppl.): 65. 1941. Described from Xizang.
- Berberis jingguensis* G. S. Fan & X. W. Li, J. Trop. Subtrop. Bot. 5(3): 1. 1997. Described from Yunnan.
- Berberis kartanica* Ahrendt, J. Bot. 79(Suppl.): 68. 1941. Described from Xizang.
- Berberis mairei* Ahrendt, J. Linn. Soc., Bot. 57: 76. 1961. Described from Yunnan.
- Berberis oblanceifolia* C. M. Hu, Bull. Bot. Res., Harbin 6(2): 12. 1986. Described from Hunan.
- Berberis oritrepha* C. K. Schneider, Oesterr. Bot. Z. 67: 293. 1918. Described from Shaanxi.
- Berberis orthobotrys* Bienert ex Aitchison var. *rupestris* Ahrendt, J. Linn. Soc., Bot. 57: 143. 1961. Described from Xizang.
- Berberis petrogena* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 253. 1939. Described from Yunnan.
- Berberis pingbaensis* M. T. An, Bull. Bot. Res., Harbin 28: 641. 2008. Described from Guizhou.
- Berberis poiretii* C. K. Schneider f. *weichangensis* C. K. Schneider in Sargent, Pl. Wilson. 1: 372. 1913. Described from Hebei.
- Berberis praecipua* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 46: 248. 1939. Described from Hunan and Yunnan.
- Berberis pseudothunbergii* P. Y. Li, Acta Phytotax. Sin. 10: 211. 1965. Described from Gansu and Shaanxi.
- Berberis rockii* Ahrendt, J. Bot. 79(Suppl.): 72. 1941. Described from Yunnan.
- Berberis sanei* T. Husain, Datt, Arti Garg & R. R. Rao, Bull. Mus. Natl. Hist. Nat., B. Adansonia 17: 69. 1995. Described from Xizang.
- Berberis sinensis* Desfontaines var. *angustifolia* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 2: 416. 1873 (*B. poiretii* C. K. Schneider var. *angustifolia* (Regel) Nakai, Fl. Sylv. Kor. 21: 66. 1936). Described from N and NE China.
- Berberis sphalera* Fedde, Bot. Jahrb. Syst. 36(Beibl. 82): 44. 1905. Described from Shaanxi.
- Berberis spraguei* Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941. Described from cultivated material apparently originally collected in Yunnan.
- Berberis stearnii* Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941. Described from cultivated material apparently originally collected in Yunnan.
- Berberis subsessiliflora* Pampanini, Nuovo Giorn. Bot. Ital., n.s., 22: 293. 1915. Described from Hubei.
- Berberis tarokoensis* S. Y. Lu & Yuen P. Yang, Fl. Taiwan, ed. 2, 2: 581. 1996. Described from Taiwan.
- Berberis thibetica* C. K. Schneider, Repert. Spec. Nov. Regni Veg. 6: 268. 1909. Described from cultivated material reputedly grown from seed collected in Sichuan or Yunnan.
- Berberis trichohaematoides* Ahrendt, J. Bot. 79(Suppl.): 62. 1941. Described from Xizang.
- Berberis tsangpoensis* Ahrendt, Gard. Chron., ser. 3, 109: 101. 1941. Described from Xizang.
- Berberis uniflora* F. N. Wei & Y. G. Wei, Guihaia 15: 218. 1995. Described from Guangxi.
- Berberis wanhuashanensis* Yue Jin Zhang, Acta Bot. Boreal.-Occid. Sin. 11: 258. 1991. Described from Shaanxi.
- Berberis xinganensis* G. H. Liu & S. Q. Zhou, Fl. Intramongol., ed. 2, 2: 712. 1991. Described from Nei Mongol.
- Berberis zayulana* Ahrendt, J. Bot. 79(Suppl.): 64. 1941. Described from Xizang.

### 3. MAHONIA Nuttall, Gen. N. Amer. Pl. 1: 211. 1818, nom. cons.

十大功劳属 shi da gong lao shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

*Odostemon* Rafinesque.

Shrubs or small trees, evergreen, 0.3–8 m tall. Spines absent. Leaves imparipinnate, alternate, sessile or petiolate; petiole to 14 cm; leaflets 3–41; lateral leaflets usually sessile; terminal leaflet sessile or petiolulate; margins of leaflets entire, variously toothed, or with coarse or fine serrations. Inflorescence terminal, of (1–)3–18-fascicled simple or branched racemes or panicles, 3–35 cm, subtended by leafletlike bracts. Pedicel 1.5–24 mm, subtending bract shorter or longer than pedicel. Flowers yellow, with 3 whorls of sepals and 1 whorl of petals, with or without glands at base of petals. Anther connective not prolonged, apiculate or conspicuously prolonged. Ovary ellipsoid; ovules 1–7; styles absent or to 3 mm, persistent on mature fruit. Fruit berries, bluish or black, often glaucous. Seeds 1–7.

About 60 species: mainly in E and SE Asia, also in W North America, Central America, and W South America; 31 species (27 endemic) in China; six additional species (five endemic) are insufficiently known.

Most of the Chinese wild populations of *Mahonia* have been extirpated, probably as a result of over-collecting for medicinal use, and the plants now being described are probably individuals that vary only in minor ways from the relatively few specimens that exist in herbaria.

Ahrendt (J. Linn. Soc., Bot. 57: 1–410. 1961) recognized two “groups” in *Mahonia*: “Orientales” and “Occidentales.” All of the Asian species of *Mahonia*, plus a single North American species from the Pacific Northwest, *M. nervosa* (Pursh) Nuttall, are in the “Orientales.”

See the paper by J. Y. Wu, H. N. Qin, D. Y. Xue, and K. X. Zhou, “Study on seed morphology of *Mahonia* (Berberidaceae)” (Guihaia 30: 155–160. 2010).

#### 1a. Inflorescences panicles.

2a. Petals retuse; pedicels 6–11 mm, bracts 2–3 mm; teeth per upper leaflet 4–11; ovules 5 or 6 ..... 1. *M. bracteolata*

2b. Petals emarginate or incised; pedicels 2.5–3 mm or 13–24 mm, bracts 1–2 mm or 4.5–7 mm; teeth per upper leaflet 1–5; ovules 1–4.

3a. Petals emarginate; inflorescences 25–35 cm; leaflets 2 or 3 pairs, abaxially pruinose; pedicels 13–24 mm ..... 2. *M. gracilipes*

3b. Petals incised; inflorescences 11–18 cm; leaflets 5–9 pairs, abaxially not pruinose; pedicels 2.5–3 mm ..... 3. *M. monyulensis*

#### 1b. Inflorescences racemes.

##### 4a. Inflorescence of branched racemes.

5a. Petals incised; leaflets 12–20 pairs; ovules 2 or 3 ..... 4. *M. oiwakensis*

5b. Petals emarginate; leaflets 4–9 pairs; ovules 4–7.

6a. Bracts longer than pedicels; fruit obovoid, style less than 0.5 mm; leaf blade basally cuneate ..... 5. *M. calamicaulis*

6b. Bracts shorter than to slightly longer than pedicels; fruit globose, style 2–3 mm; leaf blade basally oblique, rounded ..... 6. *M. duclouxiana*

##### 4b. Inflorescence of unbranched racemes.

##### 7a. Petals entire.

8a. Petioles 3.5–14 cm; leaflets entire or with 1–3 inconspicuous teeth near apex ..... 9. *M. shenii*

8b. Petioles 0.5–2.5 cm; leaflets with teeth.

9a. Leaflets remote, not contiguous, apex acuminate or caudate-acuminate, margin with 9–23 teeth on each side; anther connective not prolonged; fruit globose ..... 7. *M. taronensis*

9b. Leaflets contiguous, apex acute, margin with 2–7 teeth on each side; anther connective prolonged; fruit obovoid ..... 8. *M. subimbricata*

##### 7b. Petals emarginate or incised.

##### 10a. Leaves petiolate, petiole 2.5–9 cm.

11a. Inner sepals lanceolate or obovate; anther connective prolonged.

12a. Leaflets subrhombic or elliptic, margin with 2–4 teeth on each side; inner sepals obovate ..... 10. *M. breviracema*

12b. Leaflets lanceolate, margin 8–20-spinose-serrate on each side; inner sepals lanceolate ..... 11. *M. setosa*

11b. Inner sepals oblong or elliptic; anther connective not prolonged.

13a. Inflorescence 1- or 2-fascicled racemes; leaflets ovate or ovate-elliptic, basally truncate ..... 12. *M. decipiens*

13b. Inflorescence 4–10-fascicled racemes; leaflets basally cuneate.

14a. Leaflets 2 or 3 pairs, oblong-ovate or elliptic, shortly petiolate ..... 13. *M. paucijuga*

14b. Leaflets 2–9 pairs, lanceolate to elliptic-lanceolate or elliptic, sessile.

15a. Leaflets 2–5 pairs; pedicels ca. as long as bracts; glands of petals distinct ..... 14. *M. fortunei*

15b. Leaflets 6–9 pairs; pedicels much longer than bracts; glands of petals distinct or sometimes indistinct ..... 15. *M. eurybracteata*

10b. Leaves subsessile or petiole less than 2 cm.

- 16a. Leaflets entire ..... 16. *M. microphylla*  
 16b. Leaflets spinose-serrate.  
 17a. Leaflets lanceolate, elliptic-lanceolate, or ovate-oblong.  
 18a. Leaflets 6–9 pairs, margin 3–9-spinose-serrate on each side; base of petals with glands ..... 15. *M. eurybracteata*  
 18b. Leaflets 8–12 pairs, margin 35–65-spinulose-serrulate on each side; base of petals without glands ..... 17. *M. leptodonta*  
 17b. Leaflets oblong, ovate, broadly elliptic, or rhombic.  
 19a. Veins on adaxial surface of leaflets reticulate, obviously raised, margin of leaflets 2–11-spinose-serrate on each side ..... 18. *M. retinervis*  
 19b. Veins on adaxial surface of leaflets reticulate, flat or inconspicuous, margin of leaflets 2–16-dentate on each side.  
 20a. Abaxial surface of leaflets pruinose; fruit 10–12 mm in diam. .... 19. *M. bealei*  
 20b. Abaxial surface of leaflets yellowish green, not pruinose; fruit less than 10 mm in diam.  
 21a. Floral bracts longer than pedicels.  
 22a. Racemes 3–9 per fascicle, 5–9 cm; apex of petals slightly emarginate.  
 23a. Racemes 5–9 per fascicle; fruit not pruinose; leaflets serrate, with 4–7(–11) teeth on each side ..... 20. *M. longibracteata*  
 23b. Racemes 3–5 per fascicle; fruit pruinose; leaflets spinose-serrate, with 10–16 teeth on each side ..... 21. *M. polyodonta*  
 22b. Racemes 8–15 per fascicle, 7–19 cm; apex of petals incised.  
 24a. Anther connective prolonged; ovules 2–6; leaf blade adaxially dark green and shiny ..... 22. *M. napaulensis*  
 24b. Anther connective not prolonged; ovules 2; leaf blade adaxially green ..... 23. *M. cardiophylla*  
 21b. Floral bracts shorter than to ca. as long as pedicels.  
 25a. Margin of leaflets 1–3(–6)-dentate on each side ..... 24. *M. nitens*  
 25b. Margin of leaflets 4–10-dentate on each side.  
 26a. Leaflets markedly overlapping.  
 27a. Inflorescence 3–6 racemes; anther connective prolonged; leaflets 8–18 pairs ..... 25. *M. conferta*  
 27b. Inflorescence 9 or 10 racemes; anther connective not prolonged; leaflets 5–7 pairs ..... 26. *M. imbricata*  
 26b. Leaflets separate or sometimes contiguous.  
 28a. Pedicels shorter than floral bracts; anther connective prolonged, rounded; petals 1.8–2 mm wide ..... 31. *M. hancockiana*  
 28b. Pedicels longer than or ca. as long as floral bracts; anther connective not prolonged, truncate; petals 2–2.8 mm wide.  
 29a. Fruit globose or pyriform, style not persistent; petiolar glands indistinct; leaflets 8–13 pairs ..... 27. *M. bodinieri*  
 29b. Fruit ovoid, obovoid, or ellipsoid, persistent style short; petiolar glands conspicuous; leaflets 4–9 pairs.  
 30a. Pedicels ca. as long as or slightly longer than floral bracts; leaf blade shiny, apically acute, cuspidate ..... 28. *M. sheridaniana*  
 30b. Pedicels markedly longer than floral bracts; leaf blade apically acute or acuminate, sometimes aristate.  
 31a. Leaflets 4–6 pairs, margin 2–4-dentate on each side; pedicels 6–7 mm; ovules 4–7 ..... 29. *M. japonica*  
 31b. Leaflets 5–9 pairs, margin 2–9-spinose-serrate on each side; pedicels 2.5–4 mm; ovules 2 ..... 30. *M. fordii*

**1. *Mahonia bracteolata*** Takeda, Notes Roy. Bot. Gard. Edinburgh 6: 228. 1917.

鹤庆十大功劳 *he qing shi da gong lao*

*Berberis bracteolata* (Takeda) Laferrière; *B. bracteolata* var. *zhongdianensis* (S. Y. Bao) Laferrière; *B. caesia* (C. K. Schneider) Laferrière; *Mahonia bracteolata* var. *zhongdianensis* S. Y. Bao; *M. caesia* C. K. Schneider.

Shrubs, 1.5–2 m tall. Leaves abaxially pale grayish green, adaxially dull grayish green, ovate, 14–25 × 8–14 cm; leaflets 3–8 pairs, contiguous, lowest pair 0.7–1.5 cm above base of petiole, oblong-lanceolate, 2.5–12 × 1.5–3 cm, thick, rigid, abaxially slightly pruinose, veins ± obscure, adaxially indis-

tinctly veined, base broadly cuneate, margins of lower leaflets with 2 or 3 teeth, those of upper leaflets with 4–11 teeth, apex acuminate; rachis stout, ca. 2 mm in diam.; internodes 2–3 cm, decreasing apically. Inflorescence 4–9-fascicled panicles, 7–19 cm; bracts of inflorescence ovate to ovate-lanceolate, 10–15 × 7–10 mm. Pedicel 6–11 mm; floral bracts ovate, 2–3 mm, apically acute. Sepals yellow; outer sepals ovate, 2–3 × 1.5–2 mm; median sepals ovate, 4–6 × 3–4 mm, apically obtuse; inner sepals elliptic, 7–8 × 3.5–4 mm. Petals yellow, oblong-elliptic, 6–7.5 × 2.5–3 mm, base with distinct glands, apex slightly retuse. Stamens 3.5–4.5 mm; anther connective prolonged, ca. 1.5 mm, rounded to truncate. Ovary ca. 5 mm; ovules 5 or 6. Berry slightly pruinose, subglobose, 5–7 mm in diam.; style persistent, ca. 1.5 mm. Fl. Aug–Nov, fr. Sep–Jan.

- Thickets, open hillsides; 1900–2500 m. Sichuan, Yunnan.

**2. *Mahonia gracilipes*** (Oliver) Fedde, Bot. Jahrb. Syst. 31: 128. 1901.

细柄十大功劳 xi bing shi da gong lao

*Berberis gracilipes* Oliver, Hooker's Icon. Pl. 18: t. 1754. 1887; *B. subtripplinervis* Franchet; *Mahonia gracilipes* var. *rhombica* Z. F. Pan & Z. P. Song; *M. subtripplinervis* (Franchet) Fedde.

Shrubs, 0.3–1 m tall. Leaves adaxially dark green, elliptic to narrowly elliptic, 20–41 × 7–11 cm; leaflets 2 or 3 pairs, subsessile, lowest pair 3.5–10 cm above base of petiole, abaxially white pruinose, venation reticulate, raised on both surfaces; rachis stout, 2–3 mm in diam.; internodes 5–7 cm; petiolule 2–5.5 cm; lowest leaflets oblong, 6–11 × 2–5 cm, only slightly smaller than others, apically becoming oblong to oblanceolate, 8–14.5 × 3–7.3 cm, base cuneate, margin entire below middle, 1–5-spinose-serrate on each side; terminal leaflet 8–14.5 × 3–7.3 cm. Inflorescence 3–5 simple or branched fascicles of racemes, loosely flowered, (6–)25–35 cm; bracts of inflorescence lanceolate, 2–2.5 cm × 4–7 mm. Pedicel 1.3–2.4 cm, slender; floral bracts 1–2 mm. Sepals purple; outer sepals ovate, 2.2–3 × 1.5–2 mm, apically acute; median sepals elliptic, 4.5–5 × 2.1–2.8 mm, apically acute; inner sepals elliptic, 5–5.5 × 2.2–3.2 mm. Petals yellow, oblong, 4–5 × 2–2.6 mm, base with distinct glands, apex emarginate with acute lobes. Stamens 2–3 mm; anther connective not prolonged, truncate. Ovary ca. 2 mm; ovules 3 or 4; style short. Berry black, pruinose, globose, 5–8 mm in diam. Fl. Apr–Aug, fr. Sep–Nov.

- Broad-leaved evergreen and mixed broad-leaved evergreen and deciduous forests, forest margins, shaded slopes; 700–2400 m. Sichuan, NE Yunnan.

**3. *Mahonia monyulensis*** Ahrendt, J. Linn. Soc., Bot. 57: 303. 1961.

门隅十大功劳 men yu shi da gong lao

*Berberis monyulensis* (Ahrendt) Laferrière.

Shrubs. Leaves abaxially pale yellowish green, adaxially slightly shiny, green, narrowly elliptic, 20–27 × 9–16 cm; leaflets 5–9 pairs, contiguous or slightly overlapping, lowest pair smaller than others, 1–1.5 cm above base of petiole, abaxially with raised veins, adaxially with indistinct veins; rachis 2–3 mm in diam.; internodes decreasing in length apically, 1.5–4 cm; lowest leaflets broadly ovate to suborbicular, 2–3.5 × 1.2–2.3 cm, apically becoming ovate to oblong-ovate, 3.5–9 × 2–5 cm, base truncate to obliquely rounded, margin with 2 or 3 teeth on each side, apex sharply acute, cuspidate. Inflorescence 5–11-fascicled panicles, 11–18 cm; bracts of inflorescence lanceolate to ovate-lanceolate, 2.5–4 × 0.6–1.5 cm. Pedicel 2.5–3 mm; floral bracts ovate, 4.5–7 × 1.2–2 mm. Sepals golden yellow; outer sepals oblong-ovate, 2.5–3.1 × 1.5–2 mm; median sepals elliptic-ovate, 4–5.5 × 2.7–3 mm; inner sepals elliptic, 6–6.2 × 3–4 mm. Petals golden yellow, oblong to elliptic-obovate, 4.5–5.2 × 2.1–2.3 mm, base with distinct glands, apex narrowly incised, lobes obtuse. Stamens ca. 3.5 mm; anther connective not prolonged, truncate. Ovary ca. 4 mm; ovules 3. Berry unknown. Fl. Mar–Apr, fr. unknown.

- Riverbanks; ca. 2300 m. SE Xizang.

**4. *Mahonia oiwakensis*** Hayata, Icon. Pl. Formosan. 6: 1. 1916.

阿里山十大功劳 a li shan shi da gong lao

*Berberis caelicolor* (S. Y. Bao) Laferrière; *B. discolorifolia* (Ahrendt) Laferrière; *B. lomariifolia* (Takeda) Laferrière; *B. lomariifolia* var. *estylis* (C. Y. Wu ex S. Y. Bao) Laferrière; *B. oiwakensis* (Hayata) Laferrière; *Mahonia alexandri* C. K. Schneider; *M. caelicolor* S. Y. Bao; *M. discolorifolia* Ahrendt; *M. hainanensis* C. M. Hu, Ze X. Li & F. W. Xing; *M. lomariifolia* Takeda; *M. lomariifolia* var. *estylis* C. Y. Wu ex S. Y. Bao; *M. morrisonensis* Takeda.

Trees, 1–7 m tall. Leaves abaxially yellowish green, adaxially dark green, oblong-elliptic, 15–42 × 8–15 cm; leaflets 12–20 pairs, lowest pair 0.5–1 cm above base of petiole, abaxially slightly veined or veins obscure; rachis 2–3 mm thick; internodes 1.5–5 cm, decreasing in length apically, petiolule 5–10 mm or leaflets sometimes sessile; lowest leaflets ovate to suborbicular, 1.5–3 × 1–1.5 cm, apically becoming ovate-lanceolate or lanceolate, 2–10 × 1–2.5 cm, base rounded, margin 2–9-spinose-serrate on each side, apex cuspidate-acuminate; terminal leaflet 4–6.5 × 0.9–1.5 cm. Inflorescence 7–18-fascicled racemes, 9–25 cm; bracts of inflorescence broadly lanceolate to ovate, 1.5–3 cm × 6–10 mm. Pedicel (2–)5–6 mm; floral bracts ovate, 3–3.5 × 1.5–1.8 mm. Outer sepals golden yellow, ovate to suborbicular, 1.2–3 × 1.1–2 mm; median sepals elliptic to ovate, (3–)5–6 × 2.5–3 mm; inner sepals golden yellow, elliptic to oblong, 5–7 × 2.6–3.5 mm. Petals golden yellow, oblong, 4.5–6.5 × 2–2.8 mm, base with distinct glands, apex narrowly incised, acute. Stamens 3–4 mm; anther connective slightly prolonged, subapiculate or rounded. Ovary 3.2–4 mm; ovules 2 or 3; style 0.5–1 mm. Berry blue or bluish black, pruinose, ovoid, 6–8 × 5–6 mm; style persistent, ca. 1 mm. Fl. Aug–Nov, fr. Nov–May.

- Broad-leaved forests, thickets, forest margins, slopes; 600–3800 m. Guizhou, Hong Kong (probably introduced), Sichuan, Taiwan, Xizang, Yunnan.

*Mahonia oiwakensis* is one of a number of plants with a disjunct distribution on Taiwan and in C and SW China.

**5. *Mahonia calamicaulis*** Sparre & C. E. C. Fischer subsp. *kingdon-wardiana* (Ahrendt) T. S. Ying & Boufford in T. S. Ying, Fl. Reipubl. Popularis Sin. 29: 222. 2001.

察隅十大功劳 cha yu shi da gong lao

*Mahonia veitchiorum* (Hemsley & E. H. Wilson) C. K. Schneider var. *kingdon-wardiana* Ahrendt, J. Linn. Soc., Bot. 57: 302. 1961; *Berberis veitchiorum* Hemsley & E. H. Wilson var. *kingdon-wardiana* (Ahrendt) Laferrière.

Shrubs, 0.6–1.5 m tall. Leaves abaxially pale yellowish green, adaxially dull green, oblong, 20–33 × 10–14 cm; leaflets 4–7 pairs, lowest pair ca. 1 cm above base of petiole, abaxially not pruinose, veins slightly raised; rachis 2–3 mm in diam.; internodes 2.5–4.5 cm; leaflets subsessile or petiolule to ca. 4 cm, elliptic to elliptic-lanceolate, thickly leathery, rigid, lowest leaflets 4–6 × 1.5–3 cm, remaining ones increasing in size from middle of leaf upward, 7–11.5 × 2.5–4 cm, base broadly cune-

ate, margin prominently serrate with 5–9 teeth on each side, apex caudate-acuminate; terminal leaflet larger. Inflorescence 5–7 simple or sometimes shortly branched fascicles of racemes, 6–12 cm; bracts of inflorescence triangular to ovate-oblong, 1.5–2 cm × 6–8 mm. Pedicel 4–6 mm; floral bracts narrowly lanceolate, 6–9 × 1–1.5 mm. Sepals bright yellow; outer sepals ovate-lanceolate, 3.5–4 × 2–2.5 mm; median sepals broadly obovate, 4.5–5 × 2–2.5 mm; inner sepals elliptic, 5–5.5 × 3–3.2 mm. Petals bright yellow, narrowly obovate, 4.5–5 × 1.5–1.7 mm, base with distinct glands, apex slightly emarginate, lobes obtuse. Stamens 3.2–3.5 mm; anther connective not prolonged, truncate. Ovary ellipsoid, ca. 3 mm; ovules 4; style ca. 0.5 mm. Berry purple, ± pruinose, obovoid, 1–1.3 cm × 7–10 mm. Fl. Apr–May, fr. Jun–Jul.

● Evergreen broad-leaved forests, temperate rain forests; 2500–3000 m. SE Xizang.

*Mahonia calamicaulis* subsp. *calamicaulis*, with leaflet margins spinulose toothed and apex acute, is restricted to India (Assam).

**6. *Mahonia duclouxiana*** Gagnepain, Bull. Soc. Bot. France 55: 87. 1908.

长柱十大功劳 *chang zhu shi da gong lao*

*Berberis borealis* (Takeda) Laferrière var. *parryi* (Ahrendt) Laferrière; *B. dolichostylis* (Takeda) Laferrière; *B. duclouxiana* (Gagnepain) Laferrière; *B. duclouxiana* var. *hilaica* (Ahrendt) Laferrière; *B. flavida* (C. K. Schneider) Laferrière; *B. flavida* var. *integrifoliola* (Handel-Mazzetti) Laferrière; *B. keikoe* Laferrière; *B. siamensis* (Takeda) Laferrière; *B. tsailunii* Laferrière; *Mahonia borealis* Takeda var. *parryi* Ahrendt; *M. dolichostylis* Takeda; *M. duclouxiana* var. *hilaica* Ahrendt; *M. flavida* C. K. Schneider; *M. flavida* f. *integrifoliola* Handel-Mazzetti; *M. mairei* Takeda; *M. siamensis* Takeda.

Shrubs, 1.5–4 m tall. Leaves abaxially yellowish green, adaxially dull to slightly shiny, oblong to oblong-elliptic, 20–70 × 10–22 cm, thinly papery to thinly leathery; leaflets 4–9 pairs, obliquely arranged, separate to remote, sessile, lowest pair ca. 1 cm above base of petiole, abaxial veins distinctly raised, adaxial veins reticulate, indistinctly raised; rachis 3–5 mm in diam.; internodes 2.5–11 cm, decreasing in length apically; leaflets narrowly ovate or oblong-ovate to narrowly oblong-ovate or elliptic-lanceolate, increasing in length but decreasing in width from base to apex, lowest leaflets 1.5–3 × 1.2–2 cm, those above 4.5–16 × 1.5–5 cm, base rounded, oblique, margin with 3–12 teeth on each side, apex acuminate or acute, sometimes terminal leaflet much larger, to 18 × 4 cm, sessile or (more commonly) petiolule 1–3 cm. Inflorescence 4–15 simple or shortly branched fascicles of racemes, 8–30 cm; bracts of inflorescence broadly lanceolate to ovate, 2–3.5 cm × 5–8 mm. Pedicel 3.2–6 mm; floral bracts broadly lanceolate to ovate, 3–6.5 × 1.5–2.5 mm. Sepals yellow; outer sepals ovate to triangular-ovate, 1.1–3 × 1.1–5 mm; median sepals ovate or ovate-oblong to elliptic, 2.2–5 × 1.9–2.5 mm; inner sepals oblong to elliptic, 3.2–8 × 2–3.6 mm. Petals yellow, oblong to elliptic, 3–7.2 × 1.6–3.5 mm, base with distinct glands, apex emarginate, lobes obtuse. Stamens 3.5–5.5 mm; anther connective conspicuously prolonged, truncate or rounded. Ovary 5–6 mm in diam.; ovules 4–7; style 2–3 mm. Berry deep purple,

pruinose, globose to subglobose, 5–8 mm in diam.; style persistent, 2–3 mm. Fl. Nov–Apr, fr. Mar–Jun.

Forests, thickets, roadsides, in light shade, dry slopes; 1800–2700 m. Guangxi, Sichuan, Yunnan [India, Myanmar, Thailand].

**7. *Mahonia taronensis*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 60: 181. 1923.

独龙十大功劳 *du long shi da gong lao*

*Berberis tibetensis* Laferrière.

Shrubs, 1–1.5 m tall. Leaves abaxially yellowish green, adaxially dull olivaceous-green, narrowly obovate to oblanceolate, 18–40(–65) × 7–17(–30) cm; leaflets 5–10 pairs, lowest pair smaller, ca. 1 cm above base of petiole, abaxially midvein and lateral veins conspicuously raised, adaxially midvein obviously impressed, lateral veins inconspicuous; leaflets lanceolate to ovate-lanceolate, 4–13(–20) × 1.5–3(–6) cm, thin, base broadly cuneate or subrounded, margin with 9–23 teeth on each side, apex acuminate to caudate-acuminate. Inflorescence 3–5-fascicled racemes, 5–8 cm; bracts of inflorescence ovate to ovate-oblong, 1–2 cm × ca. 7 mm. Pedicel 2–2.5 mm; floral bracts lanceolate, 4–5 × 0.7–1 mm. Flowers pale greenish yellow. Outer sepals ovate, ca. 1.9 × 1 mm; median sepals oblong-elliptic, ca. 2.3 × 1.5 mm; inner sepals oblong, ca. 3.5 × 2 mm. Petals oblong-obovate, ca. 3 × 1.5 mm, base with distinct glands, apex entire. Stamens ca. 2 mm; anther connective not prolonged, truncate. Ovary ca. 2.5 mm; ovules 2–4. Berry blue, pruinose, globose, ca. 6 mm in diam.; style persistent, short. Fl. Oct–Jan, fr. Feb–Jul.

● Forests; 1500–2900 m. SE Xizang, Yunnan.

**8. *Mahonia subimbricata*** Chun & F. Chun, J. Arnold Arbor. 29: 420. 1948.

靖西十大功劳 *jing xi shi da gong lao*

*Berberis subimbricata* (Chun & F. Chun) Laferrière.

Shrubs, ca. 1.5 m tall. Leaves abaxially ± shiny, yellowish green, adaxially dull, elliptic to oblanceolate, 12–22 × 3–5 cm; leaflets 8–13 pairs, close or overlapping, lowest pair 5–10 mm above base of petiole, abaxially initially slightly grayish pruinose, adaxial primary veins 3, slightly impressed, veinlets obscure; rachis 2–3 mm in diam.; internodes 1–2 cm, slightly decreasing in length apically; leaflets ovate to narrowly ovate, lowermost much smaller than others and with only 1 or 2 teeth on each side, gradually larger apically, 1.5–3.5 × 1–1.5 cm, base rounded or subcordate, margin with 2–7 teeth on each side, apex acute, sharply cuspidate; terminal leaflet oblong-ovate, 3–5 cm, base rounded or subcordate, apex acuminate, petiolule ca. 0.5 cm. Inflorescence 9–13-fascicled racemes, 5–9 cm; bracts of inflorescence ovate, 1.2–1.5 cm × 5–8 mm. Pedicel 2.2–3 mm; floral bracts ovate-oblong, 2–3 × 1.2–1.5 mm. Sepals yellow; outer sepals broadly ovate, ca. 2 × 1.5 mm; median sepals oblong-ovate, ca. 3 × 2 mm; inner sepals oblong-obovate, ca. 3 × 2 mm. Petals yellow, narrowly elliptic, ca. as long as inner sepals or slightly shorter, base with distinct glands, apex entire, obtuse. Stamens ca. 2.5 mm; anther connective prolonged, obtuse. Ovary ca. 2 mm; ovules 1 or 2. Berry black, pruinose, obovoid, ca. 8 × 5 mm. Fl. Sep–Nov, fr. Nov–May.

- Thickets, woodlands; ca. 1900 m. Guangxi, Yunnan.

**9. *Mahonia shenii* Chun, J. Arnold Arbor. 9: 127. 1928.**

沈氏十大功劳 shen shi shi da gong lao

*Berberis shenii* (Chun) Laferrière.

Shrubs, 0.6–2 m tall. Leaves abaxially pale to yellowish green, shiny, ovate-elliptic, 23–40 × 13–22 cm; leaflets 1–6 pairs, lowest pair 3.5–14 cm above base of petiole, abaxial veins 3–5, reticulate venation indistinct, adaxial main veins 3, faint to prominent, impressed or slightly raised; rachis 1.5–2.5 mm in diam.; internodes 2.5–8 cm, decreasing in length apically; leaflets sessile, basal pair scarcely smaller than others; lateral leaflets narrowly to broadly elliptic or obovate, 6–13 × 1–5 cm, base cuneate to broadly so, margin thickened, entire or with 1–3 inconspicuous teeth near apex, apex acute to acuminate; terminal leaflet oblong-elliptic to broadly obovate, 10–15 × 3–6 cm, margin entire or with 1 or 2 inconspicuous teeth near apex, petiolule 1.5–6.5 cm. Inflorescence 6–10-fascicled racemes, ca. 10 cm; bracts of inflorescence lanceolate, 1–2 cm × 3–5 mm. Pedicel 2–3 mm, slender; floral bracts ovate, ca. 1 × 0.8 mm. Sepals yellow; outer sepals ovate, ca. 2 × 1–1.6 mm; median sepals ovate-elliptic to elliptic, 4–4.1 × 2–3 mm; inner sepals obovate-elliptic, 4.5–4.6 × 2.2–3 mm. Petals yellow, obovate-oblong, ca. 3.6 × 1.6–2 mm, base with indistinct glands, apex entire, rounded. Stamens ca. 2.5 mm; anther connective not prolonged, truncate. Ovary 1.8–2 mm; ovules 2; stigma ca. 0.3 mm. Berry blue pruinose, globose to subglobose, 6–7 mm in diam.; style not persistent. Fl. Apr–Sep, fr. Oct–Dec.

- Mixed broad-leaved deciduous and evergreen forests, thickets, rocky slopes; 400–1500 m. Guangdong, NE Guangxi, SE Guizhou, S Hunan.

**10. *Mahonia breviracema* Y. S. Wang & P. K. Hsiao, Acta Phytotax. Sin. 23: 309. 1985.**

短序十大功劳 duan xu shi da gong lao

*Berberis breviracema* (Y. S. Wang & P. K. Hsiao) Laferrière; ?*Mahonia monodens* J. Y. Wu, H. N. Qin & S. Z. He.

Shrubs, ca. 1 m tall. Leaves abaxially pale green, adaxially green, ovate or ovate-elliptic, 14–16 × 6–8 cm; leaflets 3 or 4 pairs, lowest pair ca. 4 cm above base of petiole; rachis 1–2 mm in diam.; internodes 2.5–3 cm, ca. equidistant, abaxial veins raised, adaxial veins impressed; leaflets elliptic to subrhombic, 3–6.6 × 1.2–3 cm, slightly decreasing in size from base to apex, leathery, base cuneate, margin with 2–4 teeth on each side, apex acute to acuminate; terminal leaflet larger than others, 5.5–6.5 × 2.5–3 cm, sessile. Inflorescence 5–8-fascicled racemes, 3–8 cm; bracts of inflorescence lanceolate, 1–1.5 cm × 3–6 mm. Pedicel 2–2.5 mm; floral bracts ovate, 1–1.2 × 0.6–0.8 mm. Outer sepals ovate, 1.6–1.8 × 1–1.1 mm; median sepals obovate-oblong, 3.7–3.8 × 1.7–1.8 mm; inner sepals obovate, ca. 4 × 2.1 mm. Petals elliptic, 3.5–3.6 × 1.3–1.4 mm, base with distinct glands, apex emarginate. Stamens ca. 2.1 mm; anther connective prolonged, rounded. Ovary ca. 1.7 mm; ovules 2; style 0.3–0.5 mm. Berry unknown. Fl. Oct–Nov, fr. unknown.

- Open rocky slopes in thickets; ca. 600 m. Guangxi (Lingui, ?Tiandeng), ?Guizhou (Guiyang).

*Mahonia breviracema* is cultivated in Yan Shan Botanical Garden, Guangxi Institute of Botany, Guilin, from where the type specimen (S. K. Lee 200582, IBK) was collected. *Mahonia monodens*, described from Guangxi (Tiandeng) and Guizhou, is tentatively included in synonymy, but we have not been able to compare the limited number of specimens available to determine the appropriateness of this placement.

**11. *Mahonia setosa* Gagnepain, Bull. Soc. Bot. France 55: 86. 1908.**

刺齿十大功劳 ci chi shi da gong lao

*Berberis setosa* (Gagnepain) Laferrière.

Shrubs, ca. 1.5 m tall. Leaves abaxially pale yellowish green, becoming golden yellow when dry, adaxially dull, ca. 25 × 14 cm; leaflets 4–8 pairs, lowest pair 2.5–3.5 cm above base of petiole, abaxial veins 3, both surfaces with raised reticulate veins; rachis slender, 1–2 mm in diam.; internodes 1–2 cm; leaflets lanceolate to linear-lanceolate, 1.8–8 × 0.8–1.2 cm, thickly papery, base cuneate, margin 8–20-spinose-serrulate or setose-serrate, apex acuminate. Inflorescence 3–5-fascicled racemes, 3–5 cm; bracts of inflorescence narrowly triangular, apically acute. Pedicel slender; floral bracts lanceolate. Sepals yellow; outer sepals narrowly triangular, apex acute; median and inner sepals lanceolate, subequal. Petals yellow, scarcely shorter than inner sepals, base clawed, with distinct glands, apex slightly retuse. Stamens long; anther connective prolonged, subconical, obtuse. Ovary conical; ovules 2, stipitate. Berry unknown. Fl. Oct, fr. unknown.

- Sichuan, Yunnan.

The cuneate base and the spinose-serrulate or setose margins of the leaflets of *Mahonia setosa* are distinct in the genus.

**12. *Mahonia decipiens* C. K. Schneider in Sargent, Pl. Wilson. 1: 379. 1913.**

鄂西十大功劳 e xi shi da gong lao

*Berberis decipiens* (C. K. Schneider) Laferrière.

Shrubs, 1–2 m tall. Leaves abaxially pale, adaxially dull green, elliptic, 15–20 × 7–11 cm; leaflets 2–7 pairs, lowest pair 4–6 cm above base of petiole, abaxial veins slightly branched, veins slightly raised on both surfaces; rachis ca. 2 mm in diam.; internodes 2.5–3.5 cm; leaflets separate or sometimes contiguous, ovate to ovate-elliptic, lowest similar to others, ovate, 3–5.5 × 1.5–3 cm, those above ovate to ovate-elliptic, 4.5–7 × 2.5–3.5 cm, base subtruncate, margin with 3–6 teeth on each side, apex acute; terminal leaflet much larger, 7.5–9.5 × 3.5–5 cm, petiolule 1.5–2 cm. Inflorescence 1 or 2 racemes, 4–6 cm; bracts of inflorescence ovate to narrowly ovate, 1–1.5 cm × 4–7 mm. Pedicel 2.5–3 mm; floral bracts ovate, 2–2.5 × ca. 1.5 mm. Sepals yellow; outer sepals ovate, 2.3–2.5 × 1.5–2 mm; median sepals broadly ovate, 3–3.5 × 2–2.5 mm; inner sepals elliptic, 5–6 × 3–4 mm. Petals yellow, obovate, 5–5.5 × 3–3.2 mm, base with distinct glands, apex emarginate, acute. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovary ca. 2.5 mm; ovules 2; style ca. 0.3 mm. Berry unknown. Fl. Apr–Aug, fr. unknown.

- Forests, thickets; 800–1500 m. W Hubei.

**13. *Mahonia paucijuga*** C. Y. Wu ex S. Y. Bao, Acta Phytotax. Sin. 25: 151. 1987.

景东十大功劳 jing dong shi da gong lao

*Berberis paucijuga* (C. Y. Wu ex S. Y. Bao) Laferrière.

Shrubs, 1–3 m tall. Leaves adaxially deep green, ovate, 17–30 × 10–15 cm; leaflets 2 or 3 pairs, lowest pair 2–8 cm above base of rachis, adaxial veins obviously raised, reticulate; rachis 2–3 mm in diam.; internodes 2–3 cm; leaflets shortly petiolulate, oblong-ovate or elliptic, 6–12 × 2.5–5.5 cm, thickly leathery, base broadly cuneate, margin 6–16-spinose-serrate on each side, apex acuminate or mucronate; terminal leaflet elliptic, ca. 2 cm, petiolulate. Inflorescence 4–6-fascicled racemes; bracts of inflorescence ovate, ca. 10 × 6 mm. Pedicel 4–5 mm; floral bracts linear-lanceolate, 8–12 mm, apex long acuminate. Sepals yellow; outer sepals narrowly triangular, ca. 2.5 mm; median sepals elliptic, ca. 6 × 3 mm, 3-veined, apex rounded; inner sepals oblong, ca. 5 mm. Petals yellow, oblong, ca. 5 × 2.4 mm, base with distinct glands, apex deeply emarginate, lobes obtuse. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovary ca. 3 mm; ovules 2; style absent. Berry slightly pruinose, narrowly ellipsoid, ca. 4 mm; style not persistent. Fl. Apr–May, fr. May–Jul.

• Open forests, along trails; 2500–3000 m. Yunnan.

**14. *Mahonia fortunei*** (Lindley) Fedde, Bot. Jahrb. Syst. 31: 130. 1901.

十大功劳 shi da gong lao

*Berberis fortunei* Lindley, J. Roy. Hort. Soc. 1: 231. 1846; *B. fortunei* var. *szechuanica* (Ahrendt) Laferrière; *Mahonia fortunei* var. *szechuanica* Ahrendt.

Shrubs, 0.5–2(–4) m tall. Leaves abaxially pale yellowish green, occasionally slightly glaucous, adaxially dull to deep green, obovate to obovate-elliptic, 10–28 × 8–18 cm; leaflets 2–5 pairs, lowest pair similar to others, 2–9 cm above base of petiole, abaxial veins branched, raised, adaxial veins indistinct; rachis 1–2 mm in diam.; internodes 1.5–4 cm, slightly decreasing in length apically; leaflets sessile or subsessile, narrowly lanceolate to narrowly elliptic, 4.5–14 × 0.9–2.5 cm, base cuneate, margin with 5–10 spinose teeth on each side, apex acute. Inflorescence 4–10-fascicled racemes, 3–7 cm; bracts of inflorescence lanceolate to triangular-ovate, 5–20 × 3–5 mm. Pedicel 2–2.5 mm; floral bracts ovate, 1.5–2.5 × 1–1.2 mm, apically acute. Sepals yellow; outer sepals ovate to triangular-ovate, 1.5–3 × ca. 1.5 mm; median sepals oblong-elliptic, 3.8–5 × 2–3 mm; inner sepals oblong-elliptic, 4–5.5 × 2.1–2.5 mm. Petals yellow, oblong, 3.5–4 × 1.5–2 mm, base with distinct glands, apex emarginate, lobes acute. Stamens 2–2.5 mm; anther connective not prolonged, truncate. Ovary 1.1–2 mm; ovules 2; style absent. Berry purplish blue, pruinose, globose, 4–6 mm in diam. Fl. Jun–Sep, fr. Sep–Nov.  $2n = 28^*$ .

• Forests, scrub thickets, roadsides, along streams, margins of cultivated fields; 300–2000 m. Chongqing, NE Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang.

This species is widely cultivated in China and also cultivated in Indonesia, Japan, and the United States.

Dippel (Handb. Laubholzk. 3: 109. 1893) included the name “*Mahonia fortunei* Hort.” in synonymy but within the treatment of this plant as *Berberis*, not *Mahonia*.

**15. *Mahonia eurybracteata*** Fedde, Bot. Jahrb. Syst. 31: 127. 1901.

宽苞十大功劳 kuan bao shi da gong lao

Shrubs, 0.5–2(–4) m tall. Leaves abaxially yellowish green, adaxially dark green, oblong-oblancheolate or oblong, 18–45 × 7–15 cm, with 5–9 pairs of obliquely ascending, mostly separate or sometimes contiguous leaflets; lowest pair of leaflets similar to and close to others, ca. 5 cm above base of petiole, abaxial venation open and raised, adaxial lateral veins inconspicuous; rachis 2–3 mm in diam.; internodes decreasing in length upward, 3–6 cm; leaflets linear or narrowly elliptic to elliptic-lanceolate or narrowly ovate, lowest 2.5–6 × 0.4–1.2 cm, those above increasing in length from base to apex, becoming 4–12.5 × 0.5–4 cm, base cuneate, margin 3–9-spinose-serrate, apex acuminate; terminal leaflet scarcely larger, 8–10 × 1.2–4 cm, sessile or petiolule to ca. 3 cm. Inflorescence 4–10-fascicled racemes, 5–10 cm; bracts of inflorescence ovate to ovate-oblong, 1–1.5 cm × 6–10 mm. Pedicel 1.5–5 mm, slender; floral bracts ovate, 1.2–3 × 0.8–2 mm. Sepals yellow; outer sepals ovate to ovate-oblong, 2–4.5 × 1–2 mm; median sepals elliptic, 3–4.5 × 1.6–2.8 mm; inner sepals elliptic, 3–5 × 1.8–3 mm. Petals elliptic or oblong, 3–4.3 × 1–2 mm, glands at base distinct or sometimes indistinct, apex slightly emarginate, lobes obtuse or rounded. Stamens 2–2.6 mm; anther connective not prolonged, truncate. Ovary 2–2.5 mm; ovules 2; stigma ca. 0.5 mm. Berry blue or reddish purple, pruinose, obovoid or oblong, 4–5 × 2–4 mm; style persistent. Fl. Jul–Nov, fr. Nov–May of following year.

• Forests, forest margins, streamsides, thickets, weedy slopes, open rocky ground; 200–2000 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan.

1a. Leaflets ca. 2 cm or more wide;  
pedicels 3–5 mm ..... 15a. subsp. *eurybracteata*

1b. Leaflets ca. 1.5 cm or less wide;  
pedicels 1.5–2 mm ..... 15b. subsp. *ganpinensis*

**15a. *Mahonia eurybracteata* subsp. *eurybracteata***

宽苞十大功劳(原亚种) kuan bao shi da gong lao (yuan ya zhong)

*Berberis berberidifolia* (P. K. Hsiao & Y. S. Wang) Laferrière; *B. confusa* (Sprague) Laferrière; *B. eurybracteata* (Fedde) Laferrière; *Mahonia berberidifolia* P. K. Hsiao & Y. S. Wang; *M. confusa* Sprague; *M. ganpinensis* (H. Léveillé) Fedde var. *confusa* (Sprague) C. K. Schneider; *M. zemanii* C. K. Schneider.

Shrubs, 0.5–2(–4) m tall. Leaves oblong-oblancheolate, 25–45 × 8–15 cm, with 6–9 pairs of leaflets; leaflets ca. 2 cm or more wide. Pedicel 3–5 mm.

• Broad-leaved evergreen and bamboo forests, forest margins,

thickets, weedy slopes, open rocky ground; 300–2000 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan.

**15b. *Mahonia eurybracteata* subsp. *ganpinensis*** (H. Léveillé) T. S. Ying & Boufford in T. S. Ying, Fl. Reipubl. Popularis Sin. 29: 232. 2001.

安坪十大功劳 an ping shi da gong lao

*Berberis ganpinensis* H. Léveillé, Bull. Soc. Agric. Sarthe 59: 317. 1904; *B. confusa* var. *bournei* (Ahrendt) Laferrière; *Mahonia confusa* var. *bournei* Ahrendt; *M. ganpinensis* (H. Léveillé) Fedde.

Shrubs, (0.4–)0.5(–2) m tall. Leaves oblong, 18–35 × 7–14 cm, with 5–7 pairs of leaflets; leaflets ca. 1.5 cm or less wide. Pedicel 1.5–2 mm.

• Forests, forest margins, streamsides; 200–1200 m. Guizhou, Hubei, Sichuan.

**16. *Mahonia microphylla*** T. S. Ying & G. R. Long, Acta Phytotax. Sin. 37: 282. 1999.

小叶十大功劳 xiao ye shi da gong lao

Shrubs, ca. 1 m tall. Leaves abaxially pale yellowish green, adaxially green, narrowly elliptic, 17–20 × 3.5–4.5 cm, with 10–14 pairs of leaflets, lowest pair similar to others, close to 5–10 mm above base of petiole, abaxially venation inconspicuous, adaxially midvein slightly impressed, lateral veins slightly conspicuous; rachis 2–3 mm in diam.; internodes 1–2 cm; lowest pair of leaflets ovate or narrowly ovate, 1–1.5 cm × 5–9 mm, those above increasing in length from base to apex, becoming 1.5–2.5 × 0.8–1.2 cm, ovate to ovate-elliptic, base slightly oblique, rounded, or slightly cordate, apex acuminate; terminal leaflet larger than others, ovate-elliptic, 3–4.5 × 1–1.5 cm, sessile or petiolule 6–10 mm. Inflorescence 3–12-fascicled racemes, 4–13 cm; bracts of inflorescence ovate-lanceolate, 1–1.5 cm × ca. 5 mm. Pedicel 3–4 mm; floral bracts ovate, 2–2.2 × ca. 1 mm, apex acuminate. Flowers golden yellow, with sweet fragrance. Outer sepals ovate, ca. 2 × 1–1.1 mm; median sepals obovate-oblong, 3.4–3.8 × 2.1–2.2 mm, apex obtuse, rounded; inner sepals elliptic, 4.8–5 × 2.5–3 mm, apically obtuse. Petals narrowly elliptic, 4–4.1 × 1.8–2 mm, base with distinct glands, apex emarginate. Stamens ca. 2.5 mm; anther connective not prolonged, rounded. Ovary ovoid, ca. 2 mm; ovules 2 or 3; style absent. Berry bluish black, slightly pruinose, subglobose, 7–9 × 6–8 mm; style not persistent. Seeds usually 2. Fl. Oct–Nov, fr. Dec–Jan of following year.

• Forests and thickets on mountain ridges, summits of limestone mountains; 600–700 m. Guangxi (Rong'an).

**17. *Mahonia leptodonta*** Gagnepain, Bull. Soc. Bot. France 85: 166. 1938.

细齿十大功劳 xi chi shi da gong lao

*Berberis leptodonta* (Gagnepain) Laferrière.

Shrubs, (0.6–)1–2(–3) m tall. Leaves abaxially yellowish green, adaxially dull green, oblong, 15–18 × 10–14 cm, with 8–12 pairs of contiguous or slightly overlapping leaflets, lowest pair 0.5–1.5 cm above base of petiole, abaxially with raised

veins, adaxially with slightly impressed midvein, lateral veins indistinct; rachis 1–2.5 mm in diam.; internodes 1–3(–7) cm, decreasing in length upward; lowest leaflets suborbicular to ovate, 0.7–4 × 0.8–1.5 cm, those above lanceolate to narrowly ovate-oblong, (4.5–)7–10(–14) × 1.5–3 cm, base rounded to subcordate, margin finely 35–65(–130)-spinulose-serrulate on each side, apex caudate-acuminate. Inflorescence 5- or 6-fascicled racemes, 6–7 cm; bracts of inflorescence not seen. Pedicel 5–8 mm; floral bracts oblong, ca. 2 mm. Sepals yellow; outer sepals ovate, ca. 2 mm, apically acute; median sepals oblong, ca. 5 mm; inner sepals oblong, ca. 5 mm. Petals oblong, ca. 3 mm, base without glands, apex rounded, entire. Stamens ca. 2 mm, dilated below anthers; anther connective not prolonged, shortly mucronate. Ovary ca. 1.8 mm; ovules unknown; style absent. Berry unknown. Fl. Aug–Sep, fr. unknown.

• Forests, bamboo thickets, weedy slopes; 200–1500 m. Sichuan, Yunnan.

The combination of very thin leaflets with up to 130 spinulose serrulations on the margins and petals without glands is unique in *Mahonia* and instantly identifies *M. leptodonta*.

**18. *Mahonia retinervis*** P. K. Hsiao & Y. S. Wang, Acta Phytotax. Sin. 23: 310. 1985.

网脉十大功劳 wang mai shi da gong lao

*Berberis reticulineria* (C. Y. Wu ex S. Y. Bao) Laferrière (1997), not *B. reticulineria* T. S. Ying (1999); *B. retinervis* (P. K. Hsiao & Y. S. Wang) Laferrière (1997), not *B. retinervia* Triana & Planchon ex Weddell (1861); *Mahonia reticulineria* C. Y. Wu ex S. Y. Bao.

Shrubs, ca. 1 m tall. Leaves abaxially pale yellowish green, adaxially dull to slightly shiny green, elliptic, 15–23 × 9–12 cm, with 3–9 pairs of leaflets, lowest pair 0.5–1.2 cm above base of petiole, abaxially with 5–7 basal veins distinctly raised, reticulate veins indistinct, adaxially with distinctly raised reticulation; rachis 1.5–2.2 mm in diam.; internodes 2–5 cm; leaflets sessile, increasing in length and width from base to apex, thickly leathery, lowest pair of leaflets ovate, 1.5–3 × 1.2–2 cm, margin 2–11-spinose-serrate on each side, those above oblong-ovate or ovate-orbicular, 6–8 × 2.8–3.7 cm, base subrounded, oblique, margin indistinctly 3–11-spinose-serrate on each side, apex acuminate; terminal leaflet broadly ovate-orbicular, larger, 7–8 × ca. 5 cm, petiolule 2.5–3.2 cm. Inflorescence 5–10-fascicled racemes, 4–8 cm; bracts of inflorescence ovate-lanceolate, 1.5–2 cm × 7–9 mm. Pedicel 3–4.5 mm; floral bracts ovate to oblong, 2–3 × ca. 1 mm, apex acuminate or obtuse. Flowers pale yellow, ca. 3 mm in diam. Berry bluish black, slightly pruinose, oblong, ca. 7 × 4 mm; style persistent. Seeds 1. Fl. Aug–Sep, fr. Oct–Dec.

• Thickets on rocky slopes, open slopes; 1000–1500 m. Guangxi, Yunnan.

**19. *Mahonia bealei*** (Fortune) Carrière, Fl. Serres 10: 166. 1854.

阔叶十大功劳 kuo ye shi da gong lao

*Berberis bealei* Fortune, Gard. Chron. 1850: 212. 1850; *B. bealei* var. *planifolia* J. D. Hooker; *Mahonia bealei* var. *plani-*

*folia* (J. D. Hooker) Ahrendt; *M. japonica* Thunberg var. *bealei* (Fortune) Fedde; *M. japonica* var. *planifolia* (J. D. Hooker) H. Léveillé.

Shrubs or small trees, 0.5–4(–8) m tall. Leaves abaxially sometimes yellowish green, adaxially dull grayish green, narrowly obovate to oblong, 27–51 × 10–20 cm, with 4–10 pairs of leaflets, lowest pair 0.5–2.5 cm above base of petiole, abaxially very or slightly glaucous, venation indistinct on both surfaces; rachis 2–4 mm in diam.; internodes 3–10 cm, decreasing in length apically; leaflets increasing in length but decreasing in width from base to apex, thick, rigid, lowest pair ovate, 1.2–3.5 × 1–2 cm, with 1 or 2 teeth, those above suborbicular to ovate or oblong, 2–10.5 × 2–6 cm, base rounded, oblique, sometimes cordate, margin with 2–6 teeth on each side, apex cuspidate; terminal leaflet much larger, 7–13 × 3.5–10 cm, petiolule 1–6 cm or leaflets appearing sessile because of a basal lobe. Inflorescence erect; 3–9-fascicled racemes, 7–26 cm; bracts at base of inflorescence ovate to ovate-lanceolate, 1.5–4 × 0.7–1.2 cm. Pedicel 4–6 mm; floral bracts broadly ovate or ovate-lanceolate, 3–5 × 2–3 mm, apically obtuse. Sepals yellow; outer sepals ovate, 2.3–2.5 × 1.5–2.5 mm; median sepals elliptic, 5–6 × 3.5–4 mm; inner sepals oblong-elliptic, 6.5–7 × 4–4.5 mm. Petals obovate-elliptic, 6–7 × 3–4 mm, base with distinct glands, apex slightly emarginate, with rounded lobes. Stamens 3.2–4.5 mm; anther connective 1.1–1.3 mm, rounded to truncate. Ovary oblong-ovoid, ca. 3.2 mm; ovules 3 or 4; style short. Berry dark purple, pruinose, ovoid, ca. 1.5 × 1–1.2 cm; persistent style nearly absent. Fl. Sep–Jun of following year, fr. Mar–May.  $2n = 28^*$ .

• Forests, forest margins, weedy slopes, streamsides, roadsides, thickets; 500–2000 m. Anhui, Fujian, Guangdong, Guangxi, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Zhejiang.

This species is cultivated in Japan, Mexico, the warmer parts of Europe and the United States, and is naturalized in the SE United States.

**20. *Mahonia longibracteata*** Takeda, Notes Roy. Bot. Gard. Edinburgh 6: 236. 1917.

长苞十大功劳 *chang bao shi da gong lao*

*Berberis longibracteata* (Takeda) Laferrière.

Shrubs, 0.5–3 m tall. Leaves abaxially pale yellowish green, adaxially shiny, oblong, 14–23 × 6–11 cm, with 4 or 5 pairs of leaflets, lowest pair ca. 1 cm above base of petiole, abaxially with inconspicuously raised venation, adaxially with fairly close finely impressed reticulation; rachis 2–3 mm in diam.; internodes 2.5–4 cm, decreasing in length upward; lowest leaflets ovate, 1.5–2 × 1.2–2.2 mm, with 2 or 3 teeth on each side, those above oblong to ovate-lanceolate, 3–8 × 2–3.5 cm, base suboblique, cuneate-rounded, margin with (3 or) 4–7(–11) teeth on each side, apex mucronate or acuminate; terminal leaflet largest, petiolule 0.4–1.5 cm. Inflorescence 5–9-fascicled racemes, 6–9 cm; bracts of inflorescence narrowly ovate, 1.5–2 cm × 6–7 mm. Pedicel ca. 5 mm; floral bracts lanceolate, 7–9 × ca. 2.5 mm. Sepals yellow; outer sepals broadly lanceolate, 3–6 × 1–2.5 mm; median sepals oblong, 4–6 × 2–3 mm; inner sepals oblong-obovate, 5–6 × 2.5–3 mm. Petals oblong-elliptic, 4.1–4.5 × 2–3 mm, base with indistinct glands, apex entire. Stamens ca. 3 mm; anther connective narrow, not prolonged,

truncate. Ovary ca. 2.2 mm; ovules 2. Berry bright red, not pruinose, oblong, ca. 10 × 6 mm. Fl. Mar–May, fr. May–Oct.

• Forests, thickets, shaded slopes, sometimes in *Tsuga* forests; 1900–3300 m. SE Sichuan, Yunnan.

**21. *Mahonia polyodonta*** Fedde, Bot. Jahrb. Syst. 31: 126. 1901.

峨眉十大功劳 *e mei shi da gong lao*

*Berberis pachakshirensis* (Ahrendt) Laferrière; *B. polyodonta* (Fedde) Laferrière; *B. veitchiorum* Hemsley & E. H. Wilson; *Mahonia pachakshirensis* Ahrendt; *M. veitchiorum* (Hemsley & E. H. Wilson) C. K. Schneider.

Shrubs, 0.5–2 m tall. Leaves abaxially pale yellowish green, adaxially dull green, slightly shiny, oblong, 15–30 × 5–10 cm, with 4–8 pairs of leaflets, lowest pair 0.5–2.5(–4) cm above base of petiole, abaxially venation reticulate and raised, adaxially venation distinct, veins and veinlets sometimes impressed; rachis 2–2.5 mm in diam.; internodes (1.5–)3–6 cm, decreasing (rarely increasing) in length upward; leaflets sessile, lowest pair obovate-oblong, 2.5–6 × 1.2–2.3 cm, those above elliptic to ovate-oblong, 4–9 × 2–3 cm, base broadly cuneate to rounded, oblique, margin with 10–16 spinose teeth on each side, apex acuminate; terminal leaflet 8–12 × 2.4–3.7 cm, petiolule ca. 2 cm. Inflorescence 3–5-fascicled racemes, 5–6 cm; bracts of inflorescence ovate-lanceolate, ca. 2 × 1 cm. Pedicel 2–3(–6) mm; floral bracts broadly lanceolate, 6–11 × 3–5 mm. Flowers bright to sulfur-yellow. Outer sepals ovate, 3–4 × 2–2.5 mm; median sepals oblong-elliptic, 4–4.5 × 2–2.6 mm; inner sepals oblong, ca. 5 × 2.6–3 mm. Petals oblong, 3.5–4.2 × 2–2.1 mm, base with distinct glands, apex acutely emarginate, lobes rounded. Stamens ca. 3 mm; anther connective not prolonged, truncate. Ovary 2.7–3 mm; ovules 2. Berry bluish black, slightly pruinose, obovoid, 5–5.6 × 3–4 mm; style persistent, short, 0.5–1 mm. Fl. Mar–May, fr. May–Aug.

Forests, scrubby slopes, bamboo thickets, roadsides, rocky areas; (1300–)1800–3100 m. NE Guizhou, W Hubei, Sichuan, Xizang, Yunnan [India (Assam), Myanmar].

**22. *Mahonia napaulensis*** Candolle, Syst. Nat. 2: 21. 1821.

尼泊尔十大功劳 *ni bo er shi da gong lao*

*Berberis acanthifolia* (Wallich ex G. Don) Wallich ex Walpers; *B. gautamae* Laferrière; *B. griffithii* (Takeda) Laferrière; *B. leschenaultii* Wallich ex Wight & Arnott; *B. longlinensis* (Y. S. Wang & P. K. Hsiao) Laferrière; *B. manipurensis* (Takeda) Laferrière; *B. miccia* Walpers, nom. illeg. superfl.; *B. napaulensis* (Candolle) Laferrière; *B. napaulensis* var. *leschenaultii* (Wallich ex Wight & Arnott) J. D. Hooker & Thomson; *B. pomensis* (Ahrendt) Laferrière; *B. salweenensis* (Ahrendt) Laferrière; *Mahonia acanthifolia* Wallich ex G. Don; *M. griffithii* Takeda; *M. leschenaultii* (Wallich ex Wight & Arnott) Takeda; *M. longlinensis* Y. S. Wang & P. K. Hsiao; *M. manipurensis* Takeda; *M. miccia* Buchanan-Hamilton ex D. Don, nom. illeg. superfl.; *M. napaulensis* var. *leschenaultii* (Wallich ex Wight & Arnott) Fedde; *M. pomensis* Ahrendt; *M. salweenensis* Ahrendt; *M. sikkimensis* Takeda.

Shrubs or small trees, 1–7 m tall. Leaves abaxially yellowish green,  $\pm$  shiny, adaxially dark green,  $\pm$  shiny, elliptic to ovate,  $17\text{--}61 \times 7\text{--}19$  cm, with 5–12 pairs of leaflets, lowest 0.5–2(–4) cm above base of petiole, abaxially venation reticulate, raised, adaxially main veins impressed, others impressed or slightly raised; rachis 2–4 mm in diam.; internodes (1–)2–5(–8.3) cm, decreasing in length upward; leaflets oblong, oblong-ovate, or ovate to ovate-lanceolate, lowest  $1.3\text{--}3.7 \times 1.2\text{--}2.4$  cm, those above  $2\text{--}9.5 \times 1.5\text{--}5$  cm, base broadly cuneate, rounded, or sometimes subcordate, oblique, margin with 3–10 teeth on each side, apex acute, acuminate, or cuspidate; terminal leaflet larger,  $6\text{--}10 \times 2\text{--}3$  cm, sessile or petiolule to ca. 2.5 cm. Inflorescence 3–18-fascicled racemes, 7–23 cm; bracts of inflorescence oblong to ovate or ovate-lanceolate,  $1\text{--}3.5 \times 0.5\text{--}1.5$  cm. Pedicel 3–9 mm; floral bracts lanceolate, ovate, or oblong,  $2\text{--}6 \times 1\text{--}3$  mm. Flowers yellow to deep yellow, mildly fragrant. Outer sepals triangular-ovate or ovate to suborbicular,  $2\text{--}3.2 \times 1\text{--}2.4$  mm; median sepals ovate to oblong,  $3.5\text{--}5.2 \times 2\text{--}3.3$  mm; inner sepals elliptic to oblong-elliptic,  $5\text{--}7 \times 2.6\text{--}3.5$  mm. Petals elliptic to oblong-elliptic,  $3.6\text{--}7 \times 1.6\text{--}3.2$  mm, base with glands distinct or sometimes indistinct, apex emarginate to narrowly clawed. Stamens 3.5–7 mm; anther connective prolonged, apiculate to rounded. Ovary 3.2–4 mm; ovules 2–6; style 0.7–1.5 mm. Berry bluish black, pruinose, oblong, 5–7 mm in diam. Fl. Jun–Jan, fr. Jan–Jul.  $2n = 28$ .

Forests, forest margins, thickets; 1200–3000 m. S Sichuan, SE Xizang, Yunnan [Bhutan, India, Myanmar, Nepal; cultivated in Australia, S Europe, Indonesia, Sri Lanka, and other parts of the world].

**23. *Mahonia cardiophylla*** T. S. Ying & Boufford in T. S. Ying, Fl. Reipubl. Popularis Sin. 29: 308. 2001.

宜章十大功劳 *yi zhang shi da gong lao*

Shrubs, 1–2 m tall. Leaves abaxially yellowish green, adaxially dull, elliptic,  $20\text{--}40 \times 8\text{--}15$  cm, with 8–10 pairs of leaflets, lowest pair 1–1.5 cm above base of petiole, abaxially with raised veins, adaxially with conspicuously impressed veins; rachis 2–3 mm in diam.; internodes 2–4.5(–7) cm, decreasing in length apically; leaflets thickly leathery, lowest pair ovate,  $2\text{--}3 \times 1\text{--}2$  cm, with 2 or 3 teeth, those above ovate to ovate-elliptic,  $3\text{--}9 \times 2\text{--}4$  cm, base cordate or sometimes rounded, margin sometimes with 3–8 teeth on each side, apex cuspidate; terminal leaflet  $4\text{--}7 \times 2.3\text{--}3.5$  cm, petiolule 1–2 cm. Inflorescence 5–13-fascicled racemes, 10–17 cm; bracts of inflorescence ovate,  $1\text{--}2 \text{ cm} \times 6\text{--}10$  mm. Pedicel 2.5–3 mm; floral bracts ovate-lanceolate,  $3\text{--}5 \times 1.2\text{--}2$  mm. Sepals yellow; outer sepals triangular-ovate,  $2.7\text{--}2.8 \times 1.5\text{--}1.6$  mm; median sepals ovate,  $4.5\text{--}4.7 \times 2.1\text{--}2.2$  mm; inner sepals elliptic,  $5\text{--}5.1 \times 2.4\text{--}2.5$  mm. Petals obovate,  $4.3\text{--}4.5 \times 2\text{--}2.3$  mm, base with distinct glands, apex incised. Stamens ca. 3.2 mm; anther connective not prolonged, truncate. Ovary ca. 2.5 mm; ovules 2; style ca. 0.5 mm. Berry bluish purple, pruinose, ovoid,  $7\text{--}10 \times 4\text{--}7$  mm; style persistent. Fl. Feb–Apr, fr. May–Jun.

• Forests; 1500–1700 m. Guangxi, S Hunan, SE Sichuan, SE Yunnan.

**24. *Mahonia nitens*** C. K. Schneider in Sargent, Pl. Wilson. 1: 379. 1913.

亮叶十大功劳 *liang ye shi da gong lao*

*Berberis nitens* (C. K. Schneider) Laferrière (1997), not Schrader (1838); *B. schochii* (C. K. Schneider ex Handel-Mazzetti) Laferrière; *Mahonia schochii* C. K. Schneider ex Handel-Mazzetti.

Shrubs, 0.5–1.5 m tall. Leaves shiny, abaxially yellowish green, adaxially dull green, narrowly oblong to elliptic,  $16\text{--}43 \times 4.5\text{--}13$  cm, with 5–8 pairs of leaflets, lowest pair 0.5–2 cm above base of petiole, both surfaces with slightly raised open reticulation; rachis 1.5–2.5 mm in diam.; internodes 2.5–7 cm, longest in middle and decreasing toward both ends or decreasing in length upward; leaflets sessile, basal pair smaller than others, oblong,  $2\text{--}4 \times 1\text{--}1.5$  cm, with 1–3 teeth on each side, those above ovate to elliptic,  $5\text{--}14 \times 1.5\text{--}3.8$  cm, base cuneate, with 1–6 coarse sinuate-spinose teeth on each side, apex caudate-acuminate to attenuate, cuspidate; terminal leaflet longer but sometimes narrower than lateral leaflets, petiolule 2–3 cm. Inflorescence 5–10-fascicled racemes, 9–15 cm; bracts of inflorescence lanceolate to ovate,  $1\text{--}2.5 \text{ cm} \times 5\text{--}8$  mm. Pedicel 1.5–3 mm; floral bracts ovate-lanceolate to ovate or oblong-ovate,  $2\text{--}4 \times 1.3\text{--}2$  mm. Flowers yellow, sometimes pink. Outer sepals ovate to oblong-elliptic,  $1.5\text{--}3.5 \times 1\text{--}1.8$  mm; median sepals narrowly ovate to oblong,  $3.3\text{--}3.5 \times 2\text{--}2.5$  mm; inner sepals elliptic,  $3.5\text{--}4.5 \times 2\text{--}2.7$  mm. Petals oblong to oblong-elliptic,  $2.7\text{--}4 \times 1.5\text{--}2$  mm, base with distinct glands, apex emarginate. Stamens 1.8–3.1 mm; anther connective not or slightly prolonged, truncate or rounded. Ovary 1.3–2.5 mm; ovules 2(or 3). Berry bluish purple, pruinose, ovoid,  $7\text{--}10 \times 4\text{--}7$  mm; style persistent, 1–2 mm. Fl. Jun–Oct, fr. Oct–Mar.

• Mixed forests, thickets, streamsides, slopes; 600–2000 m. Guizhou, Sichuan.

**25. *Mahonia conferta*** Takeda, Notes Roy. Bot. Gard. Edinburgh 6: 230. 1917.

密叶十大功劳 *mi ye shi da gong lao*

*Berberis henryi* Laferrière.

Shrubs or small trees, 1.5–5 m tall. Leaves abaxially  $\pm$  shiny to dull pale green, adaxially shiny, elliptic to narrowly oblanceolate,  $8\text{--}38 \times 5\text{--}10$  cm, thickly leathery, with 8–18 overlapping pairs of leaflets, lowest pair ca. 1 cm above base of petiole, abaxially loosely veined, adaxially veins indistinct; internodes decreasing in length upward, 1.7–3.5 cm; leaflets sessile, increasing in length upward, width decreasing slightly upward, so that leaflet shape changes from broadly ovate to narrowly ovate or oblong,  $2.5\text{--}7 \times 2\text{--}3$  cm, thick, rigid, base truncate, oblique, proximal margin with 2 or 3 teeth, distal margin with 3–5 teeth, apex a bent cup,  $1.5\text{--}2.3 \text{ cm} \times 5\text{--}8$  mm; terminal leaflet ca.  $7 \times 3$  cm, petiolule ca. 1.2 cm. Inflorescence 3–6-fascicled racemes, 11–18 cm; bracts of inflorescence ovate to ovate-lanceolate,  $10\text{--}15 \times 5\text{--}7$  mm. Pedicel 5–5.5 mm; floral bracts broadly lanceolate,  $4.5\text{--}5 \times 1.6\text{--}2.3$  mm. Sepals yellow; outer sepals oblong-ovate,  $2.7\text{--}3 \times 1.5\text{--}2.2$  mm; median sepals broadly elliptic,  $5\text{--}5.1 \times \text{ca. } 3$  mm; inner sepals oblong-ovate,  $8\text{--}9 \times 4\text{--}4.5$  mm. Petals oblong-obovate,  $7\text{--}8 \times 3.5\text{--}4.2$  mm, base with distinct glands, apex emarginate. Stamens ca. 5 mm; anther connective prolonged, shortly apiculate. Ovary ellipsoid, ca. 5.5 mm; ovules 3; style ca. 1.5 mm. Berry ellipsoid, slightly pruinose, ca.  $10 \times 5\text{--}6$  mm; style persistent. Fl. Jun–Oct, fr. Oct–Dec.

- Forests, shaded places on slopes; 1500–2100 m. Yunnan.

*Mahonia conferta* is probably not distinct from *M. napaulensis*, with which it should be combined.

**26. *Mahonia imbricata*** T. S. Ying & Boufford in T. S. Ying, Fl. Reipubl. Popularis Sin. 29: 309. 2001.

遵义十大功劳 zun yi shi da gong lao

Shrubs, 1.5–4 m tall. Leaves abaxially yellowish green, adaxially dull, narrowly obovate-elliptic to oblong, 15–20 × 7–10 cm, with 5–7 pairs of leaflets, lowest pair ca. 5 mm above base of petiole, abaxially with raised veins, adaxially with impressed veins; rachis 1.5–2 mm in diam.; internodes 1.5–2.5 cm, decreasing slightly in length apically; leaflets thick, lowest suborbicular, 1–3 × 1–1.5 cm, margin 2- or 3-spinose-serrate, those above narrowly ovate to ovate-elliptic, 3–6.5 × 1.3–2.5 cm, base rounded to slightly cordate, oblique, margin with 2–5 teeth on each side, apex cuspidate; terminal leaflet larger than others, ca. 7.5 × 3 cm, petiolule ca. 1.5 cm. Inflorescence 9- or 10-fascicled racemes, 8–13 cm; bracts of inflorescence ovate, 1.5–2 cm × 5–7 mm. Pedicel 3–4 mm; floral bracts ovate, 3.5–4 × 2–2.2 mm, apex obtuse. Sepals yellow; outer sepals ovate, 2.7–3 × 1.3–1.5 mm; median sepals elliptic, ca. 4.5 × 2.5–2.6 mm; inner sepals elliptic to oblong, 5–5.2 × ca. 3 mm. Petals elliptic, 4.5–5 × ca. 2 mm, base with distinct glands, apex incised. Stamens 2.5–2.8 mm; anther connective not prolonged, truncate. Ovary 2.5–3 mm; ovules 2. Immature berry pruinose. Fl. Mar–Apr, fr. Apr–Jul.

- Slopes in evergreen broad-leaved forests, thickets; 1200–2400 m. Guizhou, Yunnan.

**27. *Mahonia bodinieri*** Gagnepain, Bull. Soc. Bot. France 55: 85. 1908.

小果十大功劳 xiao guo shi da gong lao

*Berberis bodinieri* (Gagnepain) Laferrière (1997), not H. Léveillé (1911); *B. elegans* H. Léveillé (1904), not K. Koch (1869); *B. japonica* (Thunberg) R. Brown var. *trifurca* (Lindley & Paxton) Rehder; *B. leveilleana* (C. K. Schneider) Laferrière; *B. trifurca* Lindley & Paxton; *Mahonia elegans* Rehder; *M. japonica* (Thunberg) Candolle var. *trifurca* (Lindley & Paxton) Ahrendt; *M. leveilleana* C. K. Schneider.

Shrubs or small trees, 0.5–4 m tall. Leaves abaxially yellowish green, adaxially dark green, lucid, obovate-oblong, 20–50 × 10–25 cm, with 8–13 pairs of leaflets, lowest pair close to base of petiole, abaxially coarsely reticulate, with raised veins; rachis stout, 2–4 mm in diam.; internodes (2–)5–9 cm, decreasing in length upward; leaflets shortly petiolulate or sessile, lowest suborbicular, 2.5–3 × 1.5–2.5 cm, those above becoming oblong to broadly lanceolate, 5–16.5 × 2.5–5.5 cm, base oblique, truncate to cuneate, margins of lowest leaflets with 1–3 coarse teeth 5–15 mm, middle leaflets with 3–10 smaller teeth 3–10 mm, upper leaflets with few (sometimes 1 or 2) fine teeth 2–3 mm; terminal leaflet 5–15 × 1.5–5.5 cm, petiolule 1–2 cm. Inflorescence 5–11-fascicled racemes, 10–22(–25) cm; bracts of inflorescence lanceolate, 2–3 cm × 5–7 mm. Pedicel 1.5–5 mm; floral bracts narrowly ovate, 1.5–4 × 0.7–2.5 mm. Sepals yellow; outer sepals ovate, ca. 3 × 2 mm;

median sepals elliptic, 4.5–5 × ca. 2.5 mm; inner sepals narrowly elliptic, ca. 5.5 × 3 mm. Petals oblong, subequal to median sepals, 4.5–5 × 2–2.4 mm, base with indistinct glands, apex emarginate. Stamens 2.2–3 mm; anther truncate and 3-denticulate at apex; anther connective not prolonged. Ovary ca. 2 mm; ovules 2; style absent. Berry purplish black, pruinose, globose or sometimes pyriform, 4–6 mm in diam.; style not persistent. Fl. Jun–Sep, fr. Aug–Dec.

- Broad-leaved evergreen forests, mixed broad-leaved evergreen and deciduous forests, *Juniperus* forests, scrub thickets, forest margins, streambanks; 100–1800 m. Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Zhejiang.

**28. *Mahonia sheridaniana*** C. K. Schneider in Sargent, Pl. Wilson. 1: 384. 1913.

长阳十大功劳 chang yang shi da gong lao

*Berberis fargesii* (Takeda) Laferrière; *B. huiliensis* (Handel-Mazzetti) Laferrière; *B. sheridaniana* (C. K. Schneider) Laferrière; *Mahonia fargesii* Takeda; *M. huiliensis* Handel-Mazzetti.

Shrubs, 0.3–3 m tall. Leaves abaxially pale, adaxially dull to ± shiny, elliptic to oblong-ob lanceolate, 17–36 × 8–14 cm, with 4–9 pairs of leaflets, lowest pair 7–10 mm above base of petiole, abaxially with venation slightly branched and slightly raised, adaxially indistinctly veined; internodes 1.5–5 cm, decreasing in length upward; leaflets separate or sometimes contiguous, ovate to ovate-lanceolate, thick, rigid, lowest pair 1.2–3 × 0.8–1.5 cm, increasing in size upward and becoming 3–9.5 × 1.5–3.6 cm, base broadly rounded to subtruncate or subcordate, slightly oblique, margin with 2–5 teeth on each side, apex acute, cuspidate; terminal leaflet equal to or much larger than others, 6.5–11 × 2.5–4 cm, petiolule 0.8–2.5 cm. Inflorescence 4–10-fascicled racemes, 5–18 cm; bracts of inflorescence broadly lanceolate to ovate, 1–2 × 0.5–1.2 cm. Pedicel 3–5 mm; floral bracts ovate, 2–3.5 × 1–1.7 mm. Sepals yellow; outer sepals narrowly ovate or ovate to ovate-lanceolate, 2.5–4.5 × 1.5–1.6 mm; median sepals ovate to ovate-lanceolate, 4.5–6 × 2–3 mm; inner sepals elliptic, 5.5–8.2 × 3–3.8 mm. Petals obovate or elliptic to oblong, 5–6.5 × 2–2.8 mm, base with distinct glands, apex emarginate. Stamens 3–4 mm; anther connective not prolonged, truncate. Ovary 2–3 mm; ovules 2 or 3; style ca. 0.3 mm. Berry bluish black or dark purple, pruinose, ovoid to ellipsoid, 8–10 × 4–7 mm; style persistent, short. Fl. Mar–Apr, fr. Apr–Jun.

- Evergreen broad-leaved forests, bamboo forests, thickets, trail-sides, slopes; 1200–2600 m. SC Hubei, Sichuan.

**29. *Mahonia japonica*** (Thunberg) Candolle, Syst. Nat. 2: 22. 1821.

台湾十大功劳 tai wan shi da gong lao

*Ilex japonica* Thunberg in Murray, Syst. Veg., ed. 14, 168. 1784; *Berberis japonica* (Thunberg) R. Brown; *B. japonica* var. *gracillima* (Fedde) Rehder; *B. tikushiensis* (Hayata) Laferrière; *Mahonia japonica* var. *gracillima* Fedde; *M. tikushiensis* Hayata.

Shrubs, ca. 1 m tall. Leaves abaxially pale green, adaxially deep green, oblong, 15–27 × 5–10 cm, with 4–6 pairs of sessile

leaflets, lowest pair ca. 0.5 cm above base of petiole, abaxially not pruinose, with branched raised venation; rachis 2–3 mm in diam.; internodes 2–4 cm, decreasing in length upward; leaflets ovate, lowest  $1.8\text{--}2.7 \times 1.2\text{--}2$  cm, becoming larger upward,  $3.5\text{--}7 \times 2\text{--}4$  cm, base oblique and  $\pm$  cordate, margin with 2–4 teeth on proximal side, 3–7 teeth on distal margin, apex acute; terminal leaflet larger,  $\pm$  cordate at base, petiolule 1–2 cm. Inflorescence 5–10-fascicled drooping racemes, 5–10 cm; bracts of inflorescence ovate to ovate-lanceolate,  $0.8\text{--}1.5 \times 4\text{--}7$  mm, apically acuminate. Pedicel 6–7 mm; floral bracts ovate,  $3.5\text{--}4 \times 2\text{--}2.5$  mm, apex obtuse. Sepals yellow; outer sepals ovate,  $2.5\text{--}2.7 \times 2.2\text{--}2.3$  mm, apically obtuse; median sepals broadly obovate,  $3.3\text{--}3.5 \times 2.8\text{--}2.9$  mm; inner sepals obovate-oblong,  $6\text{--}6.4 \times 3.4\text{--}3.5$  mm. Petals elliptic,  $5.5\text{--}6 \times 2.5\text{--}2.6$  mm, base with distinct glands, apex emarginate. Stamens ca. 3.3 mm; anther connective slightly prolonged, rounded. Ovary ca. 3.4 mm; ovules 4–7. Berry dark purple,  $\pm$  pruinose, ovoid, ca.  $8 \times 4$  mm; style persistent and short, or not persistent. Fl. Dec–Apr, fr. Apr–Aug.  $2n = 28^*$ .

- Forests, thickets; 800–3400 m. Taiwan.

This species is cultivated extensively in Japan and sporadically in the warmer parts of Europe and the United States.

**30. *Mahonia fordii*** C. K. Schneider in Sargent, Pl. Wilson. 1: 383. 1913.

北江十大功劳 bei jiang shi da gong lao

*Berberis fordii* (C. K. Schneider) Laferrière.

Shrubs, 0.8–1.5 m tall. Leaves abaxially pale, adaxially dull, oblong to narrowly oblong,  $20\text{--}35 \times 7\text{--}11$  cm, with 5–9 pairs of remote leaflets, lowest pair 1–1.5 cm above base of petiole, abaxially not veined, adaxially slightly veined; rachis  $1.5\text{--}2.5$  mm in diam.; internodes decreasing in length apically, 2–7 cm; lowest pair of leaflets narrowly ovate,  $3.5\text{--}4.5 \times 1.5\text{--}2.4$  cm, those above narrowly ovate to elliptic-ovate, equal in size,  $5\text{--}8 \times 1.8\text{--}2.7$  cm, base broadly rounded to cuneate, margin 2–9-spinose-serrate, apex acuminate; terminal leaflet similar to others but slightly larger, petiolule 1.5–2 cm. Inflores-

cence 5–7-fascicled racemes, 6–15 cm; bracts of inflorescence ovate to ovate-lanceolate,  $1\text{--}1.5 \times 6\text{--}8$  mm. Pedicel 2.5–4 mm; floral bracts broadly ovate,  $1.5\text{--}2 \times 0.6\text{--}1$  mm. Sepals yellow; outer sepals ovate, ca.  $2 \times 1.6$  mm; median sepals elliptic,  $3.5\text{--}4 \times 2.5\text{--}3$  mm, apically obtuse; inner sepals obovate-elliptic,  $4\text{--}4.5 \times 3$  mm. Petals elliptic, ca.  $4 \times 2.3$  mm, base with distinct glands, apex emarginate. Stamens ca. 2.6 mm; anther connective not prolonged, truncate. Ovary ca. 2.3 mm; ovules 2. Berry (immature only) obovoid, ca.  $7 \times 5$  mm; style persistent, short. Fl. Jul–Sep, fr. Oct–Dec.

- Forests, thickets; 800–900 m. Chongqing, Guangdong.

**31. *Mahonia hancockiana*** Takeda, Notes Roy. Bot. Gard. Edinburgh 6: 231. 1917.

滇南十大功劳 dian nan shi da gong lao

*Berberis hancockiana* (Takeda) Laferrière.

Shrubs, ca. 1.5 m tall. Leaves abaxially pale, adaxially dull grayish green, oblong-ob lanceolate,  $19\text{--}32 \times 10\text{--}15$  cm, with 4–9 pairs of sessile leaflets, lowest pair 0.5–2 cm above base of petiole, abaxially with branched veins and primary veins  $\pm$  raised, adaxially  $\pm$  not veined; rachis ca. 2 mm in diam.; internodes decreasing upward, 2–6 cm; lowest leaflets narrowly ovate,  $1.5\text{--}4 \times 1\text{--}2$  cm, middle leaflets elliptic,  $3\text{--}11 \times 1.8\text{--}2.8$  cm, base broadly cuneate or rounded, margin with apiculate to shallowly serrate teeth, apex cuspidate-acuminate; terminal leaflet similar to middle leaflets, petiolule 1–2 cm. Inflorescence 4–15-fascicled racemes, 12–19 cm; bracts of inflorescence lanceolate, ca.  $2.5 \times 0.5$  cm. Pedicel 2–3 mm; floral bracts ovate,  $3\text{--}3.5 \times 1.5\text{--}1.8$  mm. Flowers deep yellow (?or violet). Outer sepals ovate,  $2\text{--}3 \times 1.5\text{--}2$  mm, apically obtuse; median sepals ovate-elliptic,  $4.5\text{--}5 \times 2.4\text{--}3$  mm; inner sepals obovate-elliptic,  $4.6\text{--}6 \times 2.6\text{--}3.2$  mm. Petals elliptic,  $4\text{--}4.4 \times 1.8\text{--}2$  mm, base with distinct glands, apex emarginate with rounded lobes. Stamens ca. 3.2 mm; anther connective prolonged, rounded. Ovary ca. 3.5 mm; ovules 4 or 5; style ca. 1 mm. Berry unknown. Fl. Feb, fr. unknown.

- Mixed forests, rocky hills; 1000–3200 m. SE Yunnan.

### Insufficiently known species

***Mahonia annamica*** Gagnepain, Bull. Soc. Bot. France 55: 84. 1908.

*Berberis annamica* (Gagnepain) Laferrière.

This species was described from Vietnam and reported for Guangxi. We have not seen specimens from Guangxi and are unsure of its placement.

***Mahonia bijuga*** Handel-Mazzetti, Symb. Sin. 7: 331. 1931.

This species was described from Sichuan ("Lose-schan s von S of Ningyüen," 3300 m), based on *H. v. Handel-Mazzetti 1430* (?W), but we have not seen the type.

***Mahonia dulongensis*** H. Li, Ann. Bot. Fenn. 46: 469. 2009.

This species was recently described from Yunnan (Gongshan, Dulong Jiang, 1620 m, 5 Nov 2005), based on *Gaoligongshan Biodiversity Survey 21834* (holotype, KUN; isotypes, CAS, E).

***Mahonia hypoleuca*** Takeda, Notes Roy. Bot. Gard. Edinburgh 6: 238. 1917.

*Berberis nivea* (C. K. Schneider) Laferrière; *Mahonia nivea* C. K. Schneider.

Both *Mahonia hypoleuca* and *M. nivea* are based on *A. Henry 9863*, from Mengtze, Yunnan, which is without flowers and fruit and the only collection known.

***Mahonia jingxiensis*** J. Y. Wu, M. Ogisu, H. N. Qin & S. N. Lu, Bot. Stud. (Taipei) 50: 487. 2009.

This species was recently described from Guangxi (Jingxi Xian, Sanhe Xiang, Niansi Tun, ca. 500 m, 23 Oct 2007), based on *J. Y. Wu & M. Ogisu 1023* (holotype, PE; isotype, IBK).

***Mahonia lushuiensis*** T. S. Ying & H. Li, Ann. Bot. Fenn. 46: 472. 2009.

This species was recently described from Yunnan (Lushui County, Luzhang Township, 325 m, 19 May 2005), based on *Gaoligongshan Biodiversity Survey 24522* (holotype, KUN; isotypes, CAS, E).

#### 4. SINOPODOPHYLLUM T. S. Ying, Acta Phytotax. Sin. 17(1): 15. 1979.

桃儿七属 tao er qi shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

Herbs, perennial. Rhizomes stout, shortly nodose; aerial stems erect, with large brown scales at base. Leaves 2, simple, petiolulate; base cordate, apex 3–5-dissected, usually to ca. midway or more, sometimes partitions 2- or 3-lobed. Inflorescence terminal. Flowers appearing before leaves, bisexual, solitary, pink, large. Sepals 6, caducous. Petals 6, open. Anthers basifixed, dehiscing longitudinally. Pistils 1; ovary ellipsoid, 1-loculed, with numerous ovules. Fruit a berry. Seeds numerous, without fleshy arils. Pollen grains in tetrads.  $2n = 12^*$ ,  $14^*$ .

One species: E Afghanistan, Bhutan, China, N India, Kashmir, Nepal, and Pakistan.

*Sinopodophyllum* was included within *Podophyllum* by Shaw (in Stearn, Gen. *Epimedium*, 258. 2002).

**1. Sinopodophyllum hexandrum** (Royle) T. S. Ying in C. Y. Wu, Fl. Xizang. 2: 119. 1985.

桃儿七 tao er qi

*Podophyllum hexandrum* Royle, Ill. Bot. Himal. Mts. 1: 64. 1834; *P. emodi* Falconer ex Royle; *P. emodi* var. *chinense* Sprague; *Sinopodophyllum emodi* (Falconer ex Royle) T. S. Ying.

Plants 20–50 cm tall. Stems solitary, angulate, glabrous. Leaf petiole 10–25 cm; leaf blade orbicular, not peltate, 11–20 × 18–30 cm, thinly papery, abaxially pubescent, adaxially glabrous, base cordate, 3–5-dissected to ca. midway or more, often

partitions 2- or 3-lobed, apex of lobes acute or acuminate, margin entire or coarsely dentate, teeth apiculate. Petals obovate or obovate-oblong,  $2.5\text{--}3.5 \times 1.5\text{--}1.8$  cm, apex slightly sinuate. Stamens ca. 1.5 cm; filaments slightly shorter than anthers, 4–6 mm; anthers linear,  $5\text{--}7 \times 1.2\text{--}1.9$  mm, apex rounded, obtuse; anther connective not prolonged. Pistils ca. 1.2 cm; ovary with parietal placentation; style short, 1–3 mm. Berry red, ovoid-globose,  $4\text{--}7 \times 2.5\text{--}4$  cm, fleshy. Seeds maroon, ovoid-triangular. Fl. May–Jun, fr. Jul–Sep.

Forests, thickets, wet forest margins, weedy places, meadows; 2200–4300 m. Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [E Afghanistan, Bhutan, N India, Kashmir, Nepal, Pakistan].

#### 5. PLAGIORHEGMA Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 34. 1859.

鲜黄连属 xian huang lian shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

Herbs, perennial. Rhizome slender, with dense fibrous roots branched; aerial stems absent. Leaves basal, simple, long petiolate; leaf blade suborbicular in gross outline, not lobed, glabrous, base deeply cordate, venation palmate. Inflorescence terminal; flowers solitary, pale purple. Sepals 6, caducous, petal-form. Petals 6. Stamens opposite petals; filaments flat. Pistils 1; stigma disciform; ovules numerous, placentation marginal. Capsules leathery, obliquely dehiscing longitudinally. Seeds numerous, black.  $2n = 12$ .

One species: China, Korea, and Russia.

*Plagiorhegma* was included within *Jeffersonia* by Stearn (Gen. *Epimedium*, 222. 2002).

**1. Plagiorhegma dubium** Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 34. 1859.

鲜黄连 xian huang lian

*Jeffersonia dubia* (Maximowicz) Benth. & J. D. Hooker ex Baker & S. Moore; *J. manchuriensis* Hance.

Plants 10–30 cm tall, glabrous. Rhizome with cross section bright yellow, producing 4–6 foliage leaves or flowering shoots per year; aerial stems absent. Leaf petiole 10–30 cm, glabrous; leaf blade abaxially grayish green, suborbicular, 6–8 × 9–10 cm, membranous, base deeply cordate, margin entire or

repand, apex obtusely emarginate, apiculate. Scapes 15–20 cm. Sepals caducous, purplish red, oblong-lanceolate, ca. 6 mm, striate, glabrous. Petals 6, obovate, ca.  $1 \times 0.6$  cm, base attenuate. Stamens ca. 6 mm; filaments flat, ca. 2 mm; anthers ca. 4 mm. Pistil ca. 4 mm, glabrous; ovules numerous; style ca. 2 mm; stigma rugosely undulate on margin. Capsules yellowish brown, fusiform, ca. 1.5 cm, obliquely dehiscing from top toward base; style ca. 3 mm. Fl. May–Jun, fr. Sep–Oct.

Needle-leaved forests, mixed forests, thickets, shaded and wet places on slopes; 500–1100 m. Jilin, Liaoning [Korea, Russia (along Amur River)].

#### 6. DYSOSMA Woodson, Ann. Missouri Bot. Gard. 15: 338, t. 46. 1928.

鬼臼属 gui jiu shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

Herbs, perennial. Rhizomes creeping, short, stout, with numerous fibrous roots; aerial stems erect, simple, glabrous, with large

scales at base. Leaves peltate, large, 3–9-parted or lobed. Inflorescence of few fascicled flowers or a subumbel. Flowers perfect, nutant. Sepals 6, membranous, caducous. Petals 6, dark purplish red. Filaments decumbent, flat; anthers introrsely dehiscent; anther connective wide and usually prolonged; pollen grains 3-colpate, subspheroidal or suboblate, sexine thicker than nexine, foveolate. Pistils solitary; ovary 1-loculed; ovules numerous; stigma globose. Berry red or purplish red. Seeds numerous, without arils.  $2n = 12$ .

Between seven and ten species: China and N Vietnam; seven species (six endemic) in China; three additional species (all endemic, described under *Podophyllum*) are insufficiently known.

*Dysosma* was included within *Podophyllum* by Shaw (in Stearn, Gen. *Epimedium*, 269. 2002).

- 1a. Leaves opposite, flowers attached at base of petiole.
  - 2a. Lobes of leaf apically 3-fid; petals oblong, to 6 cm ..... 7. *D. delavayi*
  - 2b. Lobes of leaf apically not divided; petals obovate-elliptic, ca. 3 cm.
    - 3a. Leaf blade glabrous, palmately lobed, lobes triangular-ovate ..... 5. *D. pleiantha*
    - 3b. Leaf blade pubescent on both surfaces, palmately parted, lobes cuneate-oblong ..... 6. *D. tsayuenensis*
- 1b. Leaves alternate, flowers attached near or far from base of blade.
  - 4a. Flowers attached far from base of blade; petals obovate, 1.4–1.6 cm ..... 4. *D. aurantiocaulis*
  - 4b. Flowers attached near base of blade; petals oblong, lanceolate, or obovate, 2.4–10 cm.
    - 5a. Leaf lobes apically 3-fid; petals elliptic-lanceolate ..... 1. *D. majoensis*
    - 5b. Leaf lobes apically not divided; petals spatulate-obovate or oblong-loriform.
      - 6a. Leaves 4–9-lobed or deeply divided; petals spatulate-obovate; berry ca. 4 cm, ellipsoid or ovoid ..... 2. *D. versipellis*
      - 6b. Leaves mostly undivided; petals oblong-loriform; berry 1.7–2.7 cm, globose ..... 3. *D. difformis*

**1. *Dysosma majoensis*** (Gagnepain) M. Hiroe, Pl. Basho's & Buson's Hokku Lit. 8(3): 328. 1973 [*"majoense"*].

贵州八角莲 *gui zhou ba jiao lian*

*Podophyllum majoense* Gagnepain, Bull. Soc. Bot. France 85: 167. 1938; *Dysosma guangxiensis* Y. S. Wang; *D. lichuanensis* Z. Zheng & Y. J. Su; *D. majoensis* var. *emeiensis* J. L. Wu & P. Zhuang; *P. guangxiense* (Y. S. Wang) J. M. H. Shaw.

Plants ca. 50 cm tall. Rhizomes brown, stout, nodose, fibrous roots numerous. Stems erect, angulate, puberulent. Leaves alternate; petiole 4–20 cm; leaf blade abaxially grayish purple, adaxially dark green, reniform-orbicular, 10–20 × ca. 20 cm, thinly papery, abaxially puberulent, deeply 4–6-divided, lobes 3-fid at apex, margin remotely serrulate. Inflorescence a fascicle or sometimes an umbel. Pedicel grayish white, 1–3 cm, long puberulent. Flowers 2–5, attached near base of blade, purple. Sepals pale green, elliptic, unequal in size, 7–15 mm, glabrous. Petals elliptic-lanceolate, ca. 9 × 1.5 cm. Stamens ca. 1.8 cm; filaments nearly as long as or sometimes shorter than anthers; anther connective conspicuously prolonged. Ovary oblong; stigmas shield-shaped, ca. 1.5 mm in diam. Berry red when mature, oblong. Fl. Apr–Jun, fr. Jun–Sep.

• Forests, bamboo forests; 1300–1800 m. Guangxi, Guizhou, Hubei, Sichuan, Yunnan.

The specific epithet is often misspelled "*majorensis*" in Chinese publications.

**2. *Dysosma versipellis*** (Hance) M. Cheng ex T. S. Ying, Acta Phytotax. Sin. 17(1): 18. 1979.

八角莲 *ba jiao lian*

*Podophyllum versipelle* Hance, J. Bot. 21: 362. 1883; *P. esquirolii* H. Léveillé.

Plants 40–150 cm tall. Rhizomes stout, with numerous fibrous roots; aerial stems erect, pale green, unbranched, glabrous. Leaves alternate; petiole of lower leaves 12–25 cm, peti-

ole of upper leaves 1–3 cm; leaf blade suborbicular, to 30 cm in diam., thinly papery, abaxially pubescent, venation obviously raised, adaxially glabrous, palmately 4–9-lobed; lobes broadly triangular, ovate, or ovate-oblong, 2.5–4 cm, base 5–7 cm wide, margin remotely serrate, apex acute, not lobed. Inflorescence 5–8-fascicled flowers. Pedicel pendulous, slender, pubescent. Flowers attached near base of blade, red. Sepals oblong-elliptic, 0.6–1.8 cm × 3–8 mm, outside puberulent, inside glabrous, apex acute. Petals spatulate-obovate, ca. 2.5 × 0.8 cm, glabrous. Stamens ca. 1.8 cm; filaments shorter than anthers; anther connective slightly prolonged, glabrous, acute. Ovary ellipsoid, glabrous; style short; stigma shield-shaped. Berry ellipsoid or ovoid, ca. 4 × 3.5 cm. Seeds numerous. Fl. Mar–Jun, fr. May–Sep.  $2n = 12^*$ .

• Forests, thickets, shaded and wet places by streams, bamboo forests; 300–2400 m. Anhui, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shanxi, Yunnan, Zhejiang.

*Podophyllum versipelle* was treated by Shaw (in Stearn, Gen. *Epimedium*, 276–282. 2002) as comprising two subspecies: subsp. *versipelle* ("Leaf lobes elobulate, upper leaf with 4–7 lobes on one side, lobes shallow 1/5–1/3 of radius; inflorescence 4–9 flowered; pedicels with hairs") and subsp. *boreale* J. M. H. Shaw ("Leaf lobes often with lobules, upper leaf with 4 or 5 lobes on one side, lobes deep, 1/2–2/3 of radius; inflorescence 4–10(–19) flowered; pedicels glabrous or rarely hairy").

Within *Podophyllum versipelle* subsp. *boreale*, Shaw (loc. cit.) recognized two varieties: *P. versipelle* var. *boreale* (lobes of leaves with convex margins, lobes entire or trilobulate; pedicels and leaves abaxially glabrous) and *P. versipelle* var. *sichuanense* J. M. H. Shaw (lobes of leaves with concave margins, lobes usually trilobulate; pedicels and leaves abaxially hairy).

**3. *Dysosma difformis*** (Hemsley & E. H. Wilson) T. H. Wang ex T. S. Ying, Acta Phytotax. Sin. 17(1): 19. 1979.

小八角莲 *xiao ba jiao lian*

*Podophyllum difforme* Hemsley & E. H. Wilson, Bull. Misc. Inform. Kew 1906: 152. 1906; *Dysosma tonkinensis*

(Gagnepain) Hiroe; *P. tonkinense* Gagnepain; *P. triangulum* Handel-Mazzetti.

Plants 15–30 cm tall. Rhizomes usually terete, slender, with numerous fibrous roots. Stems erect, sometimes purplish red, glabrous. Leaves alternate, obliquely peltate, unequal in size, sharply diversiform; petioles unequal in length, 3–11 cm, glabrous; leaf blade adaxially sometimes purplish red, 5–11 × 7–15 cm, thinly papery, both surfaces glabrous, base often rounded, entire or lobed, margin sparsely inconspicuously serrate. Inflorescence 2–5-fascicled flowers. Pedicel 1–2 cm, nodding, sparsely white pubescent. Flowers attached near base of blade. Sepals oblong-lanceolate, 2–2.5 cm × 2–5 mm, outside pubescent, inside glabrous, apically acuminate. Petals pale brownish red, oblong-lanceolate, 4–5 × 0.8–1 cm, glabrous, apex rounded. Stamens ca. 2 cm; filaments ca. 0.8 cm; anthers ca. 1.2 cm; anther connective conspicuously prolonged. Pistil ca. 0.9 cm; ovary urceolate; style ca. 2 mm; stigma shield-shaped. Berry globose, 1.7–2.7 cm. Fl. Apr–Jun, fr. Jun–Sep.

Dense forests; 700–1800 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan [Vietnam].

Shaw (in Stearn, Gen. *Epimedium*, 280. 2002) treated *Podophyllum tonkinense* as a synonym of *P. versipelle* subsp. *versipelle*.

**4. *Dysosma aurantiocaulis*** (Handel-Mazzetti) Hu, Bull. Fan Mem. Inst. Biol., Bot. 8: 37. 1937.

云南八角莲 yun nan ba jiao lian

*Podophyllum aurantiocaulis* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 61: 163. 1924; *Dysosma furfuracea* S. Y. Bao; *D. mairei* (Gagnepain) Hiroe; *P. aurantiocaulis* subsp. *furfuraceum* (S. Y. Bao) J. M. H. Shaw; *P. mairei* Gagnepain; *P. sikkimense* R. Chatterjee & Mukerjee; *P. sikkimense* var. *majus* R. Chatterjee & Mukerjee.

Plants 30–50 cm tall. Rhizomes brown, short, stout, with numerous fibrous roots. Stems erect, pale stramineous, 3–5 mm in diam., angulate, glabrous. Leaves alternate; petiole of lower leaves 12–22 cm, petiole of upper leaves 3–7 cm, all petioles angulate; leaf blade abaxially pale green, adaxially deep green, suborbicular or reniform in gross outline, sharply diversiform, 7–8 × 13–15 cm, thinly papery, abaxially on veins scurfy squamulate, sometimes mixed pubescent, adaxially glabrous, 5–8-lobed, lobe margin scarcely inconspicuously serrulate. Inflorescence 2–5-fascicled flowers. Pedicel nutant, 3–6 cm, glabrous. Flowers attached far from base of blade, purple or pink. Sepals narrowly oblong, 10–12 × 4–5 mm, glabrous. Petals obovate or suborbicular, 1.4–1.6 × 1–1.2 cm, apex rounded. Stamens ca. 8 mm; filaments flat, shorter than anthers; apex of anther connective not prolonged. Pistil ca. 8 mm; ovary subglobose; style ca. 1 mm; stigma disciform, margin rugosely undulate. Berry pale green (immature), subglobose, ca. 8 mm in diam. Seeds numerous. Fl. May–Jun, fr. Jun–Aug.

• Deciduous broad-leaved forests; 2800–3000 m. Yunnan [Myanmar].

Shaw (in Stearn, Gen. *Epimedium*, 299–306. 2002) recognized two subspecies of *Podophyllum aurantiocaulis*, which he separated into subsp. *aurantiocalis* (“Leaf lobes long, obovate to lanceolate; sinuses deep, penetrating 1/2–2/3 of radius; flowers usually in petiole fork; an-

thers 5–7.5(–9) mm long”) and subsp. *furfuraceum* (“Leaf lobes short, triangular, sinuses shallow penetrating 1/4–1/3 of radius; flowers borne on petiole; anthers 3.5–4.5 mm”).

**5. *Dysosma pleiantha*** (Hance) Woodson, Ann. Missouri Bot. Gard. 15: 339. 1928.

六角莲 liu jiao lian

*Podophyllum pleianthum* Hance, J. Bot. 21: 175. 1883; *Dysosma chengii* (S. S. Chien) Hiroe; *D. hispida* (K. S. Hao) Hiroe; *P. chengii* S. S. Chien; *P. hispidum* K. S. Hao; *P. onzoi* Hayata; *P. pleianthum* var. *album* Masamune.

Plants 20–60(–80) cm tall. Rhizomes creeping, stout, nodose, with numerous fibrous roots; aerial stems erect, solitary, glabrous. Leaves opposite; petiole 10–28 cm, angulate, glabrous; leaf blade abaxially pale yellowish green, adaxially dark green, usually shiny, suborbicular in gross outline, 16–33 cm in diam., papery, both surfaces glabrous, 5–9-lobed; lobes broadly triangular-ovate, margin spinose-serrulate, apex acute. Inflorescence 5–8-fascicled flowers. Pedicel 2–4 cm, often nodding, glabrous. Flowers attached at base of petiole, purplish red. Sepals caducous, elliptic-oblong or ovate-oblong, 1–2 × ca. 0.8 cm. Petals 6–9, purplish red, obovate-oblong, 3–4 × 1–1.3 cm. Stamens falcate-inflexed, ca. 2.3 cm; filaments flat, 7–8 mm; anthers ca. 1.5 cm; anther connective prolonged. Ovary oblong, ca. 1.3 cm; ovules numerous; style ca. 3 mm. Berry purplish black, obovoid-oblong or ellipsoid, ca. 3 × 2 cm. Fl. Mar–Jun, fr. Jul–Sep.  $2n = 12^*$ .

• Forests, streamsides, grassy slopes in valleys; 400–1600 m. Anhui, Fujian, Guangdong, Guangxi, Henan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang.

Shaw (in Stearn, Gen. *Epimedium*, 279. 2002) treated *Podophyllum hispidum* as a synonym of *P. versipelle* subsp. *versipelle*, and, based on flower color, recognized two varieties of *P. pleianthum*: var. *pleianthum* (“petals dark maroon red”) and var. *album* (“petals white”).

**6. *Dysosma tsayuensis*** T. S. Ying, Acta Phytotax. Sin. 17(1): 20. 1979.

西藏八角莲 xi zang ba jiao lian

Plants 50–90 cm tall. Rhizomes creeping, stout, with numerous fibrous roots; aerial stems 35–55 cm high, unbranched, glabrous, angulate, scaly brown at base. Leaves opposite; petiole centrally attached, 11–25 cm; leaf blade abaxially pale yellowish green, adaxially deep green, orbicular or suborbicular in gross outline, papery, both surfaces strigose, palmately 5–7-parted to ca. midway; lobes cuneate-oblong, 8–12 × 4–7 cm, margin spinose-serrulate, ciliolate, apex acute. Inflorescence 2–6-fascicled flowers. Pedicel 2–4 cm, glabrous. Flowers attached at base of petiole, large, 4–5 cm in diam. Sepals 6, caducous, elliptic, 1.3–1.5 cm × 5–6 mm. Petals 6, white, obovate-elliptic, 2.7–2.8 × 1–1.1 cm. Stamens ca. 1 cm; filaments flat, ca. 2 mm; anthers introrse; anther connective wide, not prolonged. Pistils nearly as long as stamens; ovary stipitate; ovules numerous; style ca. 2 mm; stigma inflated, rugosely undulate. Berry red, ovoid or ovoid-ellipsoid, ca. 3 cm; style ± persistent. Seeds numerous. Fl. May, fr. Jul.

• *Picea*, *Abies*, and *Pinus* forests and openings in forests; 2500–3500 m. Xizang.

Shaw (in Stearn, Gen. *Epimedium*, 304. 2002) treated *Dysosma*

*tsayuensis* as a synonym of *Podophyllum aurantiocaulis* subsp. *aurantiocalis*.

**7. *Dysosma delavayi*** (Franchet) Hu, Bull. Fan Mem. Inst. Biol., Bot. 8: 37. 1937.

川八角莲 chuan ba jiao lian

*Podophyllum delavayi* Franchet, Bull. Mus. Hist. Nat. (Paris) 1: 63. 1895; *Dysosma veitchii* (Hemsley & E. H. Wilson) L. K. Fu ex T. S. Ying; *D. veitchii* var. *longipetala* J. L. Wu & P. Zhuang; *P. delavayi* var. *longipetalum* J. M. H. Shaw; *P. veitchii* Hemsley & E. H. Wilson.

Plants 20–50 cm tall. Rhizomes creeping, short, stout, fibrous roots slightly stout. Leaves opposite; petiole white, 7–10 cm, pubescent; leaf blade abaxially pale yellowish green or dark purplish red, adaxially dark green, sometimes purplish green, suborbicular in gross outline, to 22 cm in diam., papery, abaxially venation pubescent, often ultimately glabrous, adaxially glabrous, 4- or 5-parted to ca. midway; lobes cuneate-

oblong, apex 3-lobed, lobules subtriangular, margin scarcely spinulose-suberrulate, apex acuminate. Inflorescence 2–6-fascicled flowers, rarely umbellate. Pedicel nutant, 1.5–2.5 cm, densely white pubescent. Flowers large, attached at base of petiole, dark purplish red. Sepals caducous, oblong-obovate, ca. 2 cm, outside pubescent. Petals purplish red, oblong, 4–6 cm, apex rounded, obtuse. Stamens ca. 3 cm; filaments flat, shorter than anthers; anther connective conspicuously prolonged, to 9 mm. Pistils short, only ca. 1/2 as long as stamens; ovary ellipsoid; stigma large, rugosely undulate. Berry scarlet when mature, obovoid-ellipsoid, 3–5 × 3–3.5 cm. Seeds numerous, white. Fl. Apr–May, fr. Jun–Sep.  $2n = 12^*$ .

• Forests, streamsides, shaded wet places; 1200–2500 m. Guizhou, Sichuan, Yunnan.

Shaw (in Stearn, Gen. *Epimedium*, 294–295. 2002) reported *Podophyllum delavayi* from S Shaanxi and recognized two varieties of the species: var. *delavayi* (“petals 3.5–7 cm long, 3–5 mm wide”) and var. *longipetalum* (“petals 8–10 cm long, ca. 9 mm wide”).

### Insufficiently known species

Shaw (in Stearn, Gen. *Epimedium*, 283, 285, 297. 2002) recognized three species of *Podophyllum*, below, that we have not seen, or for which we have seen inadequate material. The descriptions and key characters (in quotes) provided here are taken from Shaw’s treatment.

***Podophyllum glaucescens*** J. M. H. Shaw, New Plantsman 6(3): 162. 1999.

Plants to 40 cm tall. Mature leaves 2, glabrous, membranous, abaxially glaucescent, adaxially dark green, shiny; lower leaf trapezoid, 4-lobed, sinuses shallowly undulate, margin minutely toothed, apex of lobes shortly acuminate; upper leaf roughly pentagonal, with 4 obvious and 2 obscure lobes, ca. 20 cm across. Inflorescence inserted on petiole of upper leaf ca. 2 cm below blade, 7-flowered. Pedicel thin, 4–6 cm, swollen near apex, densely hairy. Sepals narrowly ovate, ca. 14 × 6 mm, margins membranous. Petals 6, reddish purple, ovate-lanceolate, 10–12 × 5–6 mm, apex acute or slightly toothed. Stamens 6, ca. 1 cm; filaments flattened, 2–3 mm; anthers 6–7 mm, apical mucro 1.5–2 mm. Ovary ovoid, ca. 5 × 3 mm; style 2–3 mm; stigma peltate, corrugated, ca. 3 mm in diam. Mature fruit and seeds unknown.

• Moist woodlands; ca. 1200 m. Guangxi.

On the basis of petal size and leaf blade color, Shaw (in Stearn, Gen. *Epimedium*, 285–286. 2002) distinguished *Podophyllum glaucescens* (“petals less than 1.2 cm; leaves abaxially glaucous”) from *P. difforme* and *P. versipelle* (“petals more than 1.5 cm; leaves abaxially pale green”). Shaw (loc. cit.) also speculated that *P. glaucescens* may be of hybrid origin from a cross between those two species, which he distinguished from each other by their leaf lobes and flower number (*P. difforme* with “upper leaf irregularly and indistinctly lobed; inflorescence 1–3-flowered” vs. *P. versipelle* with “upper leaf 4–7-lobed; inflorescence 4–9-flowered”).

***Podophyllum hemsleyi*** J. M. H. Shaw & Stearn, New Plantsman 6(3): 161. 1999.

Plants to 40 cm. Stems grooved. Leaves 2, abaxially glaucous green, adaxially dark green, to 35 cm in diam., lobed to 4/5 of radius, sinuses rounded, lobes spatulate-oblong, abaxially with prominent main veins, margin with fine teeth, apex of lobes rounded, tip acute to acuminate. Inflorescence inserted on petiole ca. 2 cm below blade, 4-flowered. Pedicel glabrous, 3–4

cm, dilated to 2 mm wide below receptacle. Sepals ovate-lanceolate, 14–16 mm, outer sepals 6–8 mm wide, inner sepals 3–4 mm wide, glabrous, entire, apex rounded. Petals dark red, 3–3.5 cm, oblong-spatulate, widest below apex, entire, apex rounded. Stamens 6; filaments flattened, 7–8 mm; anthers 9–10 mm. Ovary globose to pyriform, 6–7 × ca. 4 mm; style 2–3 × ca. 1 mm; stigma globose, corrugated, 3–5 mm across. Berry and seeds unknown.

• Forests; 1500–1800 m. W Hubei.

This is apparently known from only three collections made by E. H. Wilson between 1901 and 1909. It was reported by Shaw to be most similar to *Podophyllum versipelle* subsp. *boreale*. Shaw separated *P. hemsleyi* by its “lobes of leaves spatulate-oblong, to 4/5 of leaf radius; inflorescence 4-flowered, on petiole 2 cm below lamina” and *P. versipelle* by its “lobes of leaves obovate to oblong, 1/2–2/3 of leaf radius; inflorescence 4–19-flowered, on petiole just below upper leaf.”

***Podophyllum trilobulum*** J. M. H. Shaw, New Plantsman 7: 158. 2000 [“*trilobulus*”].

Plants 20–25(–40) cm tall. Stem and petioles with fine short linear hairs. Leaves 2, lobed, lobes trilobulate, margin finely toothed; lower leaf 18–28 cm wide, lobes 7, sinuses to 2/3 of radius, rounded, keyhole-shaped; upper leaf ca. 15 cm wide, lobes 5, strongly retarded on adaxial margin, reduced to few large teeth. Inflorescence inserted at or above midpoint on petiole of upper leaf, 2–5-flowered. Pedicel 2.2–2.5 cm, apically dilated, brown pilose, hairs linear. Petals purplish red, ovate-lanceolate, tapering gradually to acute apex, 4–5 × 8–10 mm. Anthers ca. 6 mm. Fruit unknown.

• Forests; ca. 1600 m. Sichuan (Emei Shan).

*Podophyllum trilobulum* is most similar to *Dysosma delavayi*. Shaw separated *P. delavayi* by its “inflorescence in fork of petioles” and *P. trilobulum* by its “inflorescence along petiole just below leaf, at or above midpoint of upper leaf or held above leaves on elongated peduncle.”

## 7. *DIPHYLLEIA* Michaux, Fl. Bor.-Amer. 1: 203, t. 19–20. 1803.

山荷叶属 shan he ye shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

Herbs, perennial, with thickened creeping rhizomes and coarse fibrous roots; rhizomes formed of distinct annual increments, producing stout 2(or 3)-leaved stem separating at base in autumn along marked articulation, leaving broad bowl-like excavation on rhizome. Leaves alternate; blade petiolate and peltate [except in *Diphylleia grayi* F. Schmidt, in which upper leaf sessile or subsessile and attached at sinus], transversely oblong to reniform-orbicular, pubescent or sparsely pubescent with unicellular hairs, palmately veined with main veins connected by secondary reticulate veins, 2-cleft with divisions shallowly to coarsely lobed and prominently dentate. Inflorescence terminal, pedunculate, usually a many-flowered cyme or umbel; branches glabrous or pubescent. Flowers pedicellate, actinomorphic, 3-merous. Sepals 6 in 2(or 3) whorls, white or pale green. Petals 6 in 2 whorls, white. Stamens opposite petals; anthers basifixed, longitudinally dehiscent; thecae separating from connective and ultimately attached only at apex; pollen conspicuously spiny. Ovary ellipsoid, 1-loculed; placentation parietal near base of ovary; ovules 2–11, anatropous; style absent or short and thickened; stigma peltate, cristate. Fruit berries, dark blue or purplish black, glaucous, globose or broadly ellipsoid. Seeds reddish brown, oblong to ovoid.  $n = 6$ .

Three species: discontinuous distribution in E Asia and SE North America; one species (endemic) in China.

### 1. *Diphylleia sinensis* H. L. Li, J. Arnold Arbor. 28: 443. 1947.

南方山荷叶 nan fang shan he ye

*Diphylleia cymosa* Michaux subsp. *sinensis* (H. L. Li) T. Shimizu.

Plants 40–80 cm tall. Petiole of lower leaf 7–20 cm, of upper leaf (2.5–)6–13 cm; blade peltate, reniform or reniform-orbicular to transversely oblong, 19–40 × 20–46 cm in lower leaf and 6.5–31 × 19–42 cm in upper leaf, abaxially whitish pubescent, sparsely so or subglabrous adaxially, 2-cleft with divisions undulate or shallowly 3–6-lobed, margin irregularly dentate with teeth apiculate. Inflorescence 4.2–35 cm including peduncle, 3.5–10 cm in diam.; branches pubescent or glabrescent

in fruit; peduncle 3.5–28 cm, solitary, occasionally bifurcate. Pedicel 0.4–3.7 cm. Flowers (8–)15–51. Outer sepals lanceolate to linear-lanceolate, 2.3–3.5 × 0.7–1.2 mm; inner sepals broadly elliptic to subcircular, 4–4.5 × 3.8–4 mm. Outer petals narrowly to broadly obovate, 5–8 × 2.5–5 mm; inner petals narrowly elliptic to narrowly obovate, 5.5–8 × 2.5–3.5 mm. Stamens ca. 4 mm; laminar filaments 1.7–2 mm; anthers ca. 2 × 0.6 mm. Ovary ellipsoid, 3–4 × 1.8–2 mm; ovules 5–11; style absent or represented by slight constriction at summit of ovary; stigma ca. 0.3 × 1 mm. Berry dark blue or purplish black, slightly pruinose, globose to broadly ellipsoid, 1–1.5 cm × 6–10 mm. Seeds 2–4, ovoid. Fl. May–Jun, fr. Jul–Aug.  $2n = 12^*$ .

• Moist deciduous and coniferous forests, thickets, bamboo thickets; 1900–3700 m. Gansu, Hubei, Shaanxi, Sichuan, Yunnan.

## 8. *EPIMEDIUM* Linnaeus, Sp. Pl. 1: 117. 1753.

淫羊藿属 yin yang huo shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

*Aceranthus* C. Morren & Decaisne; *Vindicta* Rafinesque.

Herbs, perennial, deciduous or evergreen. Rhizome sympodial, short or horizontally creeping, stout. Stems solitary or caespitose, glabrous, squamate at base. Leaves basal or cauline, simple or compound; petioles of basal leaves longer than those of cauline; leaflets ovate, ovate-lanceolate, or suborbicular, basally cordate, lateral lobes asymmetric, with outer basal lobe longer than inner, usually spiny on margin, apex acute or acuminate. Flowering stem leafless or with 1–4 leaves, opposite or rarely alternate. Inflorescence simple or compound, with terminal raceme or panicle, few or many flowered, glabrous or glandular. Flowers dimerous. Sepals 8 in 2 whorls; inner sepals petaloid. Petals 4, flat, or saccate and prolonged outward into nectariferous pouches or spurs shorter or longer than sepals. Stamens 4, opposite petals; filaments glabrous; anthers dehiscing by 2 oblong valves, curling upward; pollen grains elliptic, smooth, with 3 longitudinal furrows. Ovary with parietal placentation; ovules 6–15; style slender; stigma slightly dilated. Capsule loculicidal. Seeds with conspicuous fleshy aril.  $2n = 12$ .

About 50 species: China, India (W Himalaya), Japan, Korea, Russia (Far East), S Europe, and N Africa; 41 species (40 endemic) in China; eight additional species (seven endemic) are insufficiently known.

See Stearn, The Genus *Epimedium* and Other Herbaceous Berberidaceae [hereafter Gen. *Epimedium*]. 2002.

*Epimedium cavaleriei* H. Léveillé (Cat. Pl. Yun-Nan, 18. 1916) is a synonym of *Stauntonia cavaleriana* Gagnepain (Bull. Soc. Bot. France 55: 47. 1908) in the Lardizabalaceae (see Fl. China 6: 452. 2001).

### 1a. Leaves simple.

2a. Inflorescences panicles ..... 1. *E. simplicifolium*

2b. Inflorescences racemes.

- 3a. Petals without spurs; stem leaf 1; plant 15–25 cm tall ..... 2. *E. parvifolium*
- 3b. Petals with spurs; stem leaves 2, opposite; plant 20–60 cm tall.
- 4a. Leaf blade oblong to suborbicular; sepals 4 in 1 whorl; petals purple, saccate ..... 3. *E. zhushanense*
- 4b. Leaf blade ovate to ovate-elliptic; sepals 8 in 2 whorls; petals yellow, horn-shaped ..... 4. *E. glandulosopilosum*
- 1b. Leaves compound.
- 5a. Petals without spurs.
- 6a. Flowering stem leaf 1 ..... 5. *E. platypetalum*
- 6b. Flowering stem leaves 2–4.
- 7a. Flowering stem leaves 2.
- 8a. Rachis and pedicels glandular pubescent; leaflets abaxially pubescent or tomentose ..... 6. *E. pubescens*
- 8b. Rachis and pedicels glabrous; leaflets abaxially glabrous or strigose.
- 9a. Base of terminal leaflet truncate or rounded; petals suborbicular, apex slightly involute, ca. 1 mm ..... 7. *E. truncatum*
- 9b. Base of terminal leaflet cordate; petals saccate, 1.5–4 mm.
- 10a. Apex of terminal leaflet unlobed; apex of sepals unlobed ..... 8. *E. sagittatum*
- 10b. Apex of terminal leaflet 2–5-lobed; apex of sepals 2-lobed ..... 9. *E. lobophyllum*
- 7b. Flowering stem leaves 2–4.
- 11a. Rachis and pedicels glandular pubescent; leaves 3(or 5 or 7)-foliolate; inner sepals purple ..... 10. *E. ecalcaratum*
- 11b. Rachis and pedicels glabrous; leaves trifoliolate; inner sepals white.
- 12a. Leaflets lanceolate to narrowly lanceolate, abaxially lanose; petals flat, apex slightly involute ..... 11. *E. borealiguizhouense*
- 12b. Leaflets ovate, elliptic, or lanceolate, abaxially strigose; petals saccate.
- 13a. Inflorescence 70–210-flowered; inner sepals ovate; petals orange-yellow and red; leaflets 5–11 mm ..... 12. *E. myrianthum*
- 13b. Inflorescence 300–400-flowered; inner sepals lanceolate; petals pale yellow; leaflets 12–14 mm ..... 13. *E. multiflorum*
- 5b. Petals with spurs.
- 14a. Inflorescences racemes.
- 15a. Flowering stem leaf 1.
- 16a. Leaves biternate, leaflets 9 ..... 14. *E. koreanum*
- 16b. Leaves trifoliolate, leaflets 3 or 5.
- 17a. Leaflets 5 (occasionally 3), abaxially glabrous ..... 15. *E. flavum*
- 17b. Leaflets 3, abaxially pubescent.
- 18a. Spurs 2.2–2.6 cm; inner sepals pale rose ..... 16. *E. brachyrrhizum*
- 18b. Spurs shorter than 2 cm; inner sepals white.
- 19a. Leaflets narrowly ovate or ovate, abaxially pubescent along midvein; inner sepals narrowly elliptic, 11–20 mm ..... 17. *E. leptorrhizum*
- 19b. Leaflets ovate or suborbicular, abaxially puberulent; inner sepals lanceolate, ca. 12 mm ..... 18. *E. pauciflorum*
- 15b. Flowering stem leaves 2.
- 20a. Rachis and pedicels glandular pubescent.
- 21a. Inner sepals narrowly lanceolate, white or pinkish, reflexed; spurs shorter than inner sepals ..... 24. *E. fargesii*
- 21b. Inner sepals ovate or narrowly ovate, pale yellow, not reflexed; spurs longer than inner sepals.
- 22a. Leaflets ovate or broadly ovate; spurs 7–12 mm, not curved ..... 25. *E. ensiense*
- 22b. Leaflets narrowly ovate; spurs 20–25 mm, curved.
- 23a. Leaflets abaxially strigose; inner sepals narrowly ovate, apex acuminate ..... 26. *E. franchetii*
- 23b. Leaflets abaxially villous or subglabrous; inner sepals suboblong, apex acute ..... 27. *E. lishihchenii*
- 20b. Rachis and pedicels glabrous.
- 24a. Inner sepals ovate; leaflets abaxially strigose.
- 25a. Spurs 4–5 mm, pale yellow, curved; bracts spinulose-serrulate; leaflets abaxially appressed whitish puberulent ..... 19. *E. shuichengense*
- 25b. Spurs 15–16 mm, purple, slightly curved; bracts entire; leaflets abaxially glaucous, with sparse minute prostrate hairs ..... 20. *E. epsteinii*
- 24b. Inner sepals elliptic, lanceolate, or cymbiform; leaflets abaxially puberulent or glabrous.
- 26a. Leaflets abaxially glabrous; inner sepals cymbiform, reddish; petals pale yellow ..... 21. *E. fangii*
- 26b. Leaflets abaxially puberulent; inner sepals elliptic or lanceolate, white; petals white.
- 27a. Pedicels 2.5–5 cm; inner sepals elliptic; spurs horn-shaped, slightly curved, ca. 2.5 cm ..... 22. *E. latisepalum*
- 27b. Pedicels 2–3 cm; inner sepals lanceolate; spurs subulate, curved, 1.5–1.8 cm ..... 23. *E. ogisui*
- 14b. Inflorescences panicles.
- 28a. Leaves biternately compound, leaflets 9, occasionally 5.

- 29a. Flowering stem leaves 2, 9-foliolate; flowers white or pale yellow; spurs shorter than inner sepals, ca. 2 mm ..... 40. *E. brevicornu*
- 29b. Flowering stem leaves 3, 9-foliolate or occasionally 5-foliolate; flowers yellow; spurs longer than inner sepals, ca. 15 mm ..... 41. *E. elongatum*
- 28b. Leaves ternately compound, leaflets 3 or 5.
- 30a. Leaflets 5, rarely 3 ..... 28. *E. davidii*
- 30b. Leaflets 3.
- 31a. Rachis and pedicels glabrous.
- 32a. Leaflets abaxially glabrous.
- 33a. Leaflet margin remotely spinose-serrate; spur of petals much shorter than inner sepals, curved, blunt ..... 29. *E. dolichostemon*
- 33b. Leaflet margin closely spinose-serrulate; spur of petals longer than inner sepals, slightly curved, subulate ..... 30. *E. mikinorii*
- 32b. Leaflets abaxially hairy.
- 34a. Leaflets abaxially strigose, margin undulate; inner sepals ovate, pale green ..... 31. *E. chlorandrum*
- 34b. Leaflets abaxially lanate or glabrous, margin flat; inner sepals broadly elliptic, pale yellow .... 32. *E. wushanense*
- 31b. Rachis and pedicels, or only pedicels, glandular pubescent.
- 35a. Spur of petals shorter than inner sepals.
- 36a. Leaflets abaxially conspicuously puberulent; inner sepals lanceolate, ca. 12 mm; spur of petals brown ..... 33. *E. stellulatum*
- 36b. Leaflets glabrous or pilose along veins; inner sepals elliptic, ca. 6 mm; spur of petals yellow ..... 34. *E. reticulatum*
- 35b. Spur of petals longer than inner sepals.
- 37a. Leaflets lanceolate, margins undulate-sinuate and sparsely spinose-serrate; outer sepals apically emarginate ..... 35. *E. ilicifolium*
- 37b. Leaflets ovate to lanceolate, margins flat; outer sepals apically entire.
- 38a. Leaflets ovate to lanceolate, abaxially densely strigose ..... 36. *E. acuminatum*
- 38b. Leaflets ovate, abaxially sparsely pubescent or nearly glabrous.
- 39a. Leaflets abaxially glaucescent, terminal leaflet oblong; spurs straight ..... 37. *E. hunanense*
- 39b. Leaflets abaxially glaucous, terminal leaflet ovate; spurs curved.
- 40a. Inner sepals narrowly ovate, ca. 6 mm; spurs 20–35 mm, pale yellow; inflorescence a panicle; blade length:width ratio 2 ..... 38. *E. rhizomatosum*
- 40b. Inner sepals narrowly lanceolate, 15–17 mm; spurs 15–20 mm, pale purplish red; inflorescence a raceme; blade length:width ratio 2.5 ..... 39. *E. sutchuenense*

**1. *Epimedium simplicifolium*** T. S. Ying, Acta Phytotax. Sin. 13(2): 51. 1975.

单叶淫羊藿 dan ye yin yang huo

Herbs, 30–55 cm tall. Rhizomes brown, stout, squamate at upper part. Leaves simple, basal and cauline; petiole of stem leaf 5–7 cm, glabrous; leaf blade adaxially green, ovate or broadly elliptic-ovate, 7–19 × 8–10 cm, papery, abaxially densely sericeous, veins conspicuously raised, adaxially glabrous, reticulate veins conspicuous, base deeply or shallowly cordate with lobes rounded, subequal, margin closely spinulose-subserulate, apex acute. Flowering stem with 2 opposite leaves. Inflorescence a terminal panicle, 12–22 × 8–10 cm, usually 15–32-flowered; rachis glabrous. Pedicel 1–2.5 cm, puberulent. Flowers yellow. Sepals 8 in 2 whorls; outer sepals obovate, ca. 4 × 2 mm, apex obtuse; inner sepals ovate, ca. 6 × 4 mm, membranous, apex acute. Petals curved upward, reddish purple, horn-shaped, much longer than inner sepals, ca. 2 cm. Stamens 4, pale yellow, ca. 3 mm; filaments shorter than anthers; anthers valved. Pistil obliquely terete; style ca. 1 mm. Capsules obliquely terete; style rostriform. Fl. Apr–May, fr. May–Jun.

• Slopes in valleys; ca. 1100 m. Guizhou.

**2. *Epimedium parvifolium*** S. Z. He & T. L. Zhang, Guihaia 14: 25. 1994.

小叶淫羊藿 xiao ye yin yang huo

*Epimedium elachyphyllum* Stearn, nom. illeg. superfl.

Herbs, 15–25 cm tall, glabrous. Rhizome apparently creeping, longer than 15 cm, 1.5–3 mm in diam. Leaves simple, basal and cauline; leaf blade adaxially dark green, broadly ovate, 2.5–3.5 × 3–4 cm, abaxially sparsely puberulent, often pruinose, reticulate veins conspicuous, adaxially glabrous, base deeply cordate with rounded lobes subequal, margin remotely spinose-serrate, apex acuminate. Flowering stem with 1 simple leaf at base of rachis. Raceme 8–10 cm, 8–12-flowered; rachis glabrous. Pedicel 1–2 cm, glabrous; bracts ovate, ca. 1.5 mm. Flowers purple. Sepals in 2 whorls; outer sepals 4, purple, 2 of them lanceolate, ca. 3 × 1.2 mm, others ovate, ca. 3.5 × 2.5 mm; inner sepals 4, yellow, lanceolate, ca. 3 × 1.2 mm. Petals 4, purple, suboblong, ca. 1.2 mm, without spur. Stamens 4, ca. 2.5 mm; filaments flat; anthers ca. 1.8 mm, apex obtuse. Pistil ca. 2 mm; style ca. 1 mm. Capsules ca. 1 cm; style ca. 3 mm. Seeds 1 or 2, brown, reniform, ca. 3.5 mm, glabrous. Fl. Apr–May, fr. May–Jun.

• Forests, thickets; 1300–1400 m. Guizhou (Songtao).

**3. *Epimedium zhushanense*** K. F. Wu & S. X. Qian, Acta Phytotax. Sin. 23: 71. 1985.

竹山淫羊藿 zhu shan yin yang huo

Herbs, 40–60 cm tall. Rhizome short, stout. Flowering stem brown, terete, squamate at base, with 2 opposite leaves. Leaves simple, basal and cauline; petiole 5.5–6 cm, tomentose at base and apex; leaf blade adaxially deep green, oblong to suborbicular, 10–14 × 7–11 cm, abaxially densely sericeous-tomentose, adaxially glabrous, base deeply cordate, with rounded lobes subequal, margin slightly repand or irregularly denticulate, apex obtuse. Racemes usually many loosely flowered, ca. 30 cm, glandular. Pedicel 1.5–5 cm, slender; bracts ovate, ca. 2 mm. Flowers purple. Sepals 4 in 1 whorl, petaloid, ovate-lanceolate, 9–11 × ca. 3.5 mm, apex obtuse. Petals 4, purple, saccate, ca. 1.7 cm, base cucullate, apex long attenuate. Stamens 4, ca. 4 mm; filaments flat, shorter than anthers; anthers valved, valves revolute, apex of anther connective apiculate. Style 2.5–3 mm; stigma slightly quadrilobate or inconspicuous. Fruit unknown. Fl. Jun–Jul, fr. unknown.

• Forests, roadsides; ca. 1200 m. NW Hubei.

**4. *Epimedium glandulosopilosum*** H. R. Liang, Acta Phytotax. Sin. 28: 323. 1990.

腺毛淫羊藿 xian mao yin yang huo

Herbs, 20–50 cm tall. Rhizome short, stout, usually irregularly nodose. Flowering stem glandular pubescent and pilose. Leaves simple, basal and cauline; basal leaves broadly ovate, ca. 9 × 6.5 cm, petiole ca. 24 cm; cauline leaves opposite, petiole 3–6.5 cm, glandular pubescent and puberulent, leaf blade adaxially deep green, ovate to ovate-elliptic, 5–8.5 × 2.5–5.5 cm, abaxially densely golden yellow villous, adaxially glabrous, base deeply cordate with acute lobes nearly equal, margin spinose-serrate, apex acuminate. Racemes 8–24-flowered, 6–23 × 3–6 cm; rachis and pedicels glandular pubescent. Pedicel 1–3 cm; bracts ovate, 1–2 mm. Flowers yellow. Sepals 8 in 2 whorls; outer sepals narrowly ovate, 8–9 × 4–5 mm; inner sepals similar to outer sepals in size and shape. Petals spurred, yellow, horn-shaped, ca. 1.3 cm. Stamens ca. 4 mm; filaments flat, ca. 1 mm; anthers valved, valves revolute, apex of anther connective apiculate. Ovary terete; style ca. 2 mm; stigma quadrilobate or inconspicuous. Capsules 5–10 mm; style 3–4 mm. Fl. Apr–May, fr. May–Jun.

• 800–900 m. Sichuan.

**5. *Epimedium platypetalum*** K. Meyer, Repert. Spec. Nov. Regni Veg. Beih. 12: 380. 1922.

茂汶淫羊藿 mao wen yin yang huo

*Epimedium platypetalum* var. *tenue* B. L. Guo & P. K. Hsiao.

Herbs, 10–25 cm tall. Rhizome stout, irregularly nodose. Leaves basal and cauline, trifoliate; petioles pilose with long reddish hairs forming conspicuous tufts at nodes; leaflets adaxially deep green, broadly ovate to suborbicular, 2–4 × 1.6–3 cm, abaxially papillose and sparsely pilose, adaxially glabrous, base deeply cordate with subequal lobes rounded and nearly

touching, terminal leaflet similar to lateral leaflets in shape, margin spinose-serrate, apex rounded or acute. Flowering stem with 1 trifoliate leaf. Raceme simple, 4–8 cm, 2–8-flowered. Pedicel 5–10 mm, slender, glandular pubescent. Flowers pale yellow, campanulate. Outer sepals triangular-lanceolate, 2–2.5 × ca. 0.7 mm; inner sepals broadly ovate, 4–5 × 2.5–3 mm, apically acute or shortly acuminate. Petals oblong or obovate-oblong, ca. 8 × 4–5 mm, flat, without spur, apex rounded. Stamens ca. 3 mm; filaments ca. 1 mm; anthers ca. 2 mm. Pistil ca. 4 mm. Capsules 1–2 cm; style 2–3 mm. Fl. Apr–May, fr. May–Jun.

• Forests; 1600–2800 m. Shaanxi, Sichuan.

**6. *Epimedium pubescens*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 23: 309. 1877.

柔毛淫羊藿 rou mao yin yang huo

*Epimedium coactum* H. R. Liang & W. M. Yan; *E. pubescens* var. *cavaleriei* Stearn; *E. pubescens* subsp. *primarium* Stearn.

Herbs, 20–70 cm tall. Rhizome short, stout, sometimes elongated. Leaves basal and cauline, trifoliate; cauline leaves opposite; petiolules ca. 2 cm, sparsely pubescent; leaflets adaxially deep green, shiny, ovate, narrowly ovate, or lanceolate, 3–15 × 2–8 cm, leathery when mature, abaxially densely pubescent to tomentose with numerous fine multicellular spreading or curled gray hairs densest along primary veins and at insertion of petiolule, base deeply or shallowly cordate with usually rounded lobes, those of lateral leaflets unequal, margin spinose-serrate, apex acuminate or shortly acuminate. Flowering stem with 2 opposite trifoliate leaves. Panicle loose, 30- to more than 100-flowered, 10–20 cm, with peduncle 3–5-flowered, usually rachis and pedicels glandular pubescent. Pedicel 1–2 cm. Flowers ca. 1 cm in diam. Outer sepals purplish, broadly ovate, 2–3 mm; inner sepals white, lanceolate or narrowly lanceolate, 5–7 × 1.5–3.5 mm, apically acute or acuminate. Petals pale yellow, saccate, much shorter than inner sepals, blunt. Stamens prolonged, ca. 4 mm; anthers ca. 2 mm. Pistil ca. 4 mm; style ca. 2 mm. Capsules oblong; style long rostrate. Fl. Apr–May, fr. May–Jun.  $2n = 12^*$ .

• Forests, thickets, slopes, shaded and wet places; 300–2000 m. Anhui, Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan.

**7. *Epimedium truncatum*** H. R. Liang, Acta Phytotax. Sin. 28: 322. 1990.

偏斜淫羊藿 pian xie yin yang huo

Herbs, 50–80 cm tall, glabrous throughout. Rhizome creeping, short, stout, nodose. Leaves basal and cauline, trifoliate; cauline leaves opposite; leaflets abaxially pale green, adaxially dark green, ovate, 7.5–15 × 3.5–9 cm, leathery, abaxially with conspicuously raised veins, base of terminal leaflet truncate or obtuse, base of lateral leaflets oblique but not cordate, margin remotely spinose-serrate, apex acute or acuminate. Flowering stem with 2(or 3) trifoliate opposite leaves. Panicle many (ca. 50) flowered, ca. 28 × 7 cm. Pedicel 7–15 mm, slender. Flowers ca. 4 mm in diam. Outer sepals 4, outer pair purple, suborbicular, ca. 2 mm, inner pair white, ca. 2.5 mm; inner

sepals 4, lanceolate, ca. 2 mm. Petals 4, suborbicular, ca. 1 mm, base broadly cuneate, without spur, apex slightly involute. Stamens ca. 2.2 mm; filaments flat, ca. 0.7 mm; anthers ca. 1.5 mm, valved, apex of anther connective obtuse. Pistil ca. 2.2 mm; style ca. 1 mm. Capsules ca. 1.5 cm; style rostriform, ca. 5 mm. Fl. Apr–May, fr. May–Jun.

- Forest margins; 600–1000 m. Hunan (Baojing).

**8. *Epimedium sagittatum*** (Siebold & Zuccarini) Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 23: 309. 1877.

三枝九叶草 *san zhi jiu ye cao*

Herbs, 30–50 cm tall. Rhizome short, stout, nodose, with numerous fibrous roots. Leaves basal and cauline, trifoliolate; leaflets ovate to ovate-lanceolate, 5–19 × 3–8 cm, leathery, abaxially sparsely strigose or glabrous, adaxially glabrous, base deeply or shallowly cordate, apex acute or acuminate, terminal leaflet with equal rounded lobes or oblong, lateral leaflets oblique with outer lobe large, deltoid and acute, inner lobe smaller and rounded, margin closely spinulose-subserulate. Flowering stem with 2 opposite trifoliolate leaves. Panicle 10–20(–30) × 2–4 cm, 20–60-flowered, sometimes with lower peduncles 3-flowered, usually glabrous, occasionally scarcely glandular pubescent. Pedicel ca. 1 cm, glabrous. Flowers white or yellow, ca. 8 mm or less in diam. Outer sepals 4, purple spotted, apex blunt, outer pair narrowly ovate, ca. 3.5 × 1.5 mm, inner pair oblong-ovate, ca. 4.5 × 2 mm; inner sepals white, ovate-deltoid, ca. 4 × 2 mm, apex acute. Petals brownish yellow, saccate, 1.5–4 mm, blunt. Stamens prolonged, 3–5 mm; anthers 2–3 mm. Pistil ca. 3 mm; style longer than ovary. Capsules ca. 1 cm; style ca. 6 mm. Fl. (unknown in var. *glabratum*) Apr–May, fr. (Apr–)May–Jul.  $2n = 12^*$ .

- Forests, weedy places on slopes, thickets, streamsides, rock crevices; 200–1800 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Zhejiang.

- 1a. Leaflets abaxially sparsely strigose or glabrous; terminal leaflet narrowly ovate to lanceolate; flowers white ..... 8a. var. *sagittatum*
- 1b. Leaflets abaxially glabrous; terminal leaflet oblong; flowers yellow ..... 8b. var. *glabratum*

**8a. *Epimedium sagittatum* var. *sagittatum***

三枝九叶草(原变种) *san zhi jiu ye cao* (yuan bian zhong)

*Aceranthus sagittatus* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 175. 1845; *A. macrophyllus* Blume ex K. Koch; *A. triphyllus* K. Koch; *Epimedium coactum* H. R. Liang & W. M. Yan var. *longtouhum* H. R. Liang; *E. sagittatum* var. *oblongifoliolatum* Z. Cheng; *E. sinense* Siebold ex Miquel.

Leaflets abaxially sparsely strigose or glabrous; terminal leaflet narrowly ovate to lanceolate. Flowers white. Fl. Apr–May, fr. May–Jul.

- Forests, weedy places on slopes, thickets, streamsides, rock crevices; 200–1800 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Zhejiang.

**8b. *Epimedium sagittatum* var. *glabratum*** T. S. Ying, Acta Phytotax. Sin. 13(2): 53. 1975.

光叶淫羊藿 *guang ye yin yang huo*

Leaflets abaxially glabrous; terminal leaflet oblong. Flowers yellow. Fl. unknown, fr. Apr–May.

- Forests; ca. 700 m. Guizhou, Hubei.

**9. *Epimedium lobophyllum*** L. H. Liu & B. G. Li, Acta Phytotax. Sin. 37: 288. 1999.

裂叶淫羊藿 *lie ye yin yang huo*

Herbs, 30–70 cm tall. Rhizome compact, rigid. Leaves basal and cauline, trifoliolate; petiole 6–9.5 cm; basal leaves smaller than cauline leaves; lateral leaflets narrowly ovate, entire, base shallowly cordate, sinus widely open, lobes unequal, inner lobe rounded, outer lobe acute, margin spinulose-serulate, apex acuminate; petiolule of terminal leaflet 5–7 cm; terminal leaflet obovate to ovate or obovate-elliptic, 9–14 × 4–6.4 cm, base shallowly cordate, sinus open, lobes rounded, margin spinulose-serulate, apex (2 or)3(–5)-lobed, lobes acuminate, abaxially glaucous, glabrous except main veins pilose. Inflorescence terminal, paniculate, (8–)25–34 cm, glabrous, many flowered; peduncles 7–17 mm, mostly 5-flowered. Flowers white or yellowish, 3–4.5 mm in diam. Outer sepals 4, ovate to elliptic, 2–3.5 mm, apex 2-lobed; inner sepals 4, obovate or ovate-lanceolate, 2–3.5 × ca. 1.5 mm. Petals suborbicular, 1.5–3 × ca. 1.3 mm, slightly saccate. Stamens 3–4 mm; anthers ca. 1.5 mm. Ovary narrowly ovoid, 3–3.5 mm; ovules 2–6. Capsules 1.3–1.7 cm, beak 4–5 mm. Seeds 2–6, ca. 3.5 mm. Fl. Apr–Jul, fr. Jul–Sep.

- Forests; 700–1500 m. Hunan.

**10. *Epimedium ecalcaratum*** G. Y. Zhong, Acta Phytotax. Sin. 29: 89. 1991.

无距淫羊藿 *wu ju yin yang huo*

Herbs, 30–65 cm tall. Rhizome creeping, nodose, with numerous fibrous roots. Leaves basal and cauline, 3(or 5 or 7)-foliolate; petiole of basal leaf 3–15 cm; cauline leaf opposite or alternate, petiole 2–4 cm, sparsely brownish villous, but densely so at base and apex; leaflets adaxially deep green, ovate or narrowly ovate, 2.5–4.5 × 1.4–2.6 cm, leathery, abaxially sparsely white strigose on veins, adaxially glabrous, base deeply cordate, apex acute, terminal leaflet with equal rounded lobes, lateral leaflets oblique with outer lobe large and rounded, inner lobe smaller and rounded, margin remotely spinose-serrate. Inflorescence a raceme or sometimes subpaniculate, erect, 7–33 cm, slender; rachis, peduncle, and pedicels brownish red glandular pubescent. Pedicel 8–21 mm, slender. Flowers yellow, 8–10 mm in diam. Outer sepals caducous, pale purple, elliptic to broadly ovate, ca. 3 × 2 mm, membranous; inner sepals purple, lanceolate, 2.5–3.5 × ca. 1.5 mm. Petals yellow, sometimes purple spotted, obovate-orbicular, 6–8 × 4–5 mm, base cucullate, apex rounded, obtuse. Stamens ca. 4.5 mm; anthers ca. 1.5 mm, valved, valves revolute. Pistil longer than stamens. Capsule terete, short, 6–8 mm; style ca. 3 mm. Seeds reddish brown, shiny, reniform. Fl. and fr. May–Aug.

- Forests, thickets, rocky slopes; 1100–2100 m. Sichuan.

**11. *Epimedium borealiguizhouense*** S. Z. He & Y. K. Yang, J. Pl. Resources Environm. 2(4): 51. 1993 ["*baieali-guizhouense*"].

黔北淫羊藿 qian bei yin yang huo

Herbs, 40–60 cm tall. Rhizome nodose, short, with numerous fibrous roots. Leaves basal and cauline, trifoliate; leaflets lanceolate to narrowly lanceolate, 13–18 × 2.5–4 cm, thickly leathery, abaxially sparsely lanose, adaxially glabrous, base cordate, apex acuminate or long acuminate, terminal leaflet with subequal rounded lobes, lateral leaflets oblique with outer lobe large, cuneate and acuminate, inner lobe much smaller and rounded, margin spinose-serrate. Flowering stem with 2 opposite trifoliate leaves, occasionally 3 leaves whorled. Panicle without conspicuous peduncle, many (up to 150) flowered, 30–35 cm, usually glabrous. Pedicel 1–2 cm, glabrous. Flowers ca. 6 mm in diam. Outer sepals caducous, purple, elliptic, ca. 3.5 × 1.5–3 mm; inner sepals white, ovate, ca. 2.5 × 1 mm. Petals yellow, obovate, ca. 2 mm, apex involute, without spur. Stamens ca. 4 mm; filaments ca. 1.5 mm; anthers ca. 2.5 mm. Pistil ca. 4 mm; ovules 3 or 4; style ca. 2.5 mm. Capsule ca. 1 cm; style ca. 4 mm. Fl. Mar–Apr, fr. Apr–May.

• Streamsides in valleys; 300–500 m. Guizhou (Yanhe).

**12. *Epimedium myrianthum*** Stearn, Kew Bull. 53: 218. 1998.

天平山淫羊藿 tian ping shan yin yang huo

*Epimedium sagittatum* (Siebold & Zuccarini) Maximowicz subsp. *pyramidale* (Franchet) Stearn; *E. sagittatum* var. *pyramidale* (Franchet) Stearn; *E. sinense* Siebold ex Miquel var. *pyramidale* Franchet.

Herbs, 30–60 cm tall. Rhizome short, stout, with numerous fibrous roots. Leaves basal and cauline, leathery, trifoliate; leaflets of basal leaves mostly ovate, 5–6 × 3–4 cm, apex acute; leaflets of cauline leaves adaxially shiny, mostly narrowly ovate, sometimes elliptic or lanceolate, 6–11 × 2–6 cm, abaxially glaucous, with extremely minute appressed hairs, adaxially glabrous, base moderately cordate, apex long acuminate, lobes of terminal leaflet rounded, those of lateral leaflets unequal with lobes rounded or acute, margin flat, closely spinulose-serrate. Flowering stem with 2 opposite, or sometimes 3 or 4 whorled, long petiolate leaves. Inflorescence paniculate, loosely 70–210-flowered, 18–34 × 7–9 cm, glabrous. Pedicel 5–15 mm. Flowers minute. Outer sepals black, obtuse, unequal in length, one pair ca. 2 mm, other pair ca. 3.5 mm; inner sepals white, narrowly ovate, ca. 4 × 1.5–2 mm, apically acute. Petals orange-yellow and red, slipper-shaped, shorter than inner sepals, 2–2.5 mm, apically obtuse. Stamens exposed, pale yellow, ca. 4 mm; filaments ca. 2 mm; anthers ca. as long as filaments. Pistil ca. 5.2 mm; style ca. 2.8 mm. Fruit unknown. Fl. Apr–Jul, fr. unknown.

• Dense forests, thickets, roadsides, streamsides; 700–1500 m. Guangxi, Hubei, Hunan.

**13. *Epimedium multiflorum*** T. S. Ying, Fl. Reipubl. Popularis Sin. 29: 310. 2001.

多花淫羊藿 duo hua yin yang huo

Herbs, ca. 80 cm tall. Rhizome short, stout. Leaves basal and cauline, trifoliate; leaflets abaxially pale green, adaxially green, elliptic or oblong, sometimes narrowly ovate, 12–14 × 5–6 cm, membranous, abaxially sparsely white strigose or glabrous, adaxially glabrous, base cordate, apex acuminate or long acuminate, terminal leaflet with equal rounded lobes, lateral leaflets quite oblique with outer lobes large, acute and deltoid, inner lobes smaller and rounded, margin spinose-serrate. Flowering stem with 2 opposite, or 3 or 4 whorled, trifoliate leaves. Inflorescence compound, many (300–400) flowered, ca. 25 × 15 cm, base of rachis with 1–5 peduncles 20–30-flowered, usually glabrous. Pedicel 5–10 mm, glabrous; bracts lanceolate, ca. 1 mm. Flowers minute, ca. 3 mm in diam. Outer sepals purplish red, oblong, ca. 3.5 × 1.5 mm; inner sepals white, lanceolate, ca. 3 × 1 mm. Petals pale yellow, oblong, saccate, 1.2–2 × 0.6–1 mm, without spur. Stamens ca. 3 mm; filaments ca. 1 mm; anthers valved. Pistil 5–7 mm; style 3–4 mm. Fruit unknown. Fl. Apr–May, fr. unknown.

• Slopes in valleys, roadsides, streamsides; 500–800 m. Guizhou (Wangmo, Yinjiang, Yuping).

**14. *Epimedium koreanum*** Nakai, Fl. Sylv. Kor. 21: 63. 1936.

朝鲜淫羊藿 chao xian yin yang huo

*Epimedium cremeum* Nakai & Maekawa ex Honda; *E. grandiflorum* C. Morren subsp. *koreanum* (Nakai) Kitamura; *E. grandiflorum* var. *koreanum* (Nakai) K. Suzuki; *E. sulphurellum* Nakai (1944), not C. Morren (1849).

Herbs, 15–40 cm tall. Rhizome creeping, 3–5 mm in diam. Leaves basal and cauline, biternate, usually 9-foliate; leaflets abaxially pallid, adaxially dark green, ovate, 3–13 × 2–8 cm, papery, abaxially glabrous or sparsely puberulent, adaxially glabrous, base deeply cordate with usually rounded lobes, base of lateral leaflets conspicuously oblique with outer lobe large, deltoid, and acute, inner lobe smaller and rounded, margin minutely serrate, apex acute or acuminate. Flowering stem with 1 biternate leaf. Inflorescence a simple raceme, 4–16-flowered, 10–15 cm, glabrous or pilose. Pedicel 1–2 cm. Flowers white, pale yellow, deep rose, or violet, 2–4.5 cm in diam. Outer sepals reddish, oblong, 4–5 mm; inner sepals narrowly ovate to lanceolate, flat, 8–18 × 3–6 mm, apically acute. Petals usually much longer than inner sepals, rounded; spurs slender, elongate, tapering-subulate, 1–2 cm. Stamens ca. 6 mm; anthers ca. 4.5 mm; filaments ca. 1.5 mm. Pistil ca. 8 mm; ovary ca. 4.5 mm; style ca. 3.5 mm. Capsules narrowly fusiform, ca. 6 mm; style ca. 2 mm. Seeds 6–8. Fl. Apr–May, fr. May.  $2n = 12$ .

Forests, thickets; 400–1500 m. Anhui, Jilin, Liaoning, Zhejiang [Japan, N Korea].

**15. *Epimedium flavum*** Stearn, Bot. Mag., n.s., 12: 21. 1995.

天全淫羊藿 tian quan yin yang huo

Herbs, 15–30 cm tall. Leaves basal and cauline, nearly leathery when mature, basal leaves mostly with 5 leaflets, sometimes 3, cauline leaves with 3 or 5 leaflets; leaflets ovate, to 4 × 3 cm, both surfaces glabrous, base cordate with lobes rounded and slightly diverging or separated by a narrow sinus,

those of lateral leaflets moderately unequal, margin remotely spinose-serrate, apex acuminate. Flowering stem with 1 leaf or 2 leaves at same height or at different heights. Inflorescence simple, racemose, loosely few flowered (3–10-flowered), ca. 6 cm. Pedicel to 2 cm, with short glandular hairs. Flowers large, ca. 3 cm in diam. Outer sepals caducous; inner sepals spreading horizontally, pale sulfur-yellow, lanceolate, ca.  $11 \times 4$  mm, apex obtuse. Petals pale sulfur-yellow, slightly longer than inner sepals; spur elongated, subulate, slightly curved, ca. 1.3 cm, expanded at base into a lamina ca. 8 mm high. Stamens included, ca. 3 mm; filaments pale sulfur-yellow, ca. 0.5 mm; anthers pale sulfur-yellow, ca. 2.5 mm. Fruit unknown. Fl. Apr, fr. unknown.

- About 2000 m. Sichuan (Erlang Shan, Tianquan).

**16. *Epimedium brachyrrhizum*** Stearn, Kew Bull. 52: 659. 1997.

短茎淫羊藿 duan jing yin yang huo

Herbs, ca. 23 cm tall. Rhizome short, compact, clump-forming. Leaves basal and cauline, trifoliolate; leaflets adaxially deep green, ovate or narrowly ovate,  $6\text{--}10 \times 3.5$  cm, leathery, abaxially glabrous except for hairy thickened insertion of secondary petiole, adaxially glabrous, base deeply cordate, base of terminal leaflet with equal rounded lobes, those of lateral leaflets unequal with outer lobe large, deltoid, and acute, inner lobe smaller and rounded, margin closely spinulose subserrulate, apex acuminate. Flowering stem with 1 leaf. Inflorescence simple, racemose, loosely few flowered (6–12-flowered), ca. 14 cm. Pedicel ca. 2 cm, sparsely glandular pubescent. Flowers large, ca. 4 cm in diam. Outer sepals obovate,  $3.5\text{--}4$  mm, apically obtuse; inner sepals pale rose, lanceolate,  $20\text{--}22 \times$  ca. 6 mm. Petals basally rose, elsewhere white, slightly longer than inner sepals; spur strongly curved, elongate,  $2.2\text{--}2.6$  cm, nearly lamina-less. Stamens prolonged, ca. 4 mm; filaments whitish, ca. 1 mm, slender; anthers yellow, valved. Pistil ca. 6 mm; style ca. 2.5 mm; stigma ruminant. Fl. Apr–May, fr. unknown.

- Forests on slopes; 600–1200 m. Guizhou (Fanjing Shan).

**17. *Epimedium leptorrhizum*** Stearn, J. Bot. 71: 343. 1933.

黔岭淫羊藿 qian ling yin yang huo

*Epimedium macranthum* H. Léveillé, Fl. Kouy-Tchéou, 48. 1914–1915, not Morren & Decaisne (1834).

Herbs, 12–30 cm tall. Rhizome long creeping, 1–2 mm in diam.; internodes sometimes to 20 cm. Leaves basal and cauline, trifoliolate; petiole reddish pubescent; leaflets adaxially dark green, narrowly ovate or ovate,  $3\text{--}10 \times 2\text{--}5$  cm, leathery, abaxially often glaucous, papillose and reddish pubescent on midvein and lateral veins, especially dense at insertion of petiolules, adaxially glabrous, base deeply cordate with usually rounded lobes nearly touching, those of lateral leaflets unequal, margin closely spinose-serrate, apex long acuminate. Flowering stem with 1 trifoliolate leaf, or occasionally 2 opposite leaves. Inflorescence simple, racemose, 4–12-flowered, 12–25 cm, glandular. Pedicel 1–2.5 cm, glandular. Flowers white, tinged with rose or deep rose, large,  $3.5\text{--}4$  cm in diam. Outer sepals

ovate-oblong, 3–4 mm, apex obtuse; inner sepals white, narrowly elliptic,  $11\text{--}20 \times 4\text{--}7$  mm, apex acute. Petals longer than inner sepals, horn-shaped, to 2 cm, tapering from swollen but lamina-less base. Stamens ca. 4 mm; anthers ca. 3 mm, valved, revolute. Capsules oblong, 1.5–2 cm; style rostriform. Fl. Mar–Apr, fr. Apr–May.

- Forests, thickets; 400–1500 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan.

**18. *Epimedium pauciflorum*** K. C. Yen, Guihaia 14: 124. 1994.

少花淫羊藿 shao hua yin yang huo

Herbs, 6–20 cm tall. Rhizome long creeping, 1–3 mm in diam.; internodes sometimes to 20 cm. Leaves basal and cauline, trifoliolate; leaflets ovate or suborbicular,  $1.3\text{--}2.5 \times 1.2\text{--}2.5$  cm, abaxially sparsely puberulent, adaxially glabrous, base deeply cordate with rounded lobes nearly touching, those of lateral leaflets conspicuously unequal, margin coarsely serrate, apex acute or shortly acuminate. Flowering stem with 1 trifoliolate leaf. Inflorescence simple, racemose, few flowered (ca. 3-flowered), 4–7 cm; rachis and pedicels glandular, pubescent. Pedicel 1–2.3 cm; bracts ovate, 0.8–1.4 mm. Outer sepals caducous, narrowly obovate, ca.  $4 \times 3$  mm; inner sepals white, broadly lanceolate, ca.  $12 \times 5$  mm, apex obtuse. Petals declined, white, horn-shaped, longer than inner sepals, blunt spurs ca. 1.7 cm. Stamens 4; anthers ca. 2.5 mm, valved. Pistil ca. 6 mm; style 2–2.8 mm. Fruit unknown. Fl. Mar–Apr, fr. unknown.

- Weedy slopes; ca. 1700 m. Sichuan.

**19. *Epimedium shuichengense*** S. Z. He, Acta Bot. Yunnan. 18: 209. 1996.

水城淫羊藿 shui'cheng yin yang huo

Herbs, 15–30 cm tall. Rhizome creeping, longer than 15 cm, 1.5–2.5 mm in diam. Leaves basal and cauline, trifoliolate; petiole of basal leaf 10–17 cm, petiole of cauline leaf 3–6 cm; leaflets ovate,  $4\text{--}5.5 \times 2\text{--}2.5$  cm, abaxially appressed whitish puberulent, adaxially glabrous, base deeply cordate with lobes rounded or acute, those of lateral leaflets conspicuously unequal, margin spinose-serrulate, apex long acuminate. Flowering stem with 2 trifoliolate opposite leaves. Inflorescence simple, racemose, few flowered (6–9-flowered), 6–7 cm, glabrous or sparsely glandular pubescent; bracts broadly lanceolate, ca. 1.5 mm, spinulose-serrulate, apex dentiform. Flowers ca. 1 cm in diam. Outer sepals purple, lanceolate, ca.  $5 \times 2$  mm; inner sepals pale yellow, ovate, ca.  $4 \times 3$  mm. Petal spur curved, yellow, shortly horn-shaped, 4–5 mm. Stamens ca. 4 mm; filaments ca. 2 mm. Pistil ca. 4 mm; style ca. 2 mm. Capsules ca. 1 cm; style ca. 3 mm. Fl. Apr–May, fr. May–Jun.

- Thickets on slopes; ca. 1800 m. Guizhou (Shuicheng).

**20. *Epimedium epsteinii*** Stearn, Kew Bull. 52: 662. 1997.

紫距淫羊藿 zi ju yin yang huo

Herbs, ca. 15 cm tall. Rhizome long creeping, slender, 2–3 mm in diam. Leaves basal and cauline, trifoliolate; leaflets adaxially deep green, ovate,  $4\text{--}5 \times 2\text{--}3$  cm, abaxially glaucous,

with sparse minute prostrate hairs, adaxially glabrous, base shallowly cordate with lobes separated by a moderately broad sinus, those of terminal leaflet rounded, lateral leaflets with smaller lobe rounded and larger lobe acute, margin closely spinulose-suberrulate, apex acuminate. Flowering stem with 2 opposite leaves or only 1 leaf. Inflorescence simple, racemose, 6–15-flowered, ca. 6 cm or longer; bracts entire. Pedicel ca. 3 cm, glabrous. Flowers large, ca. 3 cm in diam. Outer sepals caducous, greenish, suborbicular, 2.5–3.5 mm; inner sepals white, ovate, ca. 13 × 9 mm, apex acute. Petals pale purple, slightly longer than inner sepals; spur basally deeper purple, slightly curved, subulate, elongated, 1.5–1.6 cm, basally expanded to 5 mm high. Stamens enclosed, ca. 4 mm; filaments ca. 0.5 mm. Pistil ca. 4.2 mm; style ca. 3 mm. Fruit unknown. Fl. Apr, fr. unknown.

• Forest margins, shaded places by streamsides; 400–1000 m. Hunan (Tianping Shan).

**21. *Epimedium fangii* Stearn, Bot. Mag., n.s., 12: 18. 1995.**

方氏淫羊藿 fang shi yin yang huo

Herbs, ca. 25 cm tall. Rhizome long creeping, slender, 1.5–2 mm in diam. Leaves basal and cauline, trifoliolate; leaflets adaxially pale green, narrowly ovate, 4–8 × 2.5–5.5 cm, leathery, abaxially glaucous, nearly glabrous except for scattered appressed minute hairs, adaxially glabrous, base moderately cordate with lobes rounded and separated by a narrow sinus, those of lateral leaflets moderately unequal, margin spinulose-serrulate, apex obtuse or nearly acute. Inflorescence simple, racemose, loosely 6–10-flowered, to 13 cm. Pedicel ca. 2 cm, glabrous. Flowers pale yellow, large, ca. 4.5 cm in diam. Outer sepals caducous, 2.5–3.5 mm; inner sepals spreading horizontally, reddish, cymbiform, ca. 6 × 2.5 mm, obtuse. Petals pale yellow, much longer than inner sepals; spur nearly straight and horizontally spreading, subulate, elongated, ca. 2.2 cm, expanded at base into a lamina ca. 1 cm high. Stamens included, ca. 3.5 mm; filaments ca. 1 mm; anthers pale yellow, ca. 2.5 mm, valved. Capsules unknown. Fl. Apr, fr. unknown.

• Forests; 1800–1900 m. Sichuan (Emei Shan).

A natural hybrid swarm (*Epimedium × omeiense* Stearn, Bot. Mag., n.s., 12: 22. 1995) reportedly results when *Epimedium fangii* and *E. acuminatum* occur together (see also Stearn, Gen. *Epimedium*, 183. 2002).

**22. *Epimedium latisepalum* Stearn, Bot. Mag. (Kew Mag.) 10: 180. 1993.**

宽萼淫羊藿 kuan e yin yang huo

Herbs, ca. 30 cm tall. Rhizome creeping, slender. Leaves basal and cauline, trifoliolate; petiole to 10 cm; leaflets adaxially deep green, narrowly ovate, 6–9 × 2.5–4 cm, leathery, abaxially glaucous, with short erect scattered hairs, adaxially glabrous, base deeply cordate with lobes acute or rounded and touching or slightly overlapping, those of lateral leaflets unequal, margin spinulose-suberrulate, apex shortly acuminate or acute. Flowering stem with 2 trifoliolate opposite leaves. Inflorescence simple, racemose, loose, few flowered (ca. 8-flowered), ca. 20 cm. Pedicel 2.5–5 cm, glabrous. Flowers pendulous, large, 4–5 cm in diam. Outer sepals caducous, green, ob-

long, 3–5 mm, margin emarginate or repand; inner sepals spreading horizontally, white, elliptic, ca. 16 × 8–9 mm, apically shortly acuminate. Petals white but slightly yellowish or purplish tinged at base, much longer than inner sepals; spur slightly curved, horn-shaped, elongated, ca. 2.5 cm, basally expanded into lamina ca. 7 mm. Stamens included, ca. 4 mm; anthers yellow, ca. 2.5 mm, valved, apex blunt. Pistil ca. 7 mm; style ca. 3.5 mm. Fl. and fr. unknown.

• About 900 m. Sichuan (Baoping).

*Epimedium latisepalum* was described from plants cultivated in the Royal Botanic Gardens, Kew, but originally from Sichuan.

**23. *Epimedium ogisui* Stearn, Bot. Mag. (Kew Mag.) 10: 182. 1993.**

芦山淫羊藿 lu shan yin yang huo

Herbs, 25–35 cm tall. Rhizome long creeping, slender, ca. 1 mm in diam. Leaves basal and cauline, basal leaves with 1 or 3 leaflets, petiole 5–13 cm. Flowering stem with 2 trifoliolate opposite leaves, petiole 2–5 cm; leaflets adaxially deep green, ovate or narrowly ovate, 3–6 × 1–3 cm, abaxially glaucous, nearly glabrous except for scattered erect short hairs, adaxially glabrous, base moderately cordate with lobes rounded and separated by a narrow sinus, those of lateral leaflets moderately unequal, margin spinulose-suberrulate, apex acute. Inflorescence simple, racemose, loosely 3–12-flowered, 12–14 cm. Pedicel 2–3 cm, glabrous. Flowers white, ca. 2.5 cm in diam. Outer sepals caducous, 2–3.5 mm; inner sepals spreading, white, lanceolate, 16–19 × 7–9 mm, apex acuminate. Petals white, ca. as long as inner sepals; spur slightly curved, subulate, elongated, 1.5–1.8 cm, basally expanded into lamina 7–8 mm high. Stamens included, ca. 4.5 mm; filaments flat, ca. 1.5 mm; anthers ca. 3 mm, valved, revolute, apex obtuse. Pistil ca. 6 mm. Fruit unknown. Fl. Apr, fr. unknown.

• Rocky cliffs by waterfalls; 900–1000 m. Sichuan (Lushan).

**24. *Epimedium fargesii* Franchet, J. Bot. (Morot) 8: 281. 1894.**

川鄂淫羊藿 chuan e yin yang huo

Herbs, 30–70 cm tall, sometimes to 80 cm tall. Rhizome creeping, stout, 2–8 mm in diam. Leaves basal and cauline, trifoliolate; leaflets adaxially dark green, narrowly ovate, 4–15 × 1.3–7 cm, leathery, abaxially glaucous, glabrous or sparsely pilose, adaxially glabrous, both surfaces with conspicuous reticulate veins, base deeply cordate with usually rounded lobes, those of lateral leaflets unequal, outer lobe large, deltoid, and acute, inner lobe smaller and rounded, margin closely spinose-serrate, apex acuminate. Flowering stem normally with 2 (abnormally 3) trifoliolate opposite leaves. Inflorescence simple, racemose, or compound with lower peduncles loosely 2- or 3-flowered, rachis glandular pubescent, 14–25-flowered, 14–30 cm. Pedicel 1.5–4 cm, glandular pubescent. Flowers purplish red, ca. 2 cm. Outer sepals violet-tinged, narrowly ovate, 3–4 × ca. 1.5 mm, apex blunt; inner sepals reflexed, white or pinkish, narrowly lanceolate, 1.5–1.8 cm × ca. 4 mm, apically acuminate. Petals dark violet, much shorter than inner sepals, slightly 2- or 3-lobed; spur straight, cylindric-subulate, blunt, 7–8 mm.

Stamens conspicuously prolonged, ca. 9 mm; anthers purple, 3–4 mm. Ovary ca. 1.3 cm. Capsules included; style ca. 2 cm. Fl. Mar–Apr, fr. Apr–Jun.

• Coniferous and broad-leaved mixed forests, thickets; 200–1700 m. Hubei, Sichuan.

**25. *Epimedium enshiense*** B. L. Guo & P. K. Hsiao, Acta Phytotax. Sin. 31: 194. 1993.

恩施淫羊藿 en shi yin yang huo

Herbs, 25–70 cm tall. Rhizome shortly creeping, nodes many. Leaves basal and cauline, usually trifoliate, rarely basal leaves simple; leaflets abaxially glaucous, slightly pruinose, adaxially dark green, ovate or broadly ovate, 3.2–9.5 × 2.5–6 cm, leathery, abaxially glabrous or sparsely white pubescent, adaxially glabrous, base cordate with lobes rounded, base of terminal leaflet with subequal lobes rounded, those of lateral leaflets slightly unequal, rounded or obtuse, margin remotely spinose-serrate, apex acuminate or shortly acuminate. Flowering stem with 2 trifoliate opposite leaves. Inflorescence simple, racemose, 10–20-flowered, 14–33 cm, glandular. Flowers large, 1.5–2.5 cm in diam. Outer sepals 4, pale brown, outer pair ovate-orbicular, ca. 1.5 mm, inner pair ovate, ca. 2.5 × 1.5 mm; inner sepals pale yellow, ovate, 6–7 × 3.2–3.7 mm, apically acute. Petal spur pale yellow, horn-shaped, longer than inner sepals, 7–12 mm, base lamina-less. Stamens slightly prolonged, ca. 3 mm; anther ca. 2 mm, valved. Capsules 1–1.4 cm; style ca. 5 mm. Seeds 10. Fl. Apr–May, fr. May–Jun.

• Slopes; ca. 400 m. Hubei (Enshi).

**26. *Epimedium franchetii*** Stearn, Kew Bull. 51: 396. 1996.

木鱼坪淫羊藿 mu yu ping yin yang huo

Herbs, 20–60 cm tall. Rhizome compact, ca. 7 mm in diam. Leaves basal and cauline, trifoliate, leathery; basal petioles 4–10 cm; leaflets abaxially occasionally reddish tinged, adaxially shiny, narrowly ovate, 9–14 × 6–7 cm, abaxially glaucous, with extremely minutely appressed hairs, adaxially glabrous, base deeply cordate with a narrow sinus, lobes of terminal leaflet equal and obtuse or acute, those of lateral leaflets unequal with inner lobe smaller and acute or obtuse, outer lobe much longer and acuminate, margin closely spinose-serrate, apex acute or acuminate. Flowering stem with 2 trifoliate opposite leaves or 3 whorled leaves. Inflorescence simple, 14–25-flowered, 15–30 cm. Pedicel 1–3 cm, glandular hairy. Flowers large, ca. 4.5 cm in diam. Outer sepals caducous, green, to 5 mm; inner sepals pale yellow, narrowly ovate, ca. 10 × 4–5 mm, apically acuminate. Petals pale sulfur-yellow, much longer than inner sepals; spur much curved, subulate, elongate, ca. 2 cm, lamina-less. Stamens exposed, ca. 4.5 mm; filaments pale yellow, ca. 2 mm; anthers pale yellow, valved. Pistil ca. 5 mm. Fruit unknown. Fl. Apr, fr. unknown.

• Forests; ca. 1200 m. Guizhou, Hubei.

**27. *Epimedium lishihchenii*** Stearn, Kew Bull. 52: 664. 1997.

时珍淫羊藿 shi zhen yin yang huo

*Epimedium membranaceum* K. Meyer subsp. *orientale* Stearn.

Herbs, 30–40 cm tall. Rhizome long creeping, slender, 2–3 mm in diam. Leaves basal and cauline, trifoliate; leaflets adaxially dark green, narrowly ovate, 5–11 × 3.5–5 cm, leathery, abaxially glaucous, with long multicellular hairs or subglabrous, base cordate with a narrow or open sinus, lobes of terminal leaflet equal and obtuse, those of lateral leaflets unequal, with inner one smaller and rounded or obtuse, outer one longer and acute, margin closely spinulose-suberrulate, apex acuminate or sometimes acute. Flowering stem with 2 opposite leaves. Inflorescence simple, 5–11-flowered, 7–12 cm. Pedicel 1–2 cm, glandular hairy. Flowers yellow, large. Outer sepals caducous, 4–5 mm, with white margins; inner sepals appressed to petals, yellowish, ovate or narrowly oblong, 10–11 × 6–7 mm, apically acute. Petals pale sulfur-yellow, much longer than inner sepals, lamina-less; spur strongly curved, subulate, elongated, 2–2.5 cm. Stamens exposed, pale yellow, ca. 5 mm; filaments ca. 1 mm; anthers ca. 3.5 mm. Pistil ca. 7 mm. Fruit unknown. Fl. Apr–May, fr. unknown.

• Forests on slopes. Jiangxi (Lu Shan).

**28. *Epimedium davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 8: 195. 1885 [“*davidi*”].

宝兴淫羊藿 bao xing yin yang huo

*Epimedium membranaceum* K. Meyer.

Herbs, 30–50 cm tall. Rhizome shortly creeping, stout. Leaves basal and cauline, (3 or) 5-foliate, basal leaf usually much shorter than flowering stem leaf, 12–25 cm; leaflets abaxially glaucescent, adaxially deep green, shiny, ovate or broadly ovate, 6–12 × 2–5 cm, leathery or papery, abaxially papillose and sparsely pubescent with short appressed hairs, both surfaces with distinct reticulate veins, base deeply or shallowly cordate with subequal rounded lobes, margin spinose-serrate, apex obtuse or acute. Flowering stem with 2 trifoliate opposite leaves, rarely alternate or 3 leaves. Panicle loosely 6–24-flowered, 15–25 cm. Pedicel 1.5–2 cm, slender, glandular. Flowers pale yellow, 2–3 cm in diam. Outer sepals ovate, 2–4 mm, blunt; inner sepals pale reddish, narrowly ovate, 6–7 × 3–4 mm, apex acute. Petals much longer than inner sepals, lamina distinct, petaloid, rounded, forming a cup 7–13 mm deep; spur slender, curved, subulate, 1–1.5 cm. Stamens included, 3–4 mm; filaments flat, ca. 7 mm; anthers ca. 4 mm, valved. Ovary ca. 5 mm. Capsule 1.5–2 cm; style ca. 5 mm, rostrate. Fl. Apr–May, fr. May–Aug.

• Forests, thickets, mixed forests by streams, rock crevices; 1400–3000 m. Sichuan, Yunnan.

**29. *Epimedium dolichostemon*** Stearn, Kew Bull. 45: 685. 1990.

长蕊淫羊藿 chang rui yin yang huo

Herbs, ca. 30 cm tall. Rhizome shortly creeping. Leaves basal and cauline, trifoliate; leaflets adaxially deep green, ovate-lanceolate or lanceolate, to 8 × 3 cm, leathery, abaxially glabrous, base deeply cordate with subequal acute lobes, those of lateral leaflets unequal, acuminate, margin remotely spinose-serrate, apex acuminate. Flowering stem with 2 trifoliate op-

posite leaves. Panicle loosely many flowered (to 38-flowered), ca. 15 cm, with lower peduncles 1–2 cm, each 2- or 3-flowered at base of rachis. Pedicel 1–1.5 cm, glabrous. Outer sepals caducous, 2.5–3 mm; inner sepals white, narrowly elliptic, 8–9 × ca. 2.5 mm. Petals reddish purple, cucullate, much shorter than inner sepals, ca. 3 mm, with slight lamina and blunt incurved spur. Stamens conspicuously prolonged, ca. 8 mm; filaments yellowish, 4.5–5 mm; anthers ca. 2.5 mm, valved, revolute. Fruit unknown. Fl. Apr; fr. unknown.

• Habitat unknown, described from plants in cultivation in England; ca. 1400 m. Sichuan (Shizhu).

**30. *Epimedium mikinorii*** Stearn, Kew Bull. 53: 214. 1998.

直距淫羊藿 *zhi ju yin yang huo*

Herbs, 30–40 cm tall. Rhizome shortly repent, compact. Leaves basal and cauline, trifoliolate; leaflets adaxially dark green, lanceolate, 8–11 × 3–4 cm, leathery, abaxially glaucous, glabrous, base cordate with equal lobes rounded, those of lateral leaflets oblique with outer lobe large and acute, inner lobe smaller and rounded, margin closely spinose-serrulate, apex long acuminate. Flowering stem with 2 trifoliolate opposite leaves. Panicle ca. 30-flowered, ca. 18 cm, glabrous, with lower peduncles 3–5-flowered. Pedicel ca. 1 cm. Flowers large. Outer sepals caducous, oblong, ca. 3.5 mm; inner sepals rose-tinged, elliptic, 11–12 × 4–5.5 mm. Petals much longer and narrower than inner sepals, with yellow-edged lamina ca. 3.5 mm high; spur slightly curved, nearly straight, purple, subulate, elongated, 1.7–2 cm. Stamens enclosed, whitish, ca. 3 mm; filaments ca. 1 mm; anthers ca. 2 mm, valved. Pistil ca. 5.8 mm; style slightly curved. Fruit unknown. Fl. Apr; fr. unknown.

• Forests on slopes; ca. 700 m. Hubei (Enshi).

**31. *Epimedium chlorandrum*** Stearn, Kew Bull. 52: 660. 1997.

绿药淫羊藿 *lü yao yin yang huo*

Herbs, 35–65 cm tall. Rhizome compact. Leaves basal and cauline, trifoliolate; leaflets adaxially green, mottled with brown when young, narrowly ovate or sublanceolate, 5–11 × 2–4.5 cm, leathery, abaxially glaucous, with numerous minutely appressed hairs, base moderately cordate, terminal leaflet with equal rounded lobes, lateral leaflets oblique with outer lobe large and obtuse or rounded, inner lobe smaller and rounded, margin slightly undulate, sparsely or closely spinulose-subserulate, apex shortly acuminate. Panicle 12–30-flowered, 25–36 cm, lower peduncles 3–5-flowered. Pedicel ca. 2.5 cm, glabrous. Flowers large, ca. 4 cm in diam. Outer sepals caducous, green, 2–3 mm; inner sepals not appressed to petals, greenish, narrowly ovate, unequal, outer pair ca. 8 × 4.5 mm, inner pair ca. 10 × 4.5 mm. Petals pale yellow, much longer than inner sepals; spur strongly curved, subulate, elongated, lamina-less. Stamens prolonged, ca. 4.5 mm; filaments white, with slightly pink tinge; anthers green, ca. 3 mm; pollen green. Fruit unknown. Fl. Apr; fr. unknown.

• Forests on slopes; ca. 900 m. Sichuan (Baoping).

**32. *Epimedium wushanense*** T. S. Ying, Acta Phytotax. Sin. 13(2): 55. 1975.

巫山淫羊藿 *wu shan yin yang huo*

Herbs, evergreen, 50–80 cm tall. Rhizome short, stout, nodose. Leaves basal and cauline, trifoliolate; leaflets lanceolate to narrowly lanceolate, 9–23 × 1.8–4.5 cm, leathery, abaxially lanate or becoming glabrous, adaxially glabrous, base cordate, terminal leaflet with equal rounded lobes, lateral leaflets oblique with outer lobe large, deltoid, and acute, inner lobe smaller and rounded, margin coarsely aristate-dentate, apex acuminate or long acuminate. Flowering stem with 2 trifoliolate opposite leaves. Panicle many flowered (25–70-flowered), 15–30(–50) cm; rachis glabrous. Pedicel 1–2 cm, sparsely glandular pubescent or glabrous. Flowers pale yellow, to 3.5 cm in diam. Outer sepals suborbicular, 2–5 × 1.5–3 mm; inner sepals pale yellow, broadly elliptic, 3–15 × 1.5–8 mm, apex obtuse. Petals slightly curved, pale yellow or sometimes purplish at base, horn-shaped, longer than inner sepals, 0.6–2 cm. Stamens ca. 5 mm; filaments 1–1.5 mm; anthers ca. 4 mm, valved, revolute. Pistil ca. 5 mm; ovary obliquely terete; ovules 10–12. Capsule ca. 1.5 cm; style ca. 4.5 mm, rostrate. Fl. Apr–May, fr. May–Jun.

• Forests, thickets, weedy places, crevices; 300–1700 m. Chongqing, Guangxi, Guizhou, Hubei, Sichuan.

**33. *Epimedium stellulatum*** Stearn, Kew Bull. 48: 810. 1993.

星花淫羊藿 *xing hua yin yang huo*

Herbs, 20–35 cm tall. Rhizome shortly creeping. Leaves basal and cauline, trifoliolate; leaflets adaxially dark green, shiny, ovate, 8–9 × 4–7 cm, leathery, abaxially conspicuously puberulent, base deeply cordate, terminal leaflet with equal rounded lobes, lateral leaflets moderately oblique with outer lobe and inner lobe smaller, acute, margin spinose-serrate, apex acute or shortly acuminate. Flowering stem with 2 trifoliolate opposite leaves, rarely with 1 leaf. Panicle loosely 20–40-flowered, 15–20 cm, with lower peduncles to 3 cm, each 3-flowered. Pedicel 5–15 mm, with numerous glandular hairs; bracteole ca. 2.2 mm, apex shortly acuminate. Outer sepals 4, caducous, unequal, 2.5–3 mm; inner sepals white, lanceolate, ca. 12 × 3 mm, apically acuminate. Petals nearly straight, brown suffuse but orange toward base, much shorter than inner sepals, ca. 2.5 mm, with slight lamina and blunt spur. Stamens conspicuously prolonged, ca. 3.5 mm; filaments yellowish, ca. 1.5 mm; anthers yellow, ca. 2 mm, valved. Pistil ca. 4.5 mm; style ca. 2.5 mm. Fruit unknown. Fl. Apr; fr. unknown.

• Slopes; ca. 900 m. Hubei, Sichuan.

**34. *Epimedium reticulatum*** C. Y. Wu ex S. Y. Bao, Acta Phytotax. Sin. 25: 156. 1987.

革叶淫羊藿 *ge ye yin yang huo*

Herbs, 30–40 cm tall. Rhizome purplish red, shortly creeping. Leaves basal and cauline, trifoliolate; petiole of basal leaves ca. 20 cm, petiole of cauline leaves 5–6 cm; leaflets adaxially dark green, ovate, 5–7 × 3.5–5 cm, thickly leathery, glabrous, abaxially pilose in axils of veins, adaxially with 5 slightly impressed veins, both surfaces with conspicuous reticulate veins, base deeply cordate with usually rounded lobes, those of lateral leaflets conspicuously unequal, margin spinose-

serrate, apex acute or acuminate. Flowering stem with 2 opposite trifoliate leaves, sometimes 3 or 4 leaves whorled. Panicle 40–45-flowered, 30–35 cm, with lower peduncles 2–20-flowered; rachis glandular pubescent. Pedicel ca. 1.5 cm, slender, glandular pubescent. Flowers yellow. Outer sepals oblong, ca. 5 mm; inner sepals elliptic, ca. 6 mm, apex rounded. Petal spur yellow, horn-shaped, shorter than inner sepals, ca. 4.5 mm. Stamens ca. 3 mm; filaments flat, short. Capsule 1.2–1.5 cm; style rostrate. Seeds 3–5, reniform. Fl. Apr–May, fr. Jun–Jul.

- Forests; ca. 1100 m. Sichuan.

**35. *Epimedium ilicifolium* Stearn, Kew Bull. 53: 213. 1998.**

镇坪淫羊藿 *zhen ping yin yang huo*

Herbs, 28–42 cm tall. Rhizome compact. Leaves basal and cauline, trifoliate; leaflets adaxially glossy, lanceolate, 8–11 × 3–4 cm, leathery, abaxially puberulent, adaxially glabrous, base cordate with an open sinus and acute lobes, terminal leaflet with equal rounded lobes, lateral leaflets oblique with outer lobe large and inner lobe smaller, margin undulate-sinuate and sparsely spinose-serrate, apex long acuminate. Flowering stem with 2 opposite trifoliate leaves. Panicle loosely 25–32-flowered, 18–23 cm. Pedicel ca. 2 cm, glandular. Flowers yellow, large. Outer sepals caducous, black, white-margined, obovate, ca. 4.2 × 4 mm, apex emarginate; inner sepals pale yellow, elliptic or narrowly ovate, 10–12 × 5–6 mm, apex acute. Petals pale yellow, much longer than inner sepals, ca. 2 mm; spur strongly curved, subulate, elongated, basal lamina ca. 7 mm high. Stamens enclosed, yellow, ca. 4 mm; filaments ca. 1 mm; anthers ca. 3 mm, valved. Pistil ca. 5.5 mm; style ca. 3 mm. Fruit unknown. Fl. Apr, fr. unknown.

- 1600–1700 m. Shaanxi (Zhenping).

**36. *Epimedium acuminatum* Franchet, Bull. Soc. Bot. France 33: 109. 1886.**

粗毛淫羊藿 *cu mao yin yang huo*

*Epimedium komarovii* H. Léveillé.

Herbs, 30–70 cm tall. Rhizome stout, short, sometimes long creeping, 0.5–2.5 cm in diam. Leaves basal and cauline, trifoliate; leaflets adaxially deep green, narrowly ovate or lanceolate, 3–18 × 1.5–7 cm, thinly leathery, abaxially glaucous, with dense or sparse shortly appressed fairly stout bristles, sometimes nearly glabrous, adaxially glabrous, base cordate, terminal leaflet with equal rounded lobes, lateral leaflets oblique with outer lobes large and rounded, inner lobes smaller and rounded, margin closely spinose-serrate, apex long acuminate. Flowering stem with 2 trifoliate opposite leaves, sometimes 3-whorled. Panicle 10–50-flowered, 12–25 cm, with lower peduncles loosely 3–5-flowered, glabrous or glandular pubescent. Pedicel 1–4 cm. Flowers yellow, white, rose-purple, or pale violet, large, 3–4 cm in diam. Outer sepals 4, outer pair ovate-oblong, ca. 3 × 2 mm, inner pair broadly obovate, ca. 4.5 × 4 mm; inner sepals ovate-elliptic, 8–12 × 3–7 mm, apically acute. Petals curving outward, horn-shaped, much longer than inner sepals, 1.5–2.5 cm, tapering from swollen but lamina-less base. Stamens 3–4 mm; anthers ca. 2.5 mm, valved, revolute. Capsule ca. 2 cm; style long rostrate. Seeds numerous. Fl. Apr–May, fr. May–Jul.  $2n = 12^*$ .

- Forests, thickets, bamboo forests, weedy slopes; 300–2400 m. Guangxi, Guizhou, Sichuan, Yunnan.

**37. *Epimedium hunanense* (Handel-Mazzetti) Handel-Mazzetti, Symb. Sin. 7: 324. 1931.**

湖南淫羊藿 *hu nan yin yang huo*

*Epimedium davidii* Franchet var. *hunanense* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 131. 1925; *E. kunawarense* S. Clay.

Herbs, ca. 40 cm tall. Rhizome shortly creeping, 3–5 mm in diam. Leaves basal and cauline, trifoliate; leaflets abaxially glaucescent, adaxially deep green, oblong-elliptic or narrowly ovate, 10–13 × ca. 6 cm, leathery, abaxially papillose and sparsely pubescent or nearly glabrous, adaxially glabrous, base deeply cordate, terminal leaflet with equal rounded lobes, lateral leaflets conspicuously oblique with outer lobe large, deltoid, and acute or rounded, inner lobe smaller and rounded, margin closely spinulose-subserulate, apex acuminate. Flowering stem with 2 trifoliate opposite leaves. Panicle loosely 10–20-flowered, nearly glabrous, with lower peduncles 2- or 3-flowered. Pedicel 1–2 cm, sparsely glandular pubescent. Flowers yellow, ca. 3.5 cm in diam. Outer sepals oblong-elliptic, ca. 4 × 2 mm, apex obtuse; inner sepals broadly elliptic, 5–6 × 3–4 mm, apically obtuse. Petals nearly cylindric and horizontally spreading, much longer than inner sepals, with distinct petaloid rounded lamina forming a cup ca. 8 mm deep and fairly stout; spurs straight, 1.5–1.8 cm, blunt. Stamens ca. 4 mm; filaments ca. 1 mm; anther ca. 3 mm, valved, revolute. Capsules narrowly ellipsoid, ca. 1.3 cm; style 2–3 mm, rostrate. Fl. Mar–Apr, fr. Apr–Jun.

- Forests, thickets, slopes, roadsides; 400–1400 m. Guangxi, Hubei, Hunan.

**38. *Epimedium rhizomatosum* Stearn, Kew Bull. 53: 220. 1998.**

强茎淫羊藿 *qiang jing yin yang huo*

Herbs, 38–42 cm tall. Rhizome creeping, elongated, ca. 8 cm or longer, slender, 1.5–2 mm in diam. Leaves basal and cauline, trifoliate; leaflets adaxially green, narrowly ovate, 4–6 × 2–3 cm, leathery, abaxially glaucous, with scattered minute erect hairs, adaxially glabrous, base shallowly cordate, with narrow sinus and basal lobes rounded or acute, lateral leaflets conspicuously oblique with outer lobe large, inner lobe smaller, margin closely spinulose-subserulate, apex acuminate. Flowering stem with 2 opposite or alternate leaves. Panicle 5–30-flowered, 9–30 cm, with lower peduncles 2–5-flowered. Pedicel 1.5–2 cm, glandular hairy. Flowers large, 4–6 cm in diam. Outer sepals caducous, white with purple tinge, ca. 4 mm; inner sepals appressed, white or reddish, narrowly ovate, ca. 6 × 2.5 mm, apically acute. Petals pale yellow, much longer than inner sepals; spur curved, subulate, elongated, 2–3.5 cm, lamina-less. Stamens nearly enclosed, pale yellow, ca. 3.5 mm; filaments ca. 1.5 mm; anthers ca. 2 mm, valved. Pistil ca. 4.3 mm. Capsules ca. 2.5 cm; style ca. 7 mm. Fl. Apr, fr. Jul.

- Forests, thickets; 2000–2200 m. Sichuan.

**39. *Epimedium sutchuenense*** Franchet, J. Bot. (Morot) 8: 282. 1894.

四川淫羊藿 *si chuan yin yang huo*

Herbs, 15–60 cm tall. Rhizome long creeping, 1–4 mm in diam., with internodes to 14 cm. Leaves basal and cauline, trifoliate; leaflets adaxially green, ovate or narrowly ovate, 5–13 × 2–5 cm, thinly leathery, abaxially glaucous, papillose, sparsely gray pubescent, reticulate veins conspicuous, adaxially glabrous, base deeply cordate, terminal leaflet with equal rounded lobes, lateral leaflets conspicuously oblique with outer lobe large and acute, inner lobe smaller and rounded, apex long acuminate. Flowering stem with 2 trifoliate opposite leaves. Inflorescence simple, racemose, 4–10-flowered, 8–15 cm, glandular. Pedicel 1.5–2.5 cm, glandular. Flowers rose or mauve-purple, 3–4 cm in diam. Outer sepals 4, outer pair ovate, ca. 3 mm, apex rounded, inner pair broadly obovate, ca. 4 mm; inner sepals reflexed, narrowly lanceolate, 1.5–1.7 cm × ca. 3 mm, apex long acuminate. Petals reflexed, pale purplish red, spur horn-shaped, ca. as long as inner sepals or slightly longer, 1.5–2 cm, lamina-less. Stamens prolonged, 4–5 mm; filaments 1–2 mm; anthers 3–4 mm, valved. Capsules 1.5–2 cm; style rostrate. Fl. Mar–Apr, fr. May–Jun.

• Forests, thickets, grasslands, streamsides; 400–1900 m. Guizhou, Hubei, Sichuan.

**40. *Epimedium brevicornu*** Maximowicz, Trudy Imp. S.-Peterburgsk. Bot. Sada 11: 42. 1889.

淫羊藿 *yin yang huo*

*Epimedium rotundatum* K. S. Hao.

Herbs, 20–60 cm tall. Rhizome short, clumped, 3–5 mm in diam. Leaves basal and cauline, usually biternate, 9-foliate, rarely 5-foliate; leaflets abaxially glaucous, adaxially usually shiny, ovate or broadly ovate, 1.5–7.5 × 1–6 cm, papery or thickly so, abaxially glabrous or scarcely pubescent, adaxially with conspicuous reticulate veins, base deeply cordate, terminal leaflet with equal rounded lobes, lateral leaflets slightly oblique with outer lobes large and acute or rounded, inner lobe smaller

and rounded, margin spinose-serrate, apex rounded or acute to acuminate. Flowering stem with 2 opposite usually biternate leaves. Panicle 10–35 cm, loosely 20–50-flowered; rachis and pedicel glandular. Pedicel 5–20 mm. Flowers white or pale yellow, ca. 1.5 cm in diam. Outer sepals dark green, ovate-triangular, 1–3 mm; inner sepals white or pale yellow, lanceolate, ca. 10 × 4 mm. Petals much shorter than inner sepals, with slight lamina and blunt spurs; spur narrow, conical, 2–3 mm. Stamens exserted, 3–4 mm; anthers ca. 2 mm, valved. Capsules ca. 1 cm; style 2–3 mm, rostrate. Fl. May–Jun, fr. Jun–Aug.

• Forests, thickets, slopes; 600–3500 m. Gansu, Henan, Hubei, Qinghai, Shaanxi, Shanxi, Sichuan.

**41. *Epimedium elongatum*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 139. 1908.

川西淫羊藿 *chuan xi yin yang huo*

Herbs, 25–60 cm tall. Rhizome moderately long creeping, 2–5 mm in diam. Leaves basal and cauline, bi- or triternate, 9-foliate or occasionally 5-foliate; leaflets adaxially green, ovate or suborbicular, 1.5–7.5 × 1–6 cm, papery, abaxially sparsely pubescent or glabrous, adaxially glabrous, both surfaces with conspicuous reticulate veins, base deeply cordate, terminal leaflet with equal rounded lobes, lateral leaflets slightly oblique with outer lobe large and rounded or acute, inner lobe smaller and rounded, margin spinose-serrate, apex rounded or acute. Flowering stem with 3 alternate or rarely opposite leaves, upper biternate or trifoliate, lower biternate or triternate. Panicle 17–30-flowered, 15–30 cm, sparsely glandular, with lower peduncles 3–5-flowered. Pedicel 1–2 cm, sparsely glandular. Flowers yellow, large, 2.5–3 cm in diam. Outer sepals whitish, ovate, 3–4 × ca. 2 mm, blunt; inner sepals purple, lanceolate, ca. 4 × 1.5 mm, apically acute. Petals yellow, longer than inner sepals; spur horizontally spreading or upwardly curved, ca. 1.5 cm, slender, lamina-less. Stamens slightly prolonged, ca. 3 mm; anthers ca. 2 mm, valved, revolute. Pistil ca. 4 mm. Capsules elongated, 2–2.5 cm, slender; style ca. 8 mm. Fl. May–Jun, fr. Jun–Jul.

• Forests, forest margins, thickets; 2600–3700 m. Sichuan.

#### Insufficiently known species

***Epimedium baojingense*** Q. L. Chen & B. M. Yang, Acta Phytotax. Sin. 20: 482. 1982 [*"baojingensis"*].

*Epimedium baojingense* is known only from the type gathering (Hunan: Baojing County, Lüdong Shan, 23 Apr 1956, B. M. Yang 34, holotype, HNU). As mentioned by Stearn (Gen. *Epimedium*, 113. 2002), *E. baojingense* has stem leaves with only a single leaflet, as in *E. simplicifolium*. It is reported to differ from *E. simplicifolium* by having a simple inflorescence with dark yellow hairs.

***Epimedium campanulatum*** Ogisu, Kew Bull. 51: 401. 1996.

According to the author, *Epimedium campanulatum* is morphologically similar to *E. ecalcaratum* G. Y. Zhong and *E. platypetalum* K. I. Meyer. *Epimedium campanulatum* is reported to differ from *E. ecalcaratum* in having 1 or 2 leaves per flowering stem, and basal and cauline leaves with only 3, never 5 or 7, leaflets. *Epimedium campanulatum* differs from *E. platypetalum* in having compact or shortly creeping rhizomes and compound, rarely simple, inflorescences. It flowers in mid

to late May and occurs at ca. 2000 m in Sichuan (Duijiangyan).

***Epimedium grandiflorum*** C. Morren, Belgique Hort. 2: 141. 1852.

*Epimedium grandiflorum* was described from cultivated plants brought to Belgium (Ghent) from Japan by Philipp Franz von Siebold in 1830. Stearn includes in the range of *E. grandiflorum* "southern Manchuria," but we have seen no specimens from China. The reports of *E. grandiflorum* in the Flora of Anhui (see X. H. Qian, Fl. Anhui 2: 346. 1986) and Flora of Zhejiang (see C. S. Ding, Fl. Zhejiang 2: 307–320. 1992) are probably based on plants here treated as *E. koreanum*.

***Epimedium jingzhouense*** G. H. Xia & G. Y. Li, Nordic J. Bot. 27: 472. 2009.

*Epimedium jingzhouense* is known only from the type gathering (Hunan: Jingzhou County, Pukou village, 300 m, 8 Apr 2008, Xia *et al.* s.n., holotype, ZJFC).

**Epimedium pseudowushanense** B. L. Guo, Acta Phytotax. Sin. 45: 814. 2007.

According to the authors, *Epimedium pseudowushanense* is morphologically similar to *E. wushanense* but differs in flower structure. It differs from *E. mikinorii* in having leaves abaxially villous and glaucous, more slender spurs, 10–15 mm, inner sepals broadly ovate or ovate, and purplish or yellow petals with purple lamina. Its flowering time is from Mar–Apr, fruiting is in May, and it occurs at 900–1400 m in Guangxi and Guizhou.

**Epimedium pudingense** S. Z. He, Y. Y. Wang & B. L. Guo, Ann. Bot. Fenn. 47: 226. 2010.

*Epimedium pudingense* is known only from the type gathering (Guizhou: Puding County, 1300 m, 13 Apr 1995, S. Z. He 95413, holotype, HGCM).

**Epimedium qingchengshanense** G. Y. Zhong & B. L. Guo, Acta Phytotax. Sin. 45: 817. 2007.

*Epimedium qingchengshanense* is reported to differ from *E. fargesii* in having smaller flowers but larger rounded petal lamina and purple filaments. Its flowering time is from May–Jun and it occurs at 900–1500 m in Sichuan (Qingcheng Shan).

**Epimedium shennongjiaense** Yan J. Zhang & J. Q. Li, Novon 19: 567. 2009 [*“shennongjiaensis”*].

*Epimedium shennongjiaense* is known only from the type gathering (Hubei: cultivated at Wuhan Botanical Garden from material collected at Muyuping, Shennongjia National Nature Reserve, 30 Mar 2007, Y. J. Zhang 148, holotype, HIB; isotype, HIB).

## 9. GYMNOSPERMIUM Spach, Hist. Nat. Vég. Phan. 8: 66. 1839.

牡丹草属 mu dan cao shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

Herbs, perennial, glabrous. Tuber subglobose or irregular; stem erect, herbaceous, branchless. Stem with 1 terminal leaf, bi- or triternate, rarely trifoliolate; leaflets thinly herbaceous, slightly pruinose. Inflorescence simple, racemose, terminal. Pedicel with bract at base. Flowers yellow. Sepals 6, petaloid. Petals 6, nectary-like, much shorter than sepals. Stamens distinct, opposite petals and equal in number; anthers dehiscent by 2 apical flaps. Pistil simple; ovary 1-loculed; ovules 2–4; placentation basal; style short or slender; stigma truncate. Capsule less than 8 mm in diam., valved. Seeds 2–4; aril whitish.  $x = 8$ .

Six to eight species: north temperate zone; three species (one endemic) in China.

1a. Leaves bipinnate or tripinnate; inflorescence 13–16-flowered; pedicel 3–4 cm; sepals 7–10 mm ..... 1. *G. kiangnanense*

1b. Leaves trifoliolate; inflorescence 5–10-flowered; pedicel 1–2.5 cm; sepals 5–8 mm.

2a. Leaflets 3-divided; ovules 2 or 3; pedicel 2–2.5 cm ..... 2. *G. microrrhynchum*

2b. Leaflets palmately 5-divided; ovules 4; pedicel ca. 1 cm ..... 3. *G. altaicum*

**1. Gymnospermium kiangnanense** (P. L. Chiu) H. Loconte, Canad. J. Bot. 67: 2315. 1989.

江南牡丹草 jiang nan mu dan cao

*Leontice kiangnanensis* P. L. Chiu, Acta Phytotax. Sin. 18: 96. 1980.

Herbs, 20–40 cm tall. Tuber subglobose, 3–5 cm in diam., sometimes to 8 cm; section of tuber yellow. Stem erect or decumbent, usually black-purple, glabrous, but slightly pruinose. Leaf terminal, 2–3 × ternately compound, 6–10 × 9–18 cm; pinnules adaxially pale green, obovate or ovate-oblong, 2.5–3.5 × 1.5–2.5 cm, abaxially slightly glaucous, 2- or 3-parted, margin entire. Raceme terminal, 13–16-flowered, 13–25 cm; bracts triangular-ovate or reniform, apex acute. Pedicel 3–4 cm. Flowers yellow, 1.1–1.8 cm in diam. Sepals narrowly elliptic or oblong-obovate, 7–10 × 5–6 mm, apically obtuse. Petals ca. 2 mm. Stamens 4–7 mm. Pistil shortly stipitate; ovary rhomboid-ovoid; ovules 2 or 3; style short; stigma truncate. Capsule subglobose, 5-valved. Seeds greenish brown, obovoid. Fl. Mar–Apr, fr. Apr–May.

• Forest margins; 700–800 m. Anhui, Zhejiang.

**2. Gymnospermium microrrhynchum** (S. Moore) Takhtajan, Bot. Zhurn. (Moscow & Leningrad) 55: 1192. 1970.

牡丹草 mu dan cao

*Leontice microrrhyncha* S. Moore, J. Linn. Soc., Bot. 17: 377. 1879; *L. microrrhyncha* f. *venosa* (S. Moore) Kitagawa; *L.*

*microrrhyncha* var. *venosa* S. Moore.

Herbs, ca. 30 cm tall. Tuber ca. 2 cm in diam. Stem erect, stramineous, herbaceous, succulent, with 1 leaf. Stipules 2, large, apex shallowly 2- or 3-lobed; leaf trifoliolate or biternate compound, herbaceous; petiole ca. 2 cm; leaf blade abaxially pale green, adaxially green, 3-divided, lobes oblong to oblong-lanceolate, 3–4 cm, entire, apex blunt. Raceme terminal, simple, 5–10-flowered; peduncle ca. 8 cm. Pedicel 2–2.5 cm, slender; bracts broadly ovate, ca. 5 × 6 mm. Flowers pale yellow. Sepals 5 or 6, obovate, ca. 5 × 3 mm, apex blunt. Petals ca. 3 mm, apex truncate. Stamens ca. 4 mm. Pistil shortly stipitate or subsessile; ovary ovoid; ovules 2 or 3; style short; stigma truncate. Capsule globose, ca. 6 mm in diam., 5-valved. Seeds usually 2. Fl. Apr–May, fr. May–Jun.

Forests, forest margins; ca. 100 m. Jilin, Liaoning [Korea].

**3. Gymnospermium altaicum** (Pallas) Spach, Hist. Nat. Vég. Phan. 8: 67. 1839.

阿尔泰牡丹草 a er tai mu dan cao

*Leontice altaica* Pallas, Acta Acad. Sci. Imp. Petrop. 2: 255. 1779.

Herbs, ca. 15 cm tall. Tuber subglobose, ca. 1.5 cm in diam. Stem erect, herbaceous, green. Stipules 2, ca. 7 × 4 mm, entire; cauline leaf 1, terminal, trifoliolate, thin in texture; leaflets abaxially pale green, adaxially green, 4- or 5-palmatisect, segments oblong or oblong-lanceolate, 2–2.5 cm × 7–10 mm,

margin entire, apex blunt. Raceme terminal, simple, 7–9-flowered, 4–5 cm; peduncle ca. 1.5 cm; bracts broadly elliptic or ovate, 7–9 × 6–7 mm. Pedicel ca. 1 cm, slender. Flowers yellow. Sepals 6, elliptic, ca. 8 × 3 mm. Petals 6, opposite sepals, yellowish brown, longitudinally half-tubular, ca. 2 mm, apex aristate. Stamens opposite petals, ca. 4 mm; filaments thin, ca.

2.2 mm; anthers valved. Pistil ca. 4.5 mm; ovules 4, obovoid, basal; style ca. 2.5 mm. Capsule unknown. Fl. Mar–Apr, fr. unknown.

Foot of mountains, along trails; ca. 200 m. Xinjiang [Russia (Siberia)].

## 10. LEONTICE Linnaeus, Sp. Pl. 1: 312. 1753.

囊果草属 nang guo cao shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

*Leontopetalon* Miller.

Herbs, perennial, with tubers, glabrous. Stem erect, herbaceous, unbranched. Cauline leaves usually 2(–5), alternate, 2–3 × pinnately compound, stipulate. Raceme simple, terminal, bracteate. Flowers yellow. Sepals 6, petaloid. Petals 6, yellow, nectary-like, much shorter than sepals. Stamens distinct. Pistil simple; carpels 1; ovary inflated, not stipitate or shortly so; ovules 2–4; placentation basal. Achene globose, utricle-like, indehiscent or irregularly lacerate on top of fruit. Seeds in fruit, usually 2; aril absent.

About three or four species: north temperate zone; one species in China.

1. *Leontice incerta* Pallas, Reise Russ. Reich. 3: 726. 1776.

囊果草 nang guo cao

*Leontice vesicaria* Willdenow.

Herbs, 5–20 cm tall. Tuber ovoid, globose, or irregular, 2–5 cm in diam. Stem pale brown, terete, shiny at base, with few lanceolate scales at base. Cauline leaves 2; petiole 3–5 cm, sheathed at base; leaf blade 2 or 3 × pinnately compound, pinnales abaxially yellowish green, adaxially deep green, elliptic or obovate, entire, abaxially inconspicuously veined, adaxially 3–

5-basinerved, both surfaces glabrous, entire. Raceme terminal, 4–6 cm; peduncle 2–2.4 cm; bracts suborbicular or broadly ovate, apex blunt, fleshy. Pedicel to 1.2 cm, stout, glabrous. Sepals yellow, bluish purple spotted on outside, elliptic or ovate, longer than petals. Petals obovate, base clawed. Stamens distinct; anthers valved. Carpel 1; ovules 2–4. Achene pale purple in upper part, subglobose, large, to 2.5–4.5 cm in diam., bladderlike inflated, indehiscent, with conspicuous reticulate veins. Seeds 2, black-brown. Fl. Apr, fr. May.

Slopes of hills in desert regions, *Haloxylon* forests; ca. 600 m. Xinjiang [Kazakhstan].

## 11. CAULOPHYLLUM Michaux, Fl. Bor.-Amer. 1: 204, t. 21. 1803.

红毛七属 hong mao qi shu

Ying Junsheng (应俊生 Ying Tsun-shen); David E. Boufford, Anthony R. Brach

*Phtheirotheca* Maximowicz ex Regel.

Herbs, perennial, deciduous, glabrous. Rhizome creeping, stout, nodose, with numerous fibrous roots. Aerial stem erect. Leaves alternate, 2 or 3 × ternately compound, broadly ovate in overall outline; petiole short or leaves sessile; pinnales petiolulate or sessile, ovate, obovate, or broadly lanceolate, undivided or lobed, venation pinnate or palmate, margin entire. Inflorescences terminal, compound cymes. Flowers 3-merous; bracteoles 3 or 4, sepald, caducous. Sepals 6, petaloid, yellow, red, purple, or green. Petals 6, fan-shaped or obovate, nectary-like. Stamens distinct; anthers dehiscing by 2 apically hinged flaps; pollen prolate, 3-colporate, exine reticulate. Ovary bladderlike; placentation basal; styles eccentric. Fruit not developing, ovary wall soon rupturing and seed coat becoming fleshy and fruitlike. Seeds 2, raised on elongating stalk, naked at maturity, globose; seed coat tunic-blue, fleshy, glaucous.  $x = 8$ .

Three species: North America and E Asia; one species in China.

1. *Caulophyllum robustum* Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 33. 1859.

红毛七 hong mao qi

*Leontice robusta* (Maximowicz) Diels.

Herbs, to 80 cm tall. Rhizomes short, stout, nodose. Stem leaves 2; terminal leaflet usually petiolulate, lateral leaflets subsessile; leaflets abaxially pale green or grayish white, adaxially green, ovate, oblong, or broadly lanceolate, 4–8 × 1.5–5 cm, both surfaces glabrous, base broadly cuneate, margin entire,

sometimes 2- or 3-lobed, apex acuminate. Flowers pale yellow, 7–8 mm in diam.; bracteoles usually 3. Sepals obovate, 5–6 × 2.5–3 mm, apex rounded. Petals much smaller than sepals, base clawed. Stamens opposite petals, ca. 2 mm; filaments longer than anthers. Pistils shorter than stamens; ovules 2, stipitate; funiculus thickened, 7–8 mm. Seeds naked at maturity, 6–8 mm in diam.; seed coat blue, fleshy, glaucous; aril absent. Fl. May–Jun, fr. Jul–Sep.  $2n = 16$ .

Forests, bamboo thickets, *Cathaya* forests, moist places in valleys; 900–3500 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Korea, Russia].

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| <b>Dryopteridaceae</b>      | 鳞毛蕨科  | <b>3</b>    | 5(1, 2)      | <b>Lardizabalaceae</b>  | 木通科   | <b>6</b>    | <b>29</b>    |
| <b>Ebenaceae</b>            | 柿科    | <b>15</b>   | 60(1)        | <b>Lauraceae</b>        | 樟科    | <b>7</b>    | <b>31</b>    |
| <b>Elaeagnaceae</b>         | 胡颓子科  | <b>13</b>   | 52(2)        | <b>Lecythidaceae</b>    | 玉蕊科   | <b>13</b>   | 52(2)        |
| <b>Elaeocarpaceae</b>       | 杜英科   | <b>12</b>   | 49(1)        | <b>Leeaceae</b>         | 火筒树科  | <b>12</b>   | 48(2)        |
| <b>Elaphoglossaceae</b>     | 舌蕨科   | <b>3</b>    | 6(1)         | <b>Lemnaceae</b>        | 浮萍科   | <b>23</b>   | 13(2)        |
| <b>Elatinaceae</b>          | 沟繁缕科  | <b>13</b>   | 50(2)        | <b>Lentibulariaceae</b> | 狸藻科   | <b>19</b>   | <b>69</b>    |
| <b>Ephedraceae</b>          | 麻黄科   | <b>4</b>    | <b>7</b>     | <b>Liliaceae</b>        | 百合科   | <b>24</b>   | 14, 15       |
| <b>Equisetaceae</b>         | 木贼科   | <b>2</b>    | 6(3)         | <b>Linaceae</b>         | 亚麻科   | <b>11</b>   | 43(1)        |
| <b>Ericaceae</b>            | 杜鹃花科  | <b>14</b>   | 56, 57(1-3)  | <b>Lindsaeaceae</b>     | 鳞始蕨科  | <b>2</b>    | <b>2</b>     |
| <b>Eriocaulaceae</b>        | 谷精草科  | <b>24</b>   | 13(3)        | <b>Linnaeaceae</b>      | 北极花科  | <b>19</b>   | <b>72</b>    |
| <b>Erythroxylaceae</b>      | 古柯科   | <b>11</b>   | 43(1)        | <b>Loganiaceae</b>      | 马钱科   | <b>15</b>   | <b>61</b>    |
| <b>Eucommiaceae</b>         | 杜仲科   | <b>9</b>    | 35(2)        | <b>Lomariopsidaceae</b> | 藤蕨科   | <b>3</b>    | 6(1)         |
| <b>Euphorbiaceae</b>        | 大戟科   | <b>11</b>   | 44(1-3)      | <b>Loranthaceae</b>     | 桑寄生科  | <b>5</b>    | <b>24</b>    |
| <b>Eupteleaceae</b>         | 领春木科  | <b>6</b>    | <b>27</b>    | <b>Lowiaceae</b>        | 兰花蕉科  | <b>24</b>   | 16(2)        |
| <b>Fabaceae</b>             | 豆科    | <b>10</b>   | 39-42        | <b>Loxogrammeaceae</b>  | 剑蕨科   | <b>3</b>    | 6(2)         |
| <b>Fagaceae</b>             | 壳斗科   | <b>4</b>    | <b>22</b>    | <b>Lycopodiaceae</b>    | 石松科   | <b>2</b>    | 6(3)         |
| <b>Flacourtiaceae</b>       | 大风子科  | <b>13</b>   | 52(1)        | <b>Lygodiaceae</b>      | 海金沙科  | <b>2</b>    | <b>2</b>     |
| <b>Flagellariaceae</b>      | 须叶藤科  | <b>24</b>   | 13(3)        | <b>Lythraceae</b>       | 千屈菜科  | <b>13</b>   | 52(2)        |
| <b>Frankeniaceae</b>        | 瓣鳞花科  | <b>13</b>   | 50(2)        | <b>Magnoliaceae</b>     | 木兰科   | <b>7</b>    | 30(1)        |
| <b>Gentianaceae</b>         | 龙胆科   | <b>16</b>   | <b>62</b>    | <b>Malpighiaceae</b>    | 金虎尾科  | <b>11</b>   | 43(3)        |
| <b>Geraniaceae</b>          | 牻牛儿苗科 | <b>11</b>   | 43(1)        | <b>Malvaceae</b>        | 锦葵科   | <b>12</b>   | 49(2)        |
| <b>Gesneriaceae</b>         | 苦苣苔科  | <b>18</b>   | <b>69</b>    | <b>Marantaceae</b>      | 竹芋科   | <b>24</b>   | 16(2)        |
| <b>Ginkgoaceae</b>          | 银杏科   | <b>4</b>    | <b>7</b>     | <b>Marattiaceae</b>     | 合囊蕨科  | <b>2</b>    | 6(3)         |
| <b>Gleicheniaceae</b>       | 里白科   | <b>2</b>    | <b>2</b>     | <b>Marsileaceae</b>     | 苹科    | <b>3</b>    | 6(2)         |
| <b>Gnetaceae</b>            | 买麻藤科  | <b>4</b>    | <b>7</b>     | <b>Martyniaceae</b>     | 角胡麻科  | <b>18</b>   | <b>69</b>    |
| <b>Goodeniaceae</b>         | 草海桐科  | <b>19</b>   | 73(2)        | <b>Mastixiaceae</b>     | 单室茱萸科 | <b>14</b>   | <b>56</b>    |
| <b>Grammitidaceae</b>       | 禾叶蕨科  | <b>3</b>    | 6(2)         | <b>Melastomataceae</b>  | 野牡丹科  | <b>13</b>   | 53(1)        |
| <b>Gymnogrammitidaceae</b>  | 雨蕨科   | <b>3</b>    | 6(1)         | <b>Meliaceae</b>        | 楝科    | <b>11</b>   | 43(3)        |
| <b>Haloragaceae</b>         | 小二仙草科 | <b>13</b>   | 53(2)        | <b>Menispermaceae</b>   | 防己科   | <b>7</b>    | 30(1)        |
| <b>Hamamelidaceae</b>       | 金缕梅科  | <b>9</b>    | 35(2)        | <b>Menyanthaceae</b>    | 睡菜科   | <b>16</b>   | <b>62</b>    |
| <b>Helminthostachyaceae</b> | 七指蕨科  | <b>2</b>    | <b>2</b>     | <b>Molluginaceae</b>    | 粟米草科  | <b>5</b>    | <b>26</b>    |
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| <b>Hemionitidaceae</b>      | 裸子蕨科  | <b>2</b>    | 3(1)         | <b>Moraceae</b>         | 桑科    | <b>5</b>    | 23(1)        |
| <b>Hernandiaceae</b>        | 莲叶桐科  | <b>7</b>    | <b>31</b>    | <b>Morinaceae</b>       | 刺参科   | <b>19</b>   | 73(1)        |
| <b>Hippocastanaceae</b>     | 七叶树科  | <b>12</b>   | <b>46</b>    | <b>Moringaceae</b>      | 辣木科   | <b>8</b>    | 34(1)        |

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| Myoporaceae          | 苦檻藍科  | 19          | 70           | Polemoniaceae    | 花苤科   | 16          | 64(1)           |
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| Myrsinaceae          | 紫金牛科  | 15          | 58           | Polypodiaceae    | 水龙骨科  | 3           | 6(2)            |
| Myrtaceae            | 桃金娘科  | 13          | 53(1)        | Pontederiaceae   | 雨久花科  | 24          | 13(3)           |
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| Nephrolepidaceae     | 肾蕨科   | 3           | 6(1)         | Primulaceae      | 报春花科  | 15          | 59(1, 2)        |
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| Nyctaginaceae        | 紫茉莉科  | 5           | 26           | Psilotaceae      | 松叶蕨科  | 2           | 6(3)            |
| Nymphaeaceae         | 睡莲科   | 6           | 27           | Pteridaceae      | 凤尾蕨科  | 2           | 3(1)            |
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| Ochnaceae            | 金莲木科  | 12          | 49(2)        | Rafflesiaceae    | 大花草科  | 5           | 24              |
| Olacaceae            | 铁青树科  | 5           | 24           | Ranunculaceae    | 毛茛科   | 6           | 27, 28          |
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| Onagraceae           | 柳叶菜科  | 13          | 53(2)        | Rhamnaceae       | 鼠李科   | 12          | 48(1)           |
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| Opiliaceae           | 山柚子科  | 5           | 24           | Rosaceae         | 蔷薇科   | 9           | 36-38           |
| Orchidaceae          | 兰科    | 25          | 17-19        | Rubiaceae        | 茜草科   | 19          | 53(2), 71(1, 2) |
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| Osmundaceae          | 紫萁科   | 2           | 2            | Rutaceae         | 芸香科   | 11          | 43(2)           |
| Oxalidaceae          | 酢浆草科  | 11          | 43(1)        |                  |       |             |                 |
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| Paeoniaceae          | 芍药科   | 6           | 27           | Salicaceae       | 杨柳科   | 4           | 20(2)           |
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| Pittosporaceae       | 海桐花科  | 9           | 35(2)        | Sladeniaceae     | 肋果茶科  | 12          | 49(2)           |
| Plagiogyriaceae      | 瘤足蕨科  | 2           | 2            | Solanaceae       | 茄科    | 17          | 67(1)           |
| Plagiopteraceae      | 斜翼科   | 11          | —            | Sphenocleaceae   | 尖瓣花科  | 19          | 73(2)           |
| Plantaginaceae       | 车前科   | 19          | 70           | Stachyuraceae    | 旌节花科  | 13          | 52(1)           |
| Platanaceae          | 悬铃木科  | 9           | 35(2)        | Staphyleaceae    | 省沽油科  | 11          | 46              |
| Platyneriaceae       | 鹿角蕨科  | 3           | 6(2)         | Stemonaceae      | 百部科   | 24          | 13(3)           |
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| <b>Tetracentraceae</b>  | 水青树科 | <b>6</b>    | 1            | <b>Vittariaceae</b>     | 书带蕨科 | <b>2</b>    | 3(2)         |
| <b>Tetramelaceae</b>    | 四数木科 | <b>13</b>   | 52(1)        |                         |      |             |              |
| <b>Theaceae</b>         | 山茶科  | <b>12</b>   | 49(3), 50(1) | <b>Woodsiaceae</b>      | 岩蕨科  | <b>2</b>    | 4(2)         |
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| <b>Tiliaceae</b>        | 椴树科  | <b>12</b>   | 49(1)        | <b>Zingiberaceae</b>    | 姜科   | <b>24</b>   | 16(2)        |
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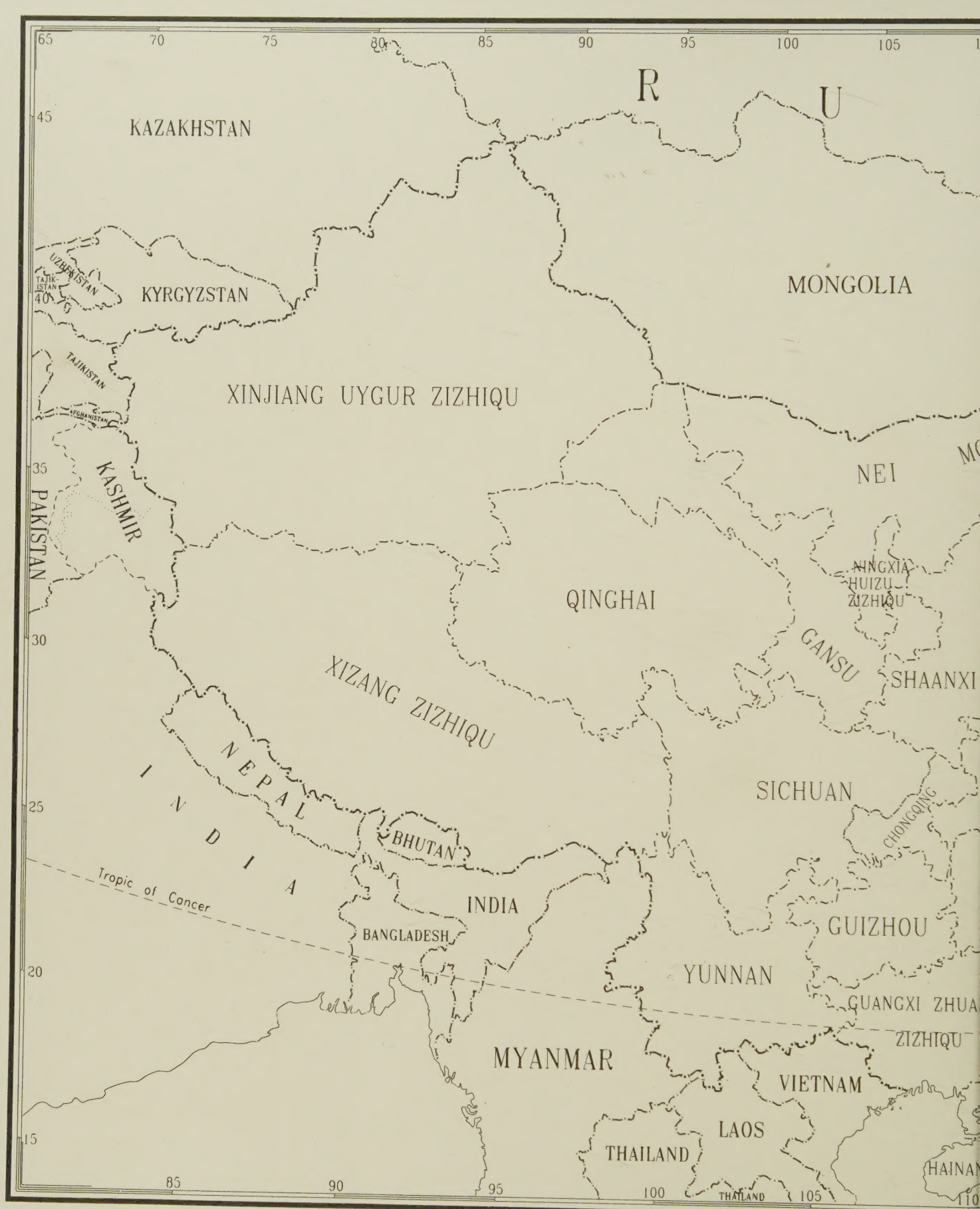




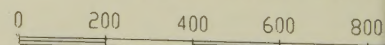


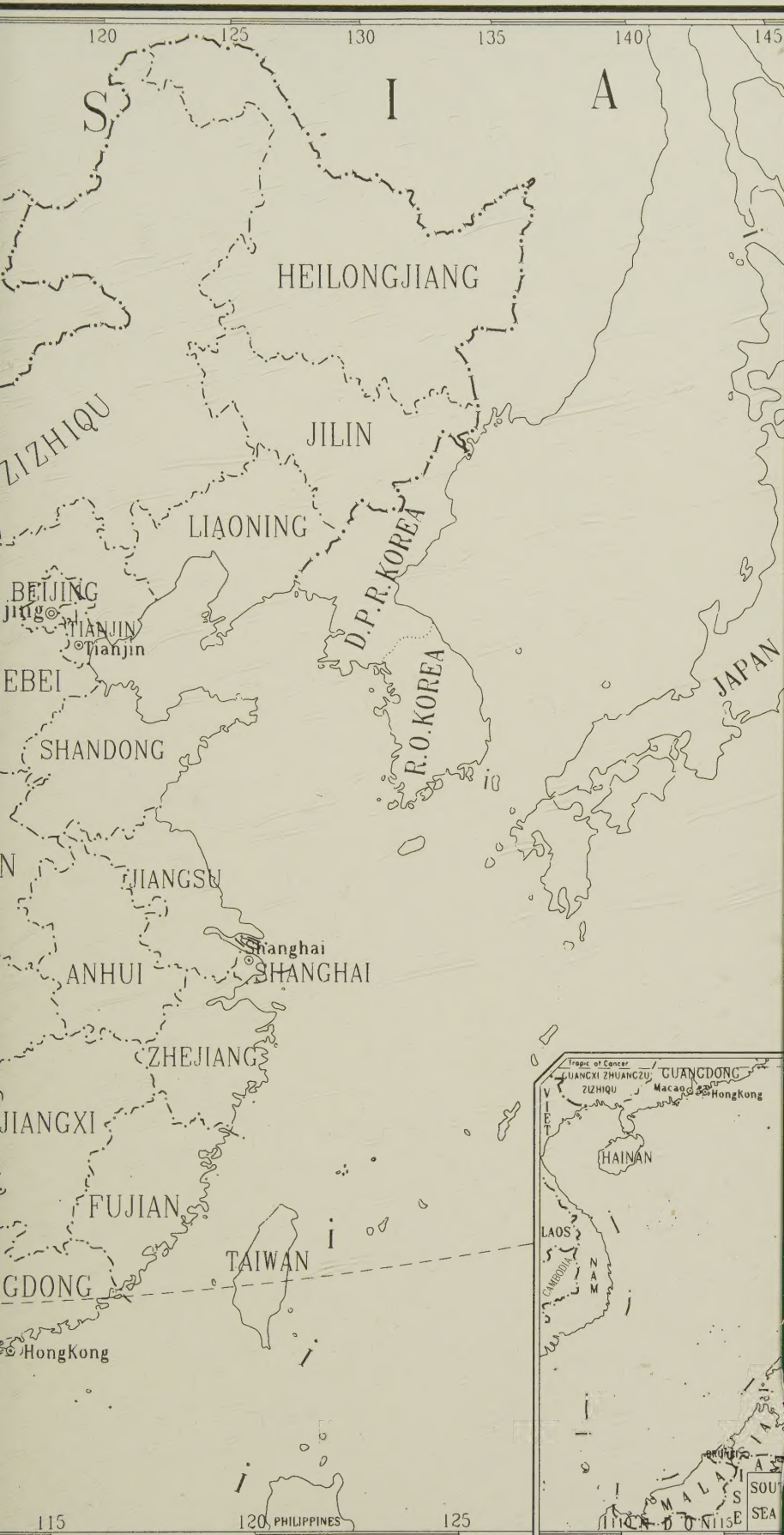






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